Cal/Amp®

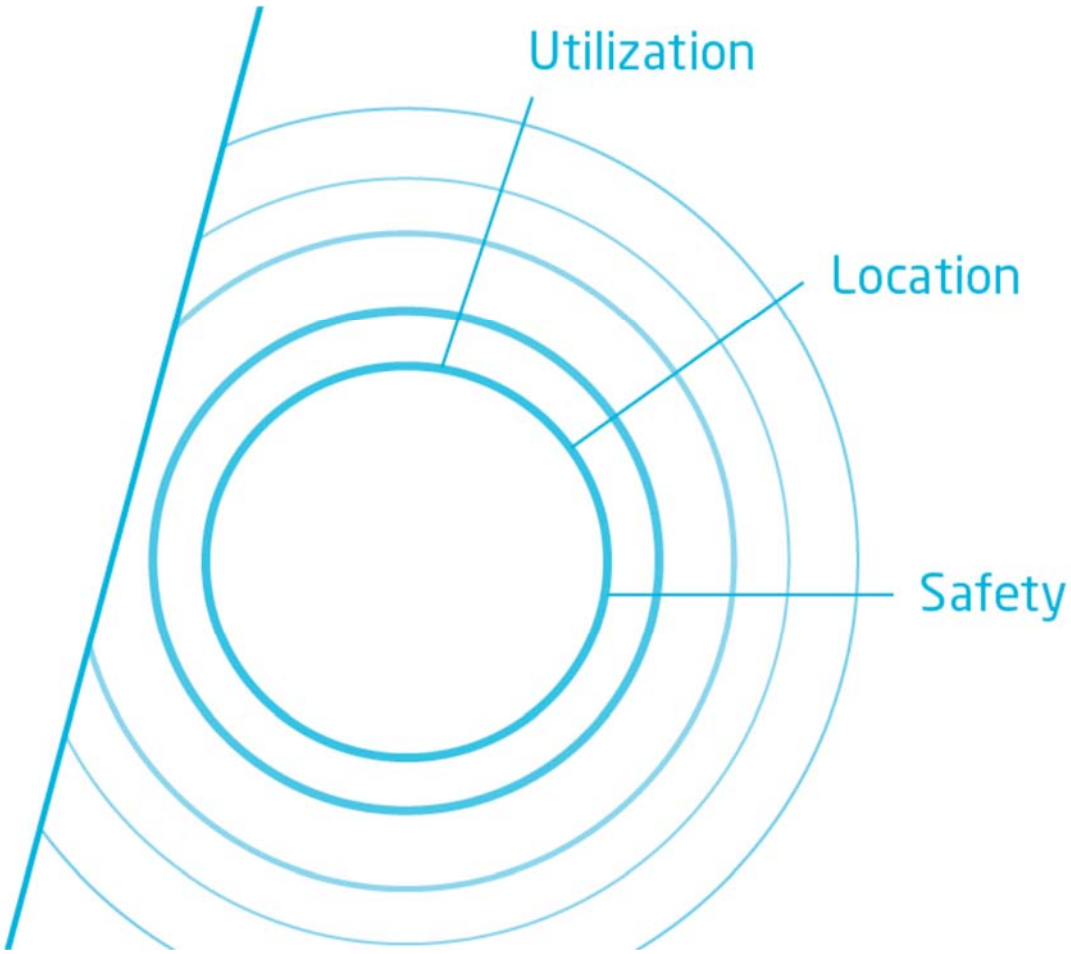
Proposal to:

Commonwealth of Virginia

RFP 2019-04

Automatic Vehicle Location Solution

December 14, 2018



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15635 Alton Pkwy, #250
Irvine, CA 92618
(310) 564-8500
Fax (310) 787-7435

December 12, 2018

Virginia Information Technologies Agency (VITA)
Shabeen Vijayan
Supply Chain Management (SCM)
11751 Meadowville Lane
Chester, VA 23836

Re: RFP 2019-04: Automatic Vehicle Location Solution

Dear Ms. Vijayan:

Please find our attached response for the Commonwealth's**: RFP 2019-04- Automatic Vehicle Location Solution.** CalAmp is a world leader in the manufacturing and implementation of vehicle telematics systems using GPS technology. We have a long history of experience with GPS-based Automatic Vehicle Location systems and have hundreds of thousands of units enabled under our platforms and services.

