CHICAGO TRANSIT AUTHORITY
STATEMENT OF WORK (SOW)

FOR

CLEVER DEVICES

**SOFTWARE AND HARDWARE MAINTENANCE OF CLEVER DEVICES SYSTEMS
ON UP TO 1,900 BUSES LOCATED AT SEVEN GARAGES**

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 (Contractor), are required to support our fleet of 1,870 buses, including the enhancement of currently deployed systems, and the implementation of new systems that will further 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 Overview of Scope

The scope of work with the contractor 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 new 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 contractor Clever Devices. A certified trained Disadvantageous Business Enterprise (DBE) sub-contractor, may perform parts of the field support (B) component. Sub-contractor support is also possible for the hosting services (A), but overall management and support is necessary from the contractor Clever Devices.

1.1.1 Annual Software License, Maintenance and Hosting Services (A)

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

- Automated Voice Announcements (AVAS)
- BusTracker, including shelter signs and third-party apps
- 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)

1.1.2 Field Support and Repair of Installed Equipment and Parts Management (B)

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

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

1.1.3 Application Extension, Training and Development of New Features (C)

The CTA is constantly coming up with new ideas to improve the technology integration of our on-board systems. Several ideas to cut costs, improve customer safety or experience and evolve over time.

- BusTools end-of-life replacement to the CleverWorks Platform
- Transit Signal Priority modifications
- Voice talent recording (or use of an automated voice)
- Professional Services for new development
- Training Services for our staff on new features

1.2 Table of Systems

The following table summarizes the systems covered or impacted:

On-Board Bus Systems		
Intelligent Vehicle Network (IVN), BusWare	Core computing system that controls and supports all Clever sub-systems, with associated hardware and software.	2.0 Bus Service (B) 3.0 Parts (B) 4.3 Software Maint. (A)
Automatic Voice Announcements (AVA)	Sub-system that automatically announces and displays stops	2.0 Bus Service (B) 3.0 Parts (B)
Automatic Passenger Counter (APC)	Sub-system that automatically counts the number of passengers boarding and leaving a bus.	2.0 Bus Service (B) 3.0 Parts (B)
Secure Bus Access (SBA)	PIN based logon and integration with vehicle multiplexer to prevent unauthorized bus movement	2.2 Bus Service (B, A)
Transit Signal Priority (TSP)	Transit Signal Priority functionality.	2.3 Bus Service (A, C)
Maintenance of On-Board Communications Systems		
BlueTree - Cellular Modem	Cellular modems break-fix support.	2.14.1 Bus Service (B) 3.4.1 Parts (B)
Utility Inc. - Rocket Mobile Communications Device	Break-fix support of Rocket Locker, timing device, switch and antennas. Parts under warranty with Utility. Swapping of cellular air cards and management with CTA staff.	2.14.2 Bus Service (B) 3.4.2 Parts (B)
Cellular Air Card Provider Svc./Change	Fleet-wide future swap of cellular provider, if requested.	2.14.3 Bus Service (B) 3.4.3 Parts (B)
Back-Office Systems		
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.	4.2, 4.3, 4.4 Software Maint. (A)
BusTools / CleverWorks	Back-end software to manage voice announcement, Schedules, Routes and BusTracker data. Bus-in-a-box test units. The current HASTUS to BusTools Integration will continue to be supported. Migration to the CleverWorks platform.	4.6 Software Maint. (A) 7.0 CleverWorks TO (C)
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.	4.9 Software Maint. (A)
AVAS Data Ingester	Database connector to push busstate (AVAS) data to CTA Oracle server for analysis	4.8 Software Maint. (A)
AVM3	Server and data flow for Automatic Vehicle Monitoring, including a web-based reporting solution.	4.10 Software Maint. (A)

CleverCAD Servers	Back-end system to manage operations and real-time communications with vehicles, includes controller console application	4.11 Software Maint. (A)
Maintenance or Services		
Voice Talent and Recording	Professional Voice recording and digital editing, option for alternative talent or digital recordings with cost benefit analysis.	5.1 Professional Services (C)
Training & Integration Support	Training and support of complex integration (AVM, MMIS, CAD, BusTools), locally or nationally centrally.	5.3 Professional Services (C)
Professional Services	Additional services not explicitly outlined that arise based on complex systems	5.0 Professional Services (C)

1.2 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	2017	2018	2019	2020	2021	2022	2023	2024
6400	Nova	40	100	80	50					
1000, 800	New Flyer	40	1035	1035	1029	900	650	400	375	300
4000	New Flyer	60	207	207	207	207	207	207	30	
4300	New Flyer	60	97	97	97	97	97	97	97	97
700	New Flyer	40-Elec	2	2	2	2	2	2	2	2
7900	Nova	40	424	449	449	449	449	449	449	449
TBD-Elec	TBD	40-Elec		5	25	25	25	25	25	25
TBD-1	TBD	40				200	200	200	200	200
TBD-2	TBD	40					250	500	500	500
TBD-3	TBD	60							200	200
TBD-3	TBD	60								100
		Total:	1865	1875	1859	1880	1880	1880	1878	1873

The first three years of the contract the CTA will likely not take delivery of more than 25 to 50 buses which should cut down substantially on bus provisioning and testing activity.

1.3 New Services & Options Summary

The following table outlines the new items not previously covered by the Clever Devices annual maintenance contract.

On-Board Bus Systems		
Transit Signal Priority (TSP)	The RTA is changing the Regional ITS Architecture and requires a fully interoperable message set at a regional level. Modifications to the existing development used on #J14, #9 and #49 routes today.	Option (2.3) (C)
Automatic Passenger Counter (APC) SLA improvements	Required by the FTA in 2018 to use APC data for NTD reporting. We must have improved documented service.	Required 2.5.1 (B)
Parts Management & Spares	Materials Management Plan and capitalized spares.	Capital 3.3 (B)
Secure Bus Access (SBA) Certificate Hosting	Previously CTA would do an annual payment to SingleHop for Internet Certificates to support the SBA back-end.	Required (A)
Back-Office Systems		
BusTools Replacement - CleverWorks	Data Collection van elimination plan. When this feature is available we will obtain through a task order from professional services; support will then continue in scope.	Required (7.0)
Ridecheck Plus Support		Required (A)
Dynamic Scheduling		Option (C)
Full CleverReports		Option (C)
AVM On-Demand		Option (C)
Maintenance or Services		
Voice Talent and Recording	New Item, was being done ad hoc	Voice Talent Cost/Benefit Analysis (digital) (5.1) (C)

2.0 BUS SERVICE (B)

The field bus service is the essence of the support, as all systems depend on a functioning Intelligent Vehicle Network (IVN) and sub systems on board the bus. Clever Devices shall provide the ability to have a field service technician on site at each CTA facility for at least a portion of each standard night work shift. Clever Devices will provide service from the Sunday night shift to the Thursday night shift. Work shifts are subject to demand and addressing the most critical issues first.