We are proposing the use of our industry-leading CalAmp devices in all vehicles to provide the optimal system with data consistency and functional continuity across all fleets and vehicle types. We have priced our solution so it makes sense to have all your vehicles equipped with our devices, which already represent 65% of **all** AVL devices in North America. In addition, our robust and versatile CTC platform and APIs allow for the integration of all data to virtually all third party systems, including your SWAS system.

CalAmp has unparalleled experience implementing systems for all types of government vehicle fleets including customers such as: Commonwealth of Pennsylvania, New York City Transit, City of Dallas, and many more. As a growing, NASDAQ traded company dedicated to the telematics industry, we have the size and stability you need for a technology partner. We urge you to learn more about how our approach allows us to offer a superior product that will best suit your needs at a great value.

We are in receipt of all addenda. We request the opportunity to negotiate specific terms and conditions of the contract including terms and pricing.

Please feel free to contact me with any questions, concerns, or requests.

Proposer Contact: Brett Lim
Phone: (310) 564-8502
email: blim@calamp.com

Sincerely,

Brett G. Lim
Director Global Sales- Government

Title Page

Company:

CalAmp Wireless Networks Corporation

Government Business

Contacts:

Brett G. Lim
Director Global Sales - Government
blim@calamp.com
310.564.8502

15635 Alton Parkway, Suite #250
Irvine, CA 92618

Date:

December 14, 2018

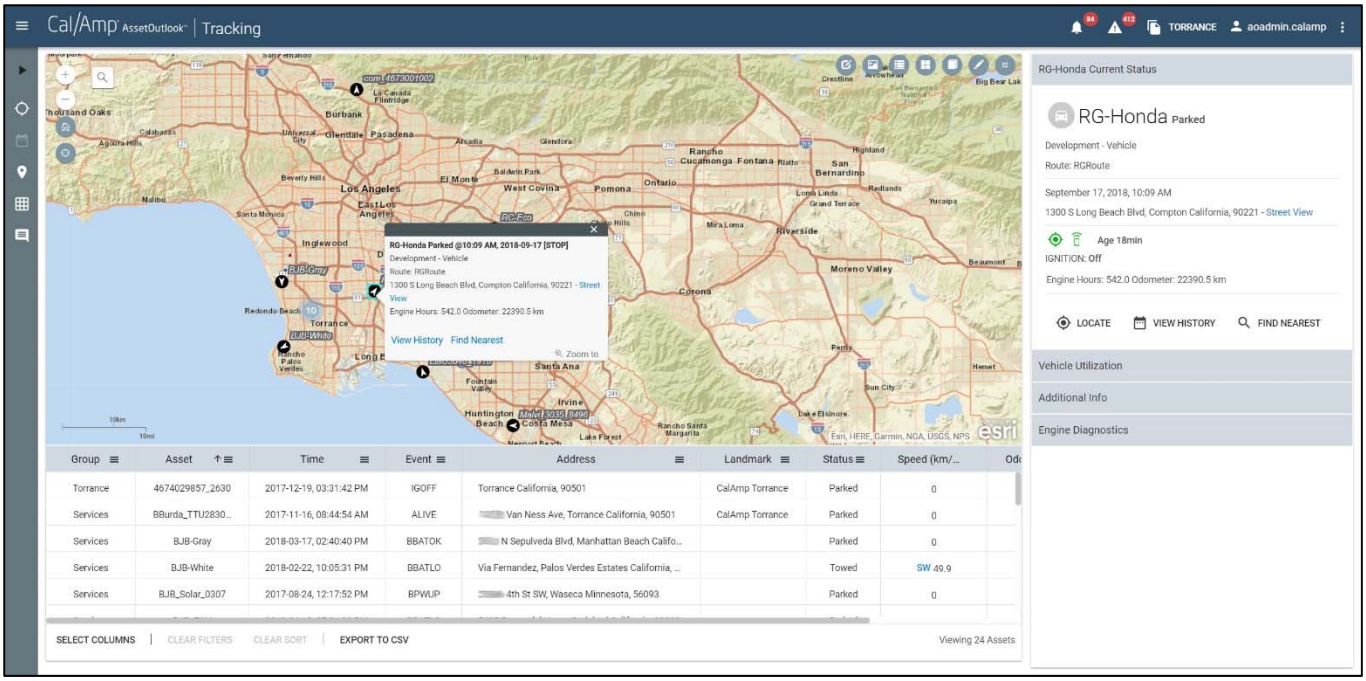

Table of Contents

Executive Summary

Commonwealth of Virginia's Objectives:

Commonwealth of Virginia seeks a fleet telematics system, or Automatic Vehicle Location (AVL) system to meet the unique requirements of their vehicle fleet and various departmental operations. The Commonwealth of Virginia desires to implement an AVL system to enhance the ability to efficiently manage the assignment of vehicle operations; to use the AVL system to increase employee safety, productivity, and service to the citizens of the Commonwealth of Virginia.

CalAmp AssetOutlook™

The CalAmp AssetOutlook AVL Solution:

Our AssetOutlook AVL system is based on Esri ArcGIS and will provide the client with the tools for faster and more efficient fleet and mobile resource management along with real-time and historical data that can be used for a variety of administrative tasks or analysis.

Using our line of cellular based GPS devices, the CalAmp AssetOutlook system will provide real-time vehicle location and other status data on our Web based AVL map software interface from our remotely hosted servers. The CalAmp AssetOutlook uses the robust CalAmp Telematics Cloud (CTC) platform can direct and communicate two way data with virtually any variety of third party database or application via a rich offering of APIs and a data pump.

As a proud Esri partner, we will provide an integrated system to meet your unique needs.

esri

Our Commitment

CalAmp has provided Automatic Vehicle Location (AVL) and telematics systems that work to the highest levels of performance, reliability, and scalability since 1990. We are one of the most experienced GPS vehicle tracking system providers in the industry and have manufactured millions of GPS units fielded throughout the world. **CalAmp has notable experience with government, utility, and large enterprise fleets.** CalAmp stands ready to continue to support our services and products for sophisticated government agencies with the high standards expected of the industry's leading manufacturer and provider of AVL technology.

Our AVL Experience

In recent years, CalAmp's acquisition of Radio Satellite Integrators, Wireless Matrix, LoJack, and others has given us unparalleled local government experience and a market-leading AVL solution based on Esri ArcGIS Server technology. CalAmp has directly implemented hundreds of AVL systems in hundreds of thousands of vehicles and has the largest breadth of AVL experience of any company in the world. We manufacture over 2 million M2M devices annually. CalAmp leverages this real world experience with municipal and government fleets to offer you the most innovative and reliable AVL systems on the market.

CalAmp Mobile Units

CalAmp is the world leader in AVL unit manufacturing and can offer a wide variety of the newest state-of-the-art AVL devices for various customer needs. The CalAmp LMU series of mobile GPS devices can be equipped with a variety of networks, options, serial ports and sensors that integrate to virtually any devices and external status signals, such as: ignition on/off, door open/shut, armature, PTO, lights, brooms, engine diagnostics, data terminal, ID reader, etc. Alternatively, our full feature in-vehicle routers offer high-speed connectivity in the mobile environment in addition to vehicle tracking.