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

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

2.1 Definition of Key Terms

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

- IVN – Intelligent Vehicle Network
- AVA – Automatic Vehicle Announcements
- AVAS – Automatic Voice Announcement System; encompasses all back-end and is essentially the CTA's AVL system.
- APC – Automatic Passenger Counting
- LED – Light Emitting Diode Sign
- GPS – Global Positioning System; includes gyroscope and odometer readings
- FSR – Field Service Report
- MMIS – Maintenance Management Information System
- NTF – No Trouble Found

2.2 Secure Bus Access Support

Clever Devices will maintain the Secure Bus Access (SBA) system and all associated integration with the on-board multiplexer, ladder logic based, systems. Clever Devices 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. Clever Devices will support a change in the secret hash key (a BusTools/CleverWorks parameter) should any compromise in security occur (highly unlikely). Implementing a new hash key will require several days and CTA will attempt to couple the

change with a standard BusTools Distribution. During this time, CTA will provide logon PINs for both the old and new hash key.

2.3 Transit Signal Priority (C)

The CTA requires the ability to operate Transit Signal Priority using the released BusWare code that supports the NTCIP protocols (Jeffery Jump & Ashland/Western corridors) through the Utility Rocket device on any vehicle. A nominal fee for setting up new intersections is chargeable through a one-time professional services task order, essentially assisting CTA staff in setting up BusTools and remote troubleshooting and log file checks.

TSP shall work on ALL buses with compatible Rocket or other suitable communications hardware.

Changes to the existing message sets, as required by the Regional Transportation Authority, will be managed through the professional services task order; funded by TSP projects.

2.4 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 Clever Devices; whether 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 / Clever Devices)
     NOT included in the Clever Devices Defects unless deemed NOT a CTA issue.
- TCH - Identification of a possible Transit Control Head defect
- Old BusTools Database - (pick distributions only) Three days after a pick goes live the bus is then considered critical because it will not display in BusTracker.

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:

- **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 - Old BusTools -** Bus has an Old BusTools 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

2.5 Non-Critical AVAS Defects

Non-Critical AVAS defects include Automatic Passenger Counters (APC), 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 in their own right, they are not considered critical. While the CTA is able to 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.

2.5.1 APC Service Plan

Starting with Fiscal Year 2019, the National Transit Database (NTD) reporting will require a description of our management plan for our APC system so that we can continue using APC data to report on passenger miles traveled.

The CTA will have to meet a certain level of accuracy and describe our process to ensure against any bias. Included in that bias could be things like broken APC. Ridecheck Plus generally throws out trips where there is an imbalance in front door and rear door counts so it is not a major issue for CTA reporting. However, there can be issues when both sets are broken because there is no imbalance; that is only zero activity trips and it is difficult to distinguish between real zero activity and bad data zero activity.

A mutually agreeable document that outlines the existing and future plans to monitor APC field service and ensure timely repair of APC issues is requested and quarterly reporting of APC defects repairs is required.

Coordination of the APC Service Plan shall rest with the CTA Planning Department.

2.6 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. The listing will itemize, Garage, bus number, issue, last real-time data, last AVAS data file, last fuel, and when the bus is due back to the garage along with an indication if a Clever Devices B39 defect is in MMIS. A sample record is below:

```
G BBBB – CDNAV RT(Xh) AVAS(YYh) F(ZZh) [In MMIS] Due: dd hh24:mi
1 1033 – CDNAV RT(0h) AVAS(17h) F(45h) [M] Due: 03 22:08
```
(The e-mail will also output a copy of the data in a comma separated, csv, format at the end of the message)

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:

http://transitweb/bus/avasmaint/maint_index2.asp

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.

2.7 MMIS Usage

CTA shall enter any and all requests for service into the MMIS system. CTA can automatically create Service Requests, and mangers 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.

2.8 Service Responsibility Flow

2.8.1 CTA 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 on the work order the date and nature of the defect.
- 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 Clever Devices and has proper lighting and electricity.
- Maintain the 802.11 network, components and ensure proper infrastructure to support coverage throughout each garage.
- All BusTools database creation and distributions. (Distributions will be handled by Clever Devices deployment team at any time of a BusWare upgrade, BusTools database, sign database, AVM data dictionary or at any time when modifications to the distribution are required; pursuant to section 2.9.)
- Supply all components and parts required for repair and replacement.
- System level maintenance and operation.

2.8.2 Clever Devices 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.

2.9 BusTools/CleverWorks Schedule Updates

Clever Devices will manage the sending and distributing of all BusTools/CleverWorks updates when there is a difference of BusWare versions, or a transition of BusTools/CleverWorks, 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. 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.

2.9.1 Destination Sign Updates

For all buses with Luminator ODK4 (and above) and a Rocket Mobile Communications Router, Clever Devices 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.

2.10 BusWare Updates

Clever Devices 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 Clever Devices quality assurance protocols, which are required in the work proposal.

2.11 Items out of Control of Clever Devices Technicians

The following items are considered out of control of Clever Devices 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 that identified as having Clever Devices defects that are determined to actually be due to items out of the control of Clever Devices Technicians, will be removed from the Critical AVAS Defects calculation for purposes of determining the Service Level as defined in section 2.16.

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

2.12 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 Clever Devices project management staff for a mutually agreeable report template.

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

2.13 Automatic Volume Control

Pursuant to this contract, Clever Devices 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. Bus Type is as defined in the BusTools database.

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.

2.14 Maintenance of On-board Communications systems

Clever Devices is responsible for troubleshooting the on-bus data communication systems. The Utility Rocket and cellular modems are furnished by CTA staff with Clever Devices field service technicians configuring the modems and replacing devices. Legacy Blue Tree modems are being phased out of all buses (estimated on 105 old Novas, and 208 New Flyer 60' vehicles by the execution of this contract).

2.14.1 BlueTree Modem

Clever Devices will continue to service BlueTree modems from a break-fix standpoint. Clever Devices field service technicians will continue to run the configuration script to match the modem to the bus and set the IVN settings by bus number.

2.14.1.1 Clever Devices Responsibilities:

- Troubleshoot issues with Blue Tree 4000 series modems & Charge Guard (until fully retired)
- Configuration and verification of replacement modems
- Provide CTA with 2-business day notice of and need for more spares

2.14.1.2 CTA Responsibilities:

- Provide replacement modems
- Assist with back-end and cellular (Sprint) troubleshooting
- Physical replacement of all antennas on the top of the bus, after testing and validation of the issue from Clever Devices technicians (South Shops).

2.14.2 Rocket Mobile Communication Devices

Currently nearly all buses have the Rocket Mobile Communications Device provided by Utility (www.utility.com). These devices are off warranty for parts from Utility. Clever Devices will provide break-fix support on Rocket Mobile Communications devices, basic troubleshooting and swapping out parts as needed. Clever Devices will return faulty units to CTA for return to Utility for replacement.

The network settings of each Rocket Mobile Communications Device 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. Once a bus is equipped with a Rocket Mobile Communications Device, IVNs and Rockets can be replaced independently of each other without any need to configure the based on the equipment change.

2.14.2.1 Clever Devices Responsibilities:

- Troubleshoot physical issues with Rocket
- Replacement or reseating cables
- Verification of complete on-board Bus RTWN system operation after a modem replacement

2.14.2.2 CTA Responsibilities:

- Provide replacement Rocket parts (Rocket, Timing Device, switch)
- Assist with back-end and configuration and troubleshooting
- Physical replacement of all antennas on the top of the bus, after testing and validation of the issue from Clever Devices technicians (South Shops).

2.14.3 Cellular Card Troubleshooting

Rocket Mobile Communications Devices use a USB cellular air card currently provided by Sprint. Clever Devices will provide break-fix and replacement

2.14.3.1 Clever Devices Responsibilities:

- Troubleshoot physical issues with the cellular card
- Pair Rockets and Air Cards with Buses via CTA's pairing web page or Android app (need to VPN to CTA)
- 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 defective cards to the CTA
- Advise within two days of any low-stock of spare air cards

2.14.3.2 CTA Responsibilities:

- Provide replacement cellular cards
- Assist with back-end and configuration, troubleshooting and activation

- Provide support for pairing of cards and rockets to vehicles

2.14.3.3 Fleetwide Cell Card Replacement Option

- Once Rockets are fully deployed, CTA may request via Task Order a quote for a Fleetwide Cellular replacement
- Clever Devices will simply acknowledge that this task order may arise during the life of this contract. Pricing will come after a formal task order is created.

2.14.4 Cellular Card on IVN without Rocket

Note that 105 old Novas still exist on BlueTree modems and will never get a Rocket, additionally about 180 New Flyer 60' Series (4000s) do not have Rockets and must go through overhaul to get the Rocket installed. It may become necessary to outfit existing IVN4 units with a Verizon air card (USB620L) plugged directly into the IVN via USB. CTA staff developed driver file (RNDIS file format) and a single line change to the OTA.ini file to support the Verizon card. Should the need arise to get off the 1xRTT BlueTree technology, Clever Devices will support and assist with deployment of the driver and Verizon air cards. CTA will develop a housing bracket to hold the USB air card to the mutual satisfaction of both parties. If the need arises CTA will assist with the development of a driver for the IVN3 platform or will accelerate the deployment of Rockets to the New Flyer 4000 series.

2.15 Repeater Buses with NTF (No Trouble Found)

Buses identified as No Trouble Found by Clever Devices technical personal after inspection and diagnosis will be reported to local CTA maintenance management. If requested, Clever Devices 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 Clever Devices 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 Clever Devices responding. The CTA shall provide a method such that CTA approved out-of-scope materials and labor can be invoiced.

2.16 Service Level Agreement

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 5 above, shall not exceed 3%. (that is 97% of the available buses do NOT have possible critical AVAS defects).

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 Clever Devices shall be measured and are defined as those currently listed on the AVAS Web site as "Navigation", "Not Reporting", "BusTools Database" (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 Clever Devices.

CTA shall provide authorized Clever Devices 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 Clever Devices 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 repair.

The Service Level Agreement for APC defects will be worked out in the aforementioned APC Service Plan (Section 2.5.1).

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

2.17 CTA – Clever Devices Responsibility Matrix
Created: 01/05/2017

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

3.0 PARTS (B)

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

Clever Devices 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:

IVN4	Estimated available: 172	Can harvest off old Novas when they retire.
IVN3	Estimated available: 50	If supply is depleted CTA will order from Clever Devices 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 Artics)	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 Clever Devices through NAPA
Clever Devices APC Receivers / Transmitters / Controllers	Spares obtained from Clever Devices via CTA stockroom	If supply is depleted CTA will order from Clever Devices through NAPA
EA Switches	Estimated available: 117 (old Nova style only)	Only for old Novas, all other EA switches are the responsibility of CTA.
Handsets	Estimated available: 96	New Nova buses use a handset provided by Nova
Radio Relays	Clever Devices has spares	If supply is depleted CTA will order from Clever Devices through NAPA.
AVC Sensor	Spares obtained from Clever Devices supply	If supply is depleted CTA will order from Clever Devices through NAPA.
Speakers	Spares obtained via CTA stockroom or new Nova warranty	If supply is depleted CTA will order from Bus OEM through NAPA.

3.1 Annual Parts Cost

Clever Devices 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 Clever Devices replenishing that pool when utilized.

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 Clever Devices, via Task Order to replenish the spare inventory.

3.2 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 Clever Devices 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 Clever Devices to properly remove old equipment and prep for reuse.

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

3.4 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 FSR summary.

3.5 On-Board Communications Systems
Clever Devices is responsible for the physical on-bus data communication systems, as outlined in section 2.14. The BlueTree modem is furnished by CTA staff with Clever Devices field service technicians configuring the modems and replacing devices. The Utility Rocket device is also provided and managed by CTA. The cellular air cards for the Utility Rocket are also provided and managed by the CTA.

3.5.1 BlueTree Modems

The CTA will continue to maintain and provide spare BlueTree 4000 Series Modems for Clever Devices field technicians. The overall service and replacement responsibilities are outlined in section 2.14.1.

Clever Devices will also maintain the Charge Guard device using CTA issued spares and will notify CTA if additional spares are required.

3.5.2 Rocket Mobile Communications Devices

Currently most 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 Clever Devices with sufficient spares of these items at the execution of the contract. The overall service and replacement responsibilities are outlined in section 2.14.2.

3.6 Service Level Agreement

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 notification
LED / Speakers	Repair and replacement	Non-Critical	96 hours from MMIS notification
TCH	Repair and replacement	Critical	72 hours from MMIS notification
APC	Repair and replacement	Non-Critical	5 business days from MMIS notification; subject to revision based on APC SLA plan outlined in section 2.5.1
Blue Tree / Rocket	Replacement	Critical	72 hours from MMIS notification
Sprint Air Card	Replacement	Critical	72 hours from MMIS notification

The vendor is required to report on a monthly basis on the adherence to the prescribed SLA.

4.0 SOFTWARE MAINTENANCE (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 will be provided for the Clever Devices Software Licenses possessed by the CTA in accordance with the Software Maintenance Guidelines already established and included in the work proposal (EXHIBIT 7-1). Clever Devices will utilize the Software Release Process "Test Process for Release of New Software to the CTA Fleet" (EXHIBIT 7-2).

Upgrades to new 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.

4.1 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.

4.1.1 Test Servers

Clever Devices will support the following test servers:

- CleverCAD Test
- BusTime Test
- BusTools/CleverWorks Test

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

4.2 BusTracker Hosting & Support

Clever Devices will continue to host and support the BusTracker external public facing application. While Clever Devices will make every effort to monitor the complex Bus Tracker system is ultimately up to the CTA to 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@Clever Devices.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.

4.2.1 BusTracker Hosting

Clever Devices 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.

Two servers from American Eagle are used to support the BusTime Web servers. 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 Clever Devices and to a named resource or email distribution list from CTA. Clever Devices will respond on a best effort basis to these alerts.

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

4.2.2 BusTracker Connectivity Support

Clever Devices will assist with network changes at either American Eagle, Cellular provider or the CTA to ensure we incur minimal downtown. Clever Devices 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.

4.2.3 BusTracker Support

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

4.2.3.1 BusTracker Prediction Support

Clever Devices will continue to support the CTA on prediction accuracy issues as they arise in helping CTA to modify a combination of operational changes, data collection or system parameters. The support is ad hoc and any issue found outside of expected support will incur Professional Services (Section 5.0) to implement a new features or enhancements. Clever Devices will reinstate the ability to monitor BusTracker Prediction accuracy.

4.2.3.2 API

Clever Devices will continue to maintain the BusTracker Application Programming Interface (API) which supports the development of third-party applications.

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

The CTA will maintain the content to the user community and the granting and revoking of API keys. Modifications will 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. The basic support of the API and functionality is the responsibility of Clever Devices.

4.2.3.3 Text Messaging

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

Clever Devices will also assist with changing to another SMS text provider upon request and for a nominal cost as issued through a Professional Services Task order as outlined in section 5.0

4.2.3.4 BusTime Maps

Clever Devices will continue to maintain the BusTime Maps back-end map edits for the time being. At some point the BusTime map hand edits will be turned over to trained CTA staff.