AssetOutlook AVL Software

CalAmp's **AssetOutlook Application** is based on Esri ArcGIS Server and can be implemented in a variety of configurations and is a hosted Web browser based software as a service. Engineered and designed as an enterprise level Government AVL solution, AssetOutlook is uniquely tailored for specific end-user departments (such as sanitation and snow plows) as well as fleet managers.

The In-Vehicle Equipment and CalAmp Telematics Cloud (CTC) are linked via two-way LTE wireless communications, allowing for timely data transmission between the field and software.

Company Profile & Financials

15635 Alton Pkwy #250
Irvine, CA 92618 USA
Phone: 949-600-5600
Fax: 805-856-3857

About CalAmp

CalAmp (NASDAQ: CAMP) is a proven leader in providing wireless communications solutions to a broad array of vertical market applications and customers. CalAmp's extensive portfolio of intelligent communications devices, robust and scalable cloud service platform, and targeted software applications streamline otherwise complex machine-to-machine (M2M) deployments. These solutions enable customers to optimize their operations by collecting, monitoring and efficiently reporting business critical data and desired intelligence from high-value remote assets.

For more information and a detailed financial statement, please visit www.calamp.com.

Audited SEC Financial filings: http://investor.calamp.com

CALAMP VITALS

- Proven leader in MRM and M2M space
- Founded in 1981; publicly traded since 1983 (NASDAQ: CAMP)
- Headquartered in Irvine, California; 11 offices worldwide
- Number of Employees: Approx. 900
- Annual device run rate: Approx. 2M units
- More than 3 million devices under management on our platforms
- Approx. 700K+ unique software application subscribers

Market Cap (1/03/18):	791.93M	Gross Profit (ttm):	143.35M
Revenue (ttm):	357.64M	Total Cash (mrq):	151.24M
Revenue Per Share (ttm):	10.17	EBITDA:	29.39M