4.3 Data Communications Controller (DCC)

Clever Devices will completely maintain 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 in an effort to incur as little downtime as possible during planned maintenance.

4.4 BusTime Prediction Server

Clever Devices will completely maintain 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.

4.5 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.

4.6 BusTools Server (Until Replacement by CleverWorks)

Clever Devices will maintain the BusTools virtual workstation (server) and the BusTools SQL Server back-end database. Upgrades to BusTools will come in a timely manner and will be fully tested in accordance with the established Clever Devices quality assurance protocols, provided with the proposal. All software on the BusTools server required for BusTools, fleet distribution, and management are the responsibility of Clever Devices. CTA BusTools staff may notify Clever Devices directly of any issues; especially during critical distribution times.

4.6.1 CTA Non Van-based Data Collection

The CTA requires the ability to move stops nearside to farside and collect new route patterns without the use of a data collection van, using desktop mapping software provided by Clever Devices in an upgraded version of BusTools. Costs for this upgrade will be covered through a Professional Services task order, as outlined in section 5.0, when such functionality is available.

4.6.2 Bus-in-a-Box Test Units

SIX total Bus-in-a-Box test fixtures require very infrequent maintenance and support. Current locations are: **TWO** at CTA offices, **ONE** at Chicago Ave. Training Center, **ONE** at South Shops Radio Department, **ONE** at the Maintenance Training Center, **ONE** Bus-on-a-Table located at 120 N. Racine. These will be upgraded with the latest BusWare upon request. Any new 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.

4.6.3 CleverWorks Support

The quote for software and maintenance support of BusTools shall be independent of if we are on BusTools or CleverWorks.

4.7 RTDBProvider Service

Clever Devices 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 (unsupported for real-time) RTDBProvider service for developmental and migration purposes. Only the RTDBProvider service running on the official Data Communications Controller (DCC) server is fully supported.

4.8 Busstate Data Ingester

Clever Devices will maintain the AVAS Data Ingester 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 Ingester service for developmental and migration purposes. Only the AVASDATA Ingester service running on the official AVASINGST server is fully supported. No other software on the AVASINGST server is supported by Clever Devices; however, the CTA must keep the system in good working operation and will confer with Clever Devices upon any major operating system upgrades.

4.9 BusLink Servers

Clever Devices will maintain the following software on the CTA BusLink servers:

- BusLink Authentication Manager
- Fleet Manager Client
- BusLink Distribution Client
- File Manager
- SQL Server Express
- Log file retention

Clever Devices will actively participate in any disaster recovery planning for the BusLink servers and will work to maintain documentation and install software. Any migration to new BusLink server hardware will be supported by the deployment team of Clever Devices, with CTA staff performing the rollout, under the direction of Clever Devices staff.

4.10 Destination Sign Distributions
Clever Devices will assist with sending MTU file via BusLink and the BusWares software on the IVN for application of message sets to the destination sign.

4.11 AVM3 Server
Clever Devices will fully support the AVM3 back-end SQL Server on their own hardware on load. CTA will provide the SQL Server license, while Clever Devices 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.

4.10.1 AVM Data Dictionary Distribution
Clever Devices will maintain a current and as common as possible fleet-wide AVM 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.

4.10.2 AVM Certification
Clever Devices will provide a simplified and streamlined process for AVM Certification. Any component on a bus from the same manufacturer certified for operation with the IVN on the J1939 or J1708 network will automatically apply to the CTA. AVM Certification will no longer be a requirement for new bus procurements, but rather will occur through mutual analysis of data after buses are delivered to CTA.

4.11 CleverCAD
Clever Devices will fully support the CleverCAD solution from end-to-end and all back-end infrastructure. Clever Devices will work with CTA Information Technology staff for backups and disaster recovery planning. Clever Devices will monitor the server and report on any health issues.

4.11.1 CleverCAD Application and SQL Server
Clever Devices 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 licensees. CTA Server staff are responsible for backups and fault tolerance while working with Clever Devices system engineers on timing and best practices.

4.11.2 CleverCAD Workstation Application
Clever Devices will fully support the CleverCAD Workstation application. The CTA, or the established desktop support provider, will maintain the physical hardware post warranty, but Clever Devices 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 Clever Devices for best practices for keeping the systems optimally tuned.

4.11.3 CleverCAD Reporting
Clever Devices 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.

4.11.4 CleverCAD Action Tracker & Upgrades
Clever Devices will continue to work on the CTA maintained 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 Clever Devices a professional services scope shall be outlined.

4.11.5 CleverCAD Mobile Tablet Application
Recognizing that the CTA will execute the previous contract option and implement CleverCAD mobile in 2017, with a one-year warranty, the CTA will require on-going support of the CleverCAD Mobile tablet application starting in year two of the contract.

4.12 Hard Brake
Clever Devices will maintain the Hard Brake application, back-end server and data flow. The Hard Brake application is a replacement of the TachoLink/Circuit Link "Black Box" data recorder and provides secure files

Clever Devices 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, all of whose functionality is available to the user.

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.

4.13 Ridecheck Plus

Given that Clever Devices now owns Ridecheck Plus, software used in our Planning Department for APC analysis, the CTA wishes to combine contract B15OP04091 with the current contract with Clever Devices.

CTA Specification 8359-15 outlines the support and maintenance of the Ridecheck Plus software. Attached as an Appendix.

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.

Ridecheck Plus is a software package developed by RSM Services Corporation, which is a divisional unit of Clever Devices, Ltd. The sole source procurement is required because RSM Services Corporation is the sole copyright holder of the Ridecheck Plus software.

4.14 Secure Bus Certificate Hosting

The CTA requires SSL certificate generation to support several internal applications related to the Secure Bus Access project. Currently our SSL certificates for this project are provided through a non-contracted relationship with SingleHop (https://www.singlehop.com/). To consolidate all aspects of the Secure Bus project into a single contract we desire Clever Devices to maintain the annual relationship with SingleHop or a certificate provider of their choice (ex. American Eagle). The single small Linux server on the outside that CTA maintains can also be used to securely transfer files in support of the CleverWorks file transfer operation.

The SingleHop architecture provides unlimited non-self-signed SSL certificate generation which supports internal CTA services including Secure Bus, Oracle Wallet, and the TAPDATA and CCBUS websites.

4.15 International Screen Layout

The CTA desires to utilize the modern screen layout format shown below:

There are several identified issues with the layout and logon workflow that need addressing before we can move forward with training nearly 10,000 bus operators. The issues are outlined in an International Screen Action Tracker. These items must be addressed within six months of the execution of this contract to the agreement of Clever Devices and the CTA.

4.16 Future Software and Reporting Tools

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

4.17 Service Level Agreement

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 business hours if a fleet-wide implication affecting critical AVAS/BusTracker
BusTools	Applications on server CTA – Virtual Server	16 business hours 4 business hours if issue impacts a critical distribution
DCC	Applications on Server CTA – New blade center	45 minutes for daytime issues. 2 hours for overnight issues.
BusTime Prediction	Applications on Server CTA – New blade center	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	Basic Windows Service	2 hour of notification if issue is truly with the service itself 1 hour if notified in peak time
Busstate Data Ingester	Basic Windows Service	16 business hours
AVM3	Complete server and application	16 business hours
CleverCAD	Complete server and application	1 hour of notification
BusLink Server Applications	Applications on server CTA – physical server	As needed assistance for reconfiguration, as requested with 16 business hour notification

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

5.0 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 two hours
- 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 does editing 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 Clever Devices
- Process for Clever Devices to pay studio:
  1. Clever Devices to setup Studio PO and make sure terms are Net-15 days; Studio will receive a Clever Devices PO number to invoice against when services are provided.
  2. When studio services occur:
     a. CTA to open request with Clever Devices.
     b. Studio session occurs
     c. Studio emails invoice to Clever Devices Accounts
        Payable: AccountsPayable@Clever Devices.com
  3. Once invoice received, CD will obtain PM (Scott's) approval via Adobe cloud and process the invoice in our system
  4. That will trigger a Clever Devices check to be issued to Studio based on net 15 terms (check will cut on the Friday following the due date)
  5. Check will be mailed to Studio, which should receive it within the 30 days or less.
  6. Clever Devices will invoice CTA for the Studio Services based on the agreed upon rate.
- After the recording studio session, files are sent to Clever Devices for final mastering and preparation for import into BusTools or CleverWorks.

Future Voice Proposal:

Once on the CleverWorks platform computer generated (server side) next stop audio becomes possible. Clever Devices will quote a one-time cost of converting existing audio phrases to digital. Any changes in either current human voice or the use of a digital voice will need review by the ADA liaison with CTA. If alternative live voice talent is used Clever Devices assumes the risk and liability to the voice recordings and agrees to re-record with new professional voice talent should the need arise.

5.2 TRAINING

Recognizing the need for quality staff to maintain the growing complex systems that support the Clever Devices system a training program is requested. A bank of funding for travel for Clever Devices staff and 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.

6.0 MISCELLANEOUS ITEMS (C)

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

6.1 Action Tracker

Clever Devices will maintain an Action Tracker document that outlines all outstanding issues. The spreadsheet based document will be provided on an as needed basis and at a minimum prior to the monthly meetings.

6.2 Weekly Call and Monthly Meeting

The CTA and Clever Devices project management team will host a weekly Monday call in of a scheduled half-hour to discuss any open issues. Holidays and general exclusions will be mutually agreed upon the week prior. Updates to the Action Tracker are not required for the weekly call, and the forum is informal to discuss any open issues and the focus of the week by the team.

In addition to the weekly call, the CTA will host a monthly Clever Devices status meeting. The meeting will be scheduled on-site (567 W. Lake St.) at least once every other month and by if weather precludes meeting on-site. Both sides will mutually agree on the date so appropriate arrangements can be made. An updated Action Tracker is required 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 Clever Devices project staffs.

6.3 Data Ownership

All data produced by Clever Devices systems remains the property of the CTA suitable for manipulation by external databases (AVASDATA, RTBM, RTBMHIST, AVM, MMIS etc.) to support agency analysis.

6.4 Contract Term

The term of the Contract is three years. There shall be two one-year options to be exercised in the discretion of the CTA. The CTA may exercise each option by providing notice, in writing, to Clever Devices no less than 90 days prior to expiration of the initial term of the contract or, with respect to the second option, no less than 90 days prior to the expiration of the first option year, of its decision to exercise an option. The second option shall be valid only if the first option has been exercised and implemented.

6.5 Maintenance of new On-Board Systems

As new on-board technologies are installed on up to 1,900 buses subject to this SOW, CTA may ask Clever Devices to add maintenance for the new system(s) at a negotiated rate.

6.6 Capitalized Task Order

At times deemed necessary CTA may request a Task Order for work capitalized across the fleet. Such work may include system wide upgrades, additional capitalized spares or other such capital work. The Task Order process is outlined in section 5.4 of the Standard CTA Contractor Agreement.

7.0 Optional Items to Quote (C)

The following items are option items with brief scope discussion to provide quotes in this contract.

7.1 Event Driven Hard Brake

To enhance the functionality and usefulness of the Hard Brake application, please quote the ability to generate a Hard Brake data capture based on an event. Events may include going in reverse, CleverCAD (PRTT, RTT, Message, on-demand request from CleverCAD), Save Event Button from camera system, or other J1939 based events.

7.2 AVM On-Demand

The 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). Please provide a quote for AVM On-Demand on all capable buses with a fleet-wide license to use on all future capable buses. The cost should be a one-time fee.

7.3 CleverCAD Quick Launch Tool

Provide the ability to launch third-party applications from CleverCAD by right clicking on a bus/event/incident and launching a command line or URL string with the bus number passed as a parameter.

7.4 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).

7.5 Dynamic Scheduling

Provide an initial cost quote to incorporate dynamic scheduling and integration with the Trapeze OPS (TOPS) System that CTA utilizes for daily schedules. The assumption is that CleverWorks is required before any attempt at dynamic schedule integration can begin.

8.0 Capital Task Order #1: CleverWorks (C)

Chicago Transit Authority (CTA) developed this scope of work for the implementation of CleverWorks® as a Task Order on the Clever Devices Contract. The CTA has used the Clever Devices BusTools® application for 15 years to manage schedules, routes, stops and announcements. Clever Devices will no longer continue to add functionally to BusTools, CTA simply must replace BusTools with CleverWorks. Clever Works is a commercially available off-the-shelf application to replace BusTools. The purpose of the data management solution is to provide a means to manage all data associated with the ITS onboard and fixed-end systems in a single application.

The proposed project will replace the current BusTools data management system with the state-of-the-art CleverWorks data management system from Clever Devices. CleverWorks is a contemporary tool from which to manage data that saves time and money when making changes to the service plan. CleverWorks will provide the same base functionality as BusTools but in a more contemporary web-like format, and will include additional data management functionality.

8.0.1 BusTools Background

The CTA took delivery of BusTools as part of the 2002 initial competitively bid Clever Devices contract (C02FR1169) to manage routes and stops. At the time the application was a Microsoft Access based application all routes were driven with a data collection van. Every time a bus stop was relocated, eliminated or added CTA staff would physically drive a van to recollect the change. Eventually the back-end of BusTools was integrated into a Microsoft SQL Server, however the application remains in Microsoft Access to this day.

CTA Staff eventually built our own solution for collecting data without physically driving the changes. The CTA application is external to BusTools and supported by CTA technology staff. The CleverWorks solution integrates data collection and will eliminate the risk of internally developed applications and data management.

All other transit authorities that use Clever Devices are also migrating to Clever Works. The CTA will have the advantage of not being the first large agency to migrate as WAMTA (Washington DC) and closer to us, MCTS (Milwaukee, WI) are currently migrating.