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Technical Overview

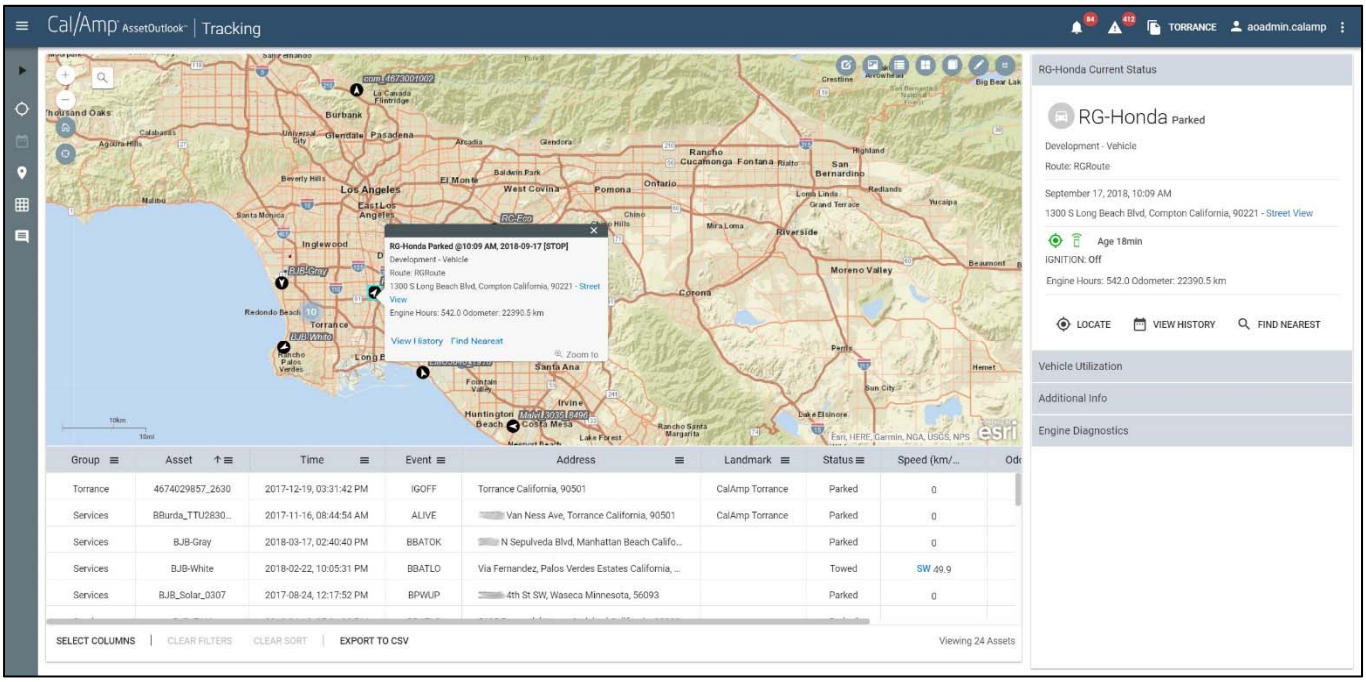
CalAmp's AssetOutlook AVL System

The CalAmp AssetOutlook solution consists of in-vehicle equipment and hosted base applications and services.

The **In-Vehicle Equipment is centered on the CalAmp LMU Mobile Unit,** a self-contained "black box" device integrating GPS location and sensor technologies, as well as wireless communications. The mobile device can be connected to any device or sensor including lights, ignition, doors open/closed, alarms, etc.

The AssetOutlook ***Web browser based Application*** is based on Esri ArcGIS Server mapping engine and securely hosted in the cloud using the CalAmp Telematics Cloud (CTC) platform. Users interact with the system through intuitive mapping tools as well as a configurable robust reporting application. The CalAmp AssetOutlook program will use the client's existing Esri GIS map data if it's available.

The CalAmp system manages all fleet communications and configuration, acts as a messaging and data transfer gateway between base-side applications and in-vehicle devices, and archives and distributes the vehicle location and status information to the mapping application over the Internet.



Note: Your user interface may differ from screen shots provided.

Data Integration With Third Party Applications

CalAmp CTC is a turn-key, cloud-based M2M application enablement platform with a complete set of services that simplifies the complexity between remote assets and enterprise applications. The result is a reliable and secure solution delivered in the shortest cycle at the most economical price from both a component and total cost of ownership analysis. CalAmp CTC enables enterprise organizations to translate business goals into significant ROI and easily roll out a solution across the entire enterprise.

CTC's interactive API docs include a tool for exercising the RESTful APIs. This developer-friendly tool visually describes how to consume the REST API services. REST API descriptions and related object schemas are integrated in the CalAmp's development practices so the API tools are documented as changes occur. Full details of all parameters and responses are available, plus an interface to try each service.

CalAmp has extensive experience interfacing with all types of third party applications such as:

- Work Orders
- Fleet Maintenance
- Scheduling
- Computer Aided Dispatch
- Routing
- Esri GIS
- Third Party Development

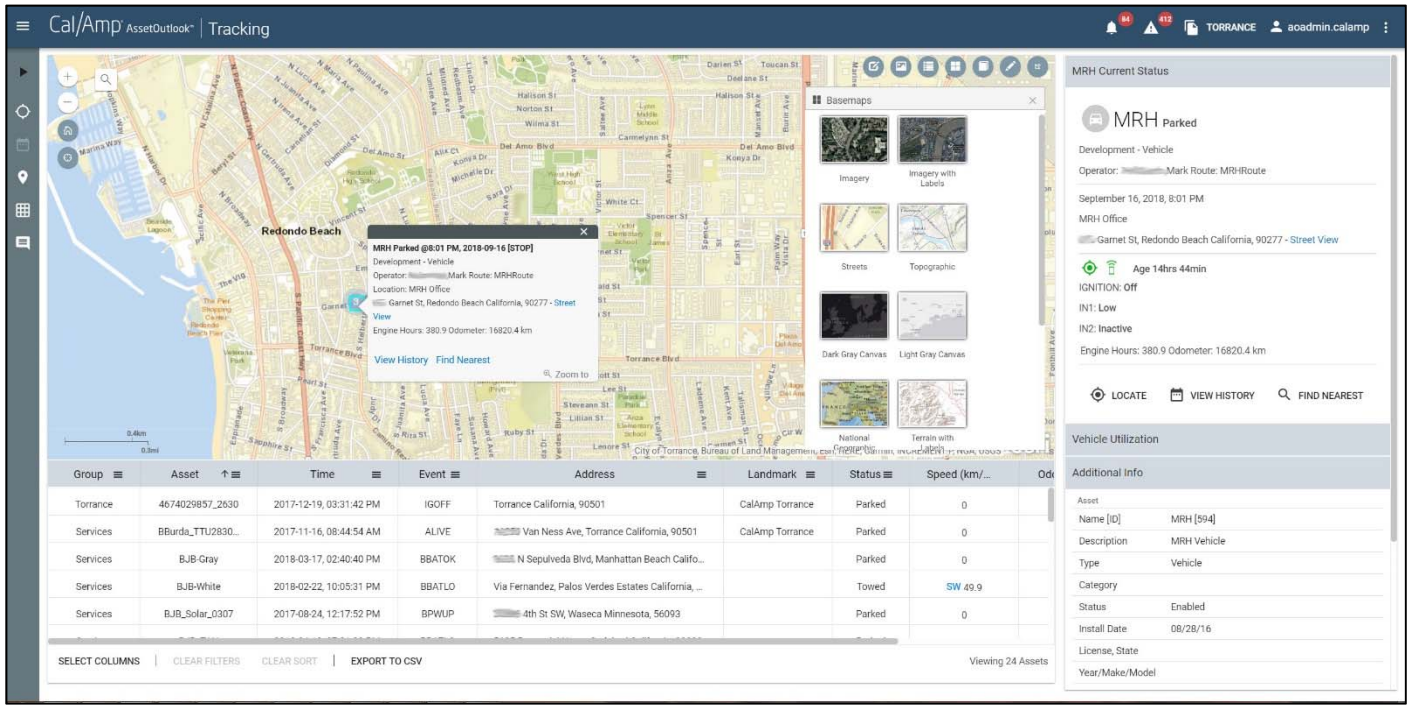
AssetOutlook Mapping and Display Application

Our newly updated powerful Web-Based mapping and display application, CalAmp AssetOutlook, will provide operations personnel the capability to rapidly, geographically analyze the GPS information and make critical decisions. This mapping application is based on an Esri ArcGIS Server Geographic Information System (GIS), which displays data collected from the mobile units. They run the tools and controls that enable the operations personnel to quickly adapt the information they are collecting and analyzing the views they are using to manage evolving situations.

The Mapping and Display Application provides valuable AVL Management tools:

- Real-Time Vehicle Tracking (map-based)
- Report Generation (tabular or map-based)
- Real-Time Alerts (e-mail and text)
- Dashboarding (KPIs and trends)

The assignment of user-permission levels allows access to appropriate sub-sets of the installed functionality.

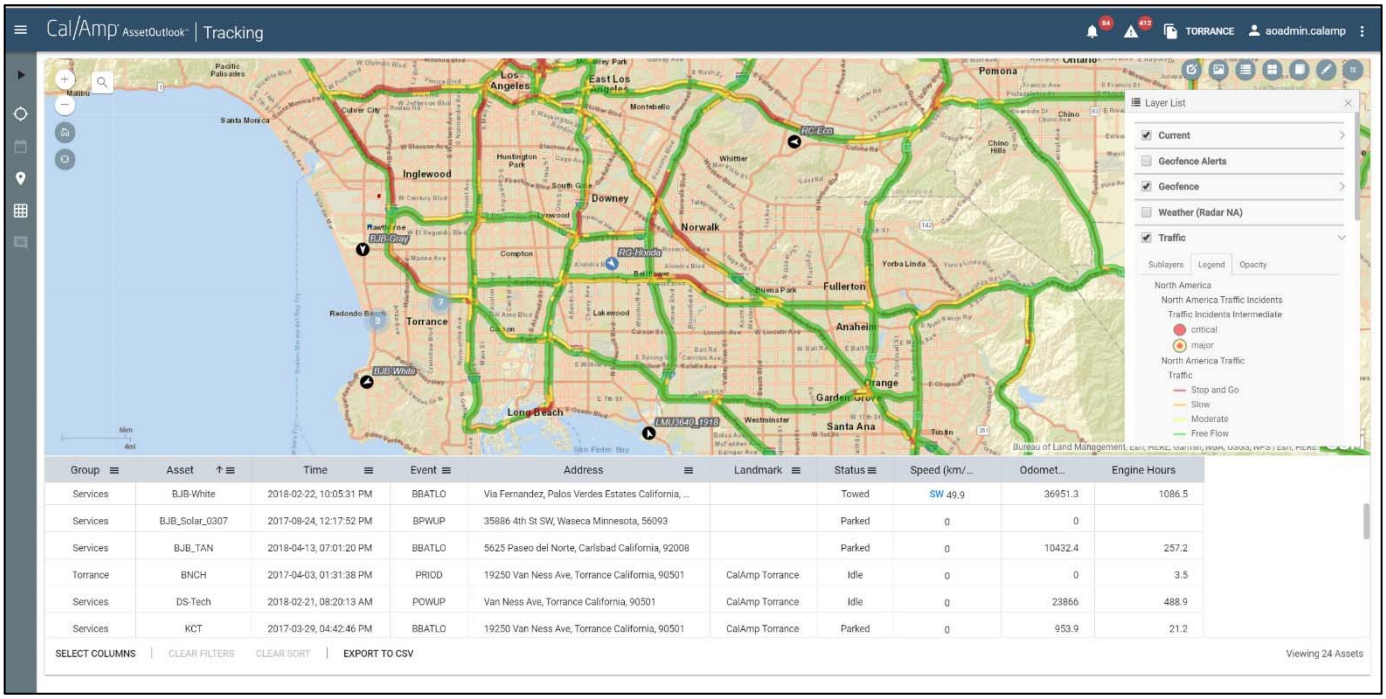


Note: Your user interface may differ from screen shots provided.

Real-Time Vehicle Tracking

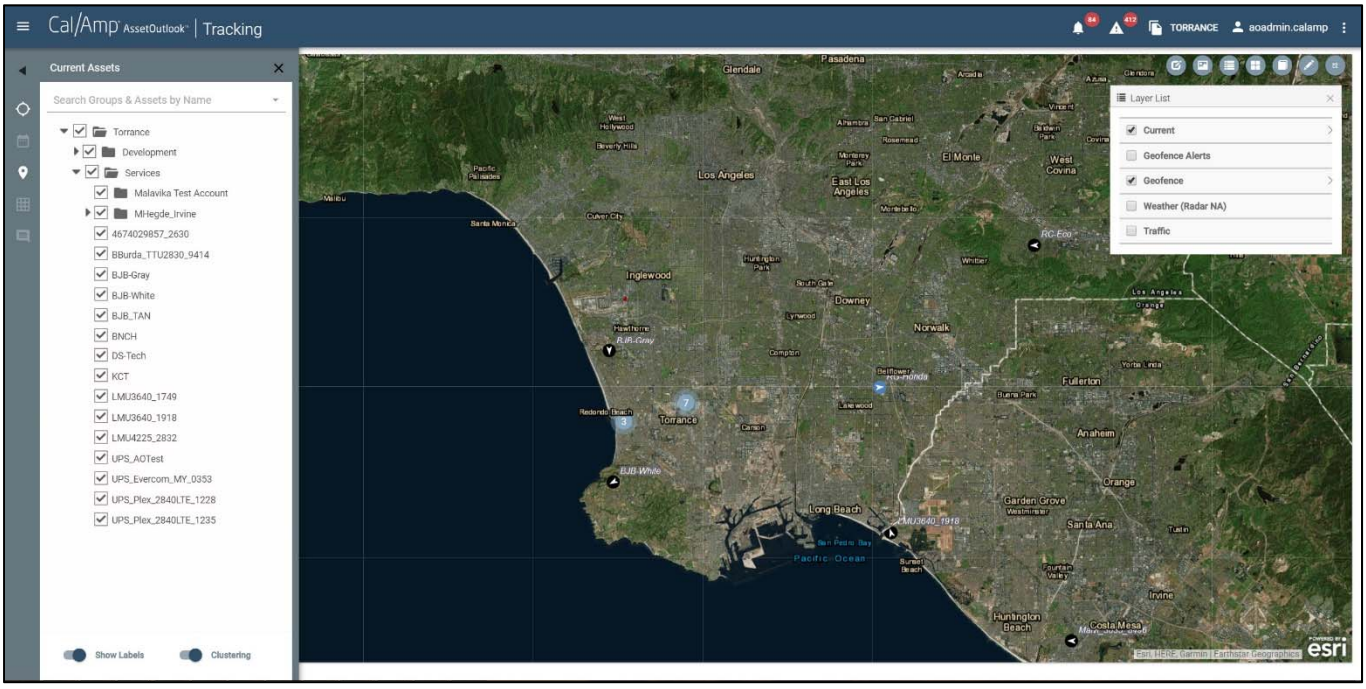
The CalAmp AssetOutlook Application displays the current location and status of the vehicle fleet, along with address, landmark and other attribute information, over your proprietary and publically available Esri GIS map data. The use of a powerful Esri ArcGIS Server engine along with the incorporation of vector map data allows for almost endless display and analysis possibilities.

The vehicle icons indicate (using colors, directional symbols, labels, and size) various vehicle attributes (such as ID, status, speed, heading, etc.). All of the vehicle attribute data may be instantly queried and displayed in a pop-up box with a simple click. Further, alarm and event notification may be set to notify the user of a status change for a particular vehicle.



Map Viewing Features

The CalAmp AssetOutlook Application displays the vehicle data in a "map window." The map window can be set to display a particular area, region, or address, or to track a specific sub-set of the entire fleet (from the entire fleet to an individual vehicle). In CalAmp AssetOutlook the map display window possesses a full-set of map manipulation and query functionality. Map manipulation tools and buttons are available to zoom, pan, and center the display on a particular vehicle or address. Additional tools are available to enable or disable labeling, and to adjust the map display according to user needs or preferences. Map query options include the ability to locate an address, vehicle, or landmark.

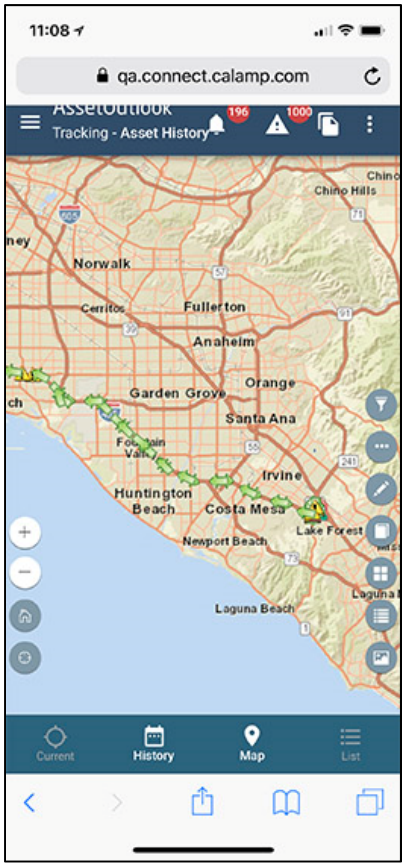