8.0.2 CleverWorks Modules

While there are several CleverWorks modules the CTA requests the following:

1. Core CleverWorks functionality
2. Map based data collection
3. Historical Data Analysis (non-CleverReports) for comparing the location of planned stops with actual stops by integration to the CTA AVASDATA Oracle database (or via busstate files).
4. Route Simulator
5. Dynamic Scheduling (future option, not included in initial deployment)
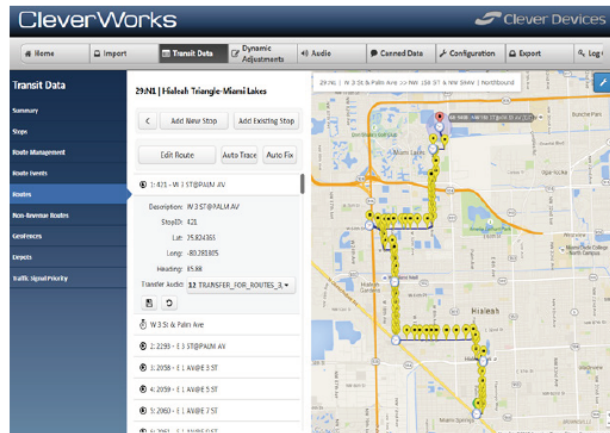
8.1 CleverWorks Fact Sheet

CleverWorks™
NEXT GENERATION DATA MANAGEMENT

QUICK FACTS

- *CleverWorks offers built-in data integrity rules and measurements to ensure data imports into the system are valid and will not cause operational issues.*

- *CleverWorks dramatically decreases the level of effort and time required to manage the ITS data, reducing operational costs*

- *Utilize Google Maps that include satellite and hybrid map views providing the user with familiar geographic information in the format they wish to view it*

- *Organizes data for efficient use and presents the data clearly and understandably to data administrators*

- *Maintaining your own data will allow for more frequent and timely updates to the vehicle database*

- *Provide the ability to make minor changes to the announcement, schedule, APC, or geofence dataset without waiting for the next major schedule change*

GENERAL INFORMATION

CleverWorks is Clever Devices' next generation of data management and is the culmination of 15 years' experience combined with state-of-the-art technology. The result is an intuitive product that significantly reduces the level of effort to manage Intelligent Transit System (ITS) data. CleverWorks provides the opportunity to make an additional and significant leap forward in the management of the data required by ITS systems.

ITS systems such as Automatic Vehicle Announcements (AVA), Automatic Passenger Counters (APC), Traffic Signal Priority (TSP), single point logon, Computer Aided Dispatch (CAD), Automatic Vehicle Location (AVL) and Real-Time Passenger Information (RTPI) require data that defines what these systems are supposed to do, otherwise known as build time data. This includes the route and stop spatial/GIS data, temporal/schedule data, audio files, signage text and

configuration data. Since this data can be so complex, its management is paramount. Clever Devices offers CleverWorks as a comprehensive ITS data management solution that is intuitive and comes with built in data integrity checks and measurements to ensure that ITS systems run with optimum efficiency.

FEATURES AND BENEFITS

- Provides data integrity checks to ensure a complete and accurate dataset is compiled

- Ability to configure, edit, and validate route paths to ensure the most efficient route geo-path is created

- Provides for data tracing via geographic map rather than time consuming data collection

- View routes, stops and timepoints on Google Maps with satellite and hybrid views

- Edit routes and stops without field data collection

- Requires no ongoing maintenance costs for map layers

- Enforces data integrity rules and notifies the user of violations related to: import rules, editing rules, export rules, and version control

- Dashboards for each module, including data integrity checks

- Statistics are automatically updated for each dashboard

- Detailed information presented quickly and efficiently

- Clear indication of when the dataset is ready to be exported

- Activity log of module modifications

- Management of all audio and text announcement data for AVA including: next stop, route and destination, transfer public service (automated and manual), Maintenance Action Necessary (M.A.N.)

- Creates and manages all canned text messages for the operator and for the dispatcher when CleverCAD CAD/AVL is deployed

- Management of the data to display in BusTime and on signs

- Export for Google's General Transit Feed Specification

- Supports the creation and management of Geofences in support of diesel particulate filter (DPF), depot/garage to notify when the bus is in or out of the garage, low object warning system, detecting and notifying when the bus enters and/ or exits a Geofence

- With the click of a button, CleverWorks will export data for use by all Clever Devices products

- Compare the location of planned stops versus where vehicles are actually stopping to service rides

- Compare the actual path traveled by vehicles versus what has been planned

- Compare actual versus planned running times to ensure accurate schedules are produced

- Investigate the location of stops based on ridership

- Compare the location of planned stops versus

where vehicles are actually stopping to service rides

- Compare the actual path traveled by vehicles versus what has been planned

- Compare actual versus planned running times to ensure accurate schedules are produced

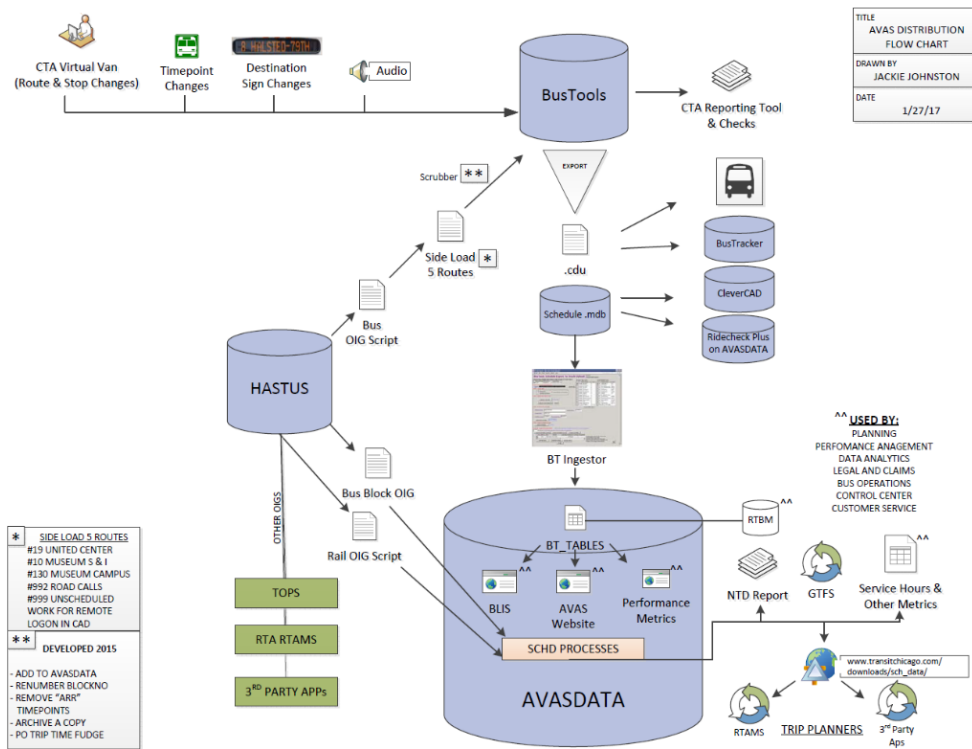- Investigate the location of stops based on ridership
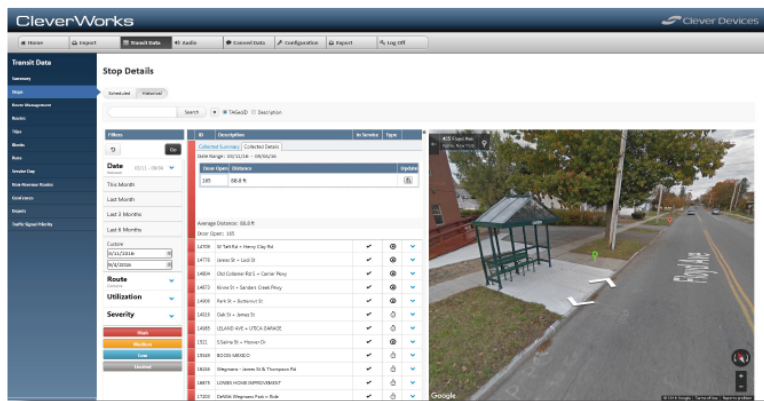
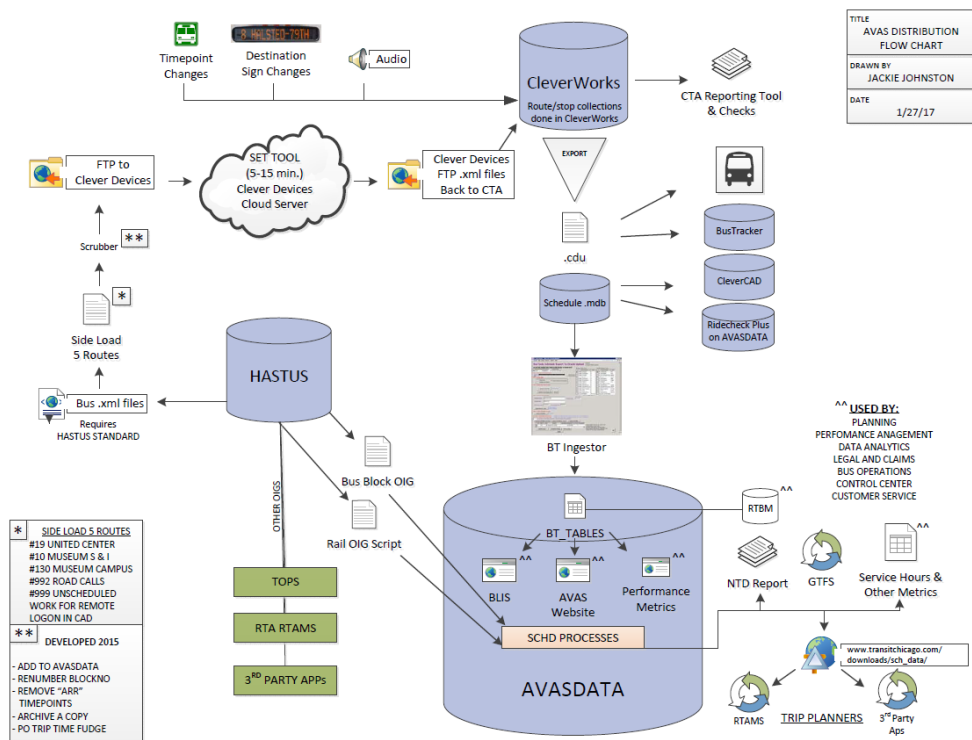*CleverWorks enables you to see historical stop details*
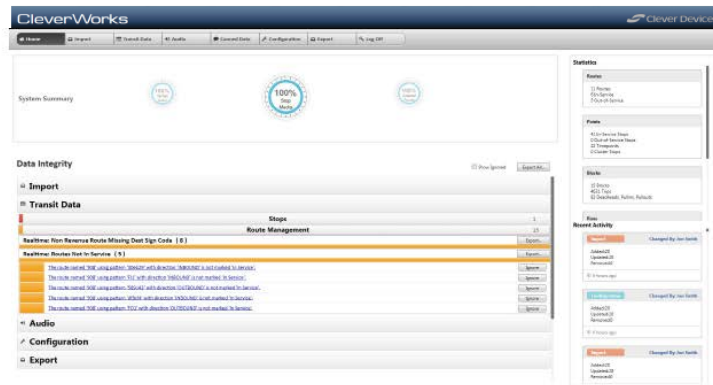
The Data Integrity Dashboard within CleverWorks provides system administrators with detailed information to quickly identify where errors exist within the dataset at a glance.

8.1.1 Current Schedule Export & Route Modification Process:

8.1.2 Future Schedule Export & Route Modification Process:

8.2 Schedule

The migration from BusTools to CleverWorks shall not exceed 12 months from Notice to Proceed (NTP) to System Acceptance.

The CTA is working to get on the HASTUS Standard Export for CleverDevices Object Interface Generator (OIG) within the next six months. By the execution of the contract and this Task Order (June, 2017) we should already be implementing the HASTUS Standard Export.

8.3 Project Approach

This proposal and scope of work is inclusive of the central software and project team professional services that will include; design (including data flows), interface to HASTUS schedule, any enhanced HASTUS integration for extra service, transition from BusTools to CleverWorks (including the import of the BusTools database), deployment, testing, training, and a one-year warranty.

The work is to be completed as a collaborative effort between CleverDevices and the CTA. Given that the CTA is already dependent on BusTools for exporting data to the fleet the success and essence of this scope of work is for a smooth transition from BusTools to CleverWorks over a 12-month period.

8.4 Service Responsibility Flow
The following outlines the flow or responsibilities

8.4.1 Clever Devices Responsibilities
1. The Contractor shall provide a data management tool to set all onboard configurable items and to be downloaded to the fleet. The data management shall include configuration for all onboard functionality and include at a minimum:
    a. Real Time Passenger Information stop text and configuration
    b. Pre-defined text messages for the vehicle operator
    c. Pre-defined text messages for the dispatcher
    d. Schedule and Route adherence thresholds
    e. Navigation and trigger points for all onboard functionality
    f. Voice call configuration and thresholds
    g. Assigning head sign commands for all routes, pull-in deadheads, pull-out deadheads, interlining deadheads, and
    h. Defining prefixes for each type of audible interior announcement
    i. Automatic volume control thresholds and settings
    j. Equipment configuration for each vehicle type
    k. Public announcement configuration
    l. Hard Brake thresholds and recording periods
2. CTA desires a solution that requires minimal data management and consistency for all routes and stops.
3. CleverDevices is responsible to initialize the configuration of the system including routes, stops, audio, text, import and use of the schedule data, and configuration to deliver the functionality of CleverWorks with all existing routes and stops loaded.

4. The data management solution shall interface with the scheduling system for all fixed route schedule data and run data integrity rules to ensure the schedule data is complete and accurate. CleverDevices shall describe the extent of the data integrity rules.

5. The data management solution shall provide algorithms to automatically check the data integrity of schedule data, route, data stop data, audio data that covert the import process, editing process, and export process.

6. The data management solution shall track all data errors and warnings by type, provide a dashboard of the quality of the data that identifies the completeness of each data type and the integrity of each data type.

7. All existing CTA checks for accuracy will be demonstrated in the new CleverWorks data quality dashboard.

8. The data management solution shall provide version control of all data that it distributes to the ITS system.

9. The data management solution shall support the manual assignment of destination sign commands for all routes, pull-in deadheads, pull-out deadheads, interlining deadheads. The data management solution shall support the configuration of unique destination sign commands to each of the deadhead type trips and automatically assign them upon schedule data import.

10. The data management solution shall support the creation, modification and deletion of routes and stop GIS spatial data using map based editing techniques.

11. The data management solution shall support the creation of the following geofences that are used by the onboard system to trigger specific functionality upon entry, exit or both:
    a. Diesel Particulate Filter
    b. Low Object Detection to notify CAD and the operator of low bridge
    c. Depot to notify CAD the bus is in or out of the depot
    d. Generic to notify CAD of entry or exit or both

12. The data management solution shall support the creation of audio and sign text for the onboard system that includes:
    a. Next stop audio & text
    b. Transfer audio & text
    c. Public service audio & text
    d. Route audio & destination sign codes
    e. Destination audio
    f. Stop Requested

13. The data management solution shall include the ability for CTA to record human voice or generate with text to speech the audio for the onboard system.

14. The data management solution shall allow the user the ability to create announcement messages that concatenate selected portions of recorded message files with timed pauses and text-to-speech segments.

15. The system shall allow the user to associated the stop announcement audio and text to the associated stop in the route.

16. The system shall allow CTA to export a standard CTA Rail Schedule data and export a fully multimodal GTFS and to CleverCAD for possible future expansion.

8.4.2 CTA Responsibilities

1. The CTA is required to transition the HASTUS schedule exports to the approved Clever Devices HASTUS Standard Export Object Interface Generator format.
2. Cooperation and coordination of schedule exports and communication of all route, stop, reroute and schedule change requirements well in advance.
3. Testing and quality assurance evaluation of schedule export products.
4. Upon final acceptance, the CTA will once again be responsible for exports and distributions to the CTA fleet.
5. Development and modifications of practices in the HASTUS schedule software to meet the standards of the CleverWorks schedule extraction tool.

8.5 Project Management

This section describes overall design and performance requirements that shall be utilized throughout Clever Works implementation. Clever Devices will assign a senior project manager for this project. Monthly project status reports will be provided. The project manager will manage the coordination of the internal Clever Devices team, business aspects of the project including deliverables tracking, meetings, invoicing, status reports and other communication between Clever Devices and the CTA Project Manager for this project. The project will be planned to support the completion of new functionality development (as identified in this scope) and the start of testing of the CleverWorks system by November, 2017.

The design phase of the project provides an analysis and documentation of the overall solution features and functions, including data flows, interface design, network design, and information technology (IT) specifications required to operate the system software. Gap analysis between the current implementation of BusTools and the CleverWorks feature set will be performed. Feature gaps will be developed and included in the release of CleverWorks software the agency will receive.

Added interfaces or features not contemplated in this proposal that are identified in the design phase will be addressed as a change notice. Depending on the complexity, changes may be incorporated into the overall design if identified and agreed upon early enough in the design phase to allow for incorporation of the changes into the customization process for this project. Changes that are requested that cannot be addressed within the project timeline will be scheduled to be addressed in subsequent software release using the approved release process.

All issues will be managed by an Action Tracker spreadsheet.

8.6 Transition Planning

The proposed project includes the development of the transition plan. Clever Devices will leverage experiences with transitions on other projects, and collect operational information from CTA to develop a transition plan unique to the challenges of this project. The Clever Devices team will work closely with CTA stakeholders to ensure the plan minimizes operational impacts.

The proposed project is based on HASTUS schedule interfaces being supported by the HASTSUS standard object interface generator (OIG) interface control documentation in place at the time of this proposal.

Clever Devices expects the migration from BusTools to CleverWorks to occur during one pick. Once the Clever Devices QA team starts migrating and verifying the schedule data, the transit agency will need to freeze schedule updates for 6-7 weeks to verify that the migrated schedule data matches the schedule data running on the fleet. CTA will work to the best of our ability to schedule this for the longest possible pick and interim updates may continue in parallel with the existing BusTools software.

8.7 Testing/Migration

Clever Devices will use industry accepted standard acceptance test procedures for the products included in this project. Clever Devices will employ a multi stage approach to validate the data in CleverWorks is the same as BusTools. Clever Devices Engineering will migrate the CTA data from BusTools to CleverWorks and review the migration to ensure any features specific to the CTA are replicated in CleverWorks, to ensure the move does not remove functionality.

Clever Devices Quality Assurance (QA) will perform an export of the data from CleverWorks and verify the CleverWorks export is congruent to the BusTools exports. QA will verify the schedule MDB file, DOANNT files, GTFS, and parameters are the same before and after the migration. Any abnormalities between the two sets of exports are examined to ensure there will be no adverse effects on system performance.

After the export files are compared, QA will verify the export supports system functionality by loading the export files onto a test IVN system and verifying functionality including simulating a route, ensure destination signs loads, and internal announcements play correctly. As part of system testing the QA tester will verify downstream systems work including BusTime, Ridecheck Plus and CleverCAD. CTA will test the import of the Schedule Export database into the CTA BT_INGESTER program.

Once system testing is complete, the CleverWorks database is reviewed by the Clever Device Data Systems team over approximately two weeks to verify the data is correct. After a peer review check by Data Systems, System Engineering performs system testing with the agency on site to compare the CleverWorks data output with data generated by vehicles equipped with a BusTools generated database.

8.9 Training

Clever Devices will provide on-site training for the CleverWorks system. The proposed project includes two user training sessions for CleverWorks and one Administrator training session. Some of the training can be performed via WebEx remotely. Training will be based on our standard training materials for the products being delivered in this project.

At a minimum the following two courses will be provided on-site:

CleverWorks™ **User**

Clever Devices will provide the transit authority with the ability to configure and manage its own database through CleverWorks™ database configuration training. These essential tools empower an agency to make changes to announcements, schedules, routes, stops, etc. The training will cover the topics below which are essential to configuring a database for a new sign-up and maintenance going forward.

TOPICS

- Data import
- Data integrity
- Stop management
- Route details management
- Route management
- Non-revenue route management
- GeoFence management
- Depot management
- Traffic signal priority
- Audio management
- Canned (pre-defined) data management
- Configuration
- Data export

INSTRUCTION TYPE

- On-site classroom

TARGET AUDIENCE

- Planners and schedulers
- System Administrators
- Managers

COURSE HOURS

4

MAX STUDENTS

8 (or the number of application workstations available in the classroom, whichever is less)

PRODUCTS

- CleverWorks™

PREREQUISITES

- Knowledge of transit authority schedule data and operations

CleverWorks™ **Support**

Clever Devices understands the complexity of creating and maintaining a schedule database. Whether it's adding or moving a stop, or validating the data you have defined, let Clever Devices work with you to make sure your data is valid and complete for distribution to vehicles. We will work with you remotely in two-hour blocks for a total of eight hours.

TOPICS

- Initial brief discussion to determine training topics
- Data review
- Training as necessary

INSTRUCTION TYPE

- Live instruction via remote computer session

TARGET AUDIENCE

- Planners and schedulers

COURSE HOURS

8 hours total (4 two-hour sessions or as needed)

MAX STUDENTS

8 (or the number of application workstations available in the classroom, whichever is less)

PRODUCTS

- CleverWorks™

PREREQUISITES

- Knowledge of transit authority schedule data and operations

8.10 Implementation

8.10.1 Schedule Interface
The proposed project includes utilization and interface with the CTA HASTUS scheduling system.

8.10.2 Transition of BusTools to CleverWorks
Clever Devices will transition the CTA database from BusTools to CleverWorks. This effort will result in migration of the CTA database.

8.10.3 Initial Training and Support of CleverWorks
Upon migration, Clever Devices will provide training and initial support of CleverWorks.

8.10.4 System Acceptance
An acceptance test procedure will be developed to the agreement of both the CTA and Clever Devices. Both sides will perform the ATP and document findings to accept the CleverWorks software. Bugs and associated fixes will be noted in an on-going action tracker of open issues along with all other bugs and enhancements.

8.11 Warranty
The proposed system is warranted from time of installation until one year after beneficial use/conditional acceptance.

8.12 Support
Clever Devices will continue to support BusTools through the transition. CleverWorks support will be provided for one year as part of the warranty, and general support is to be covered in the general support contract terms stated in section 4.6 above.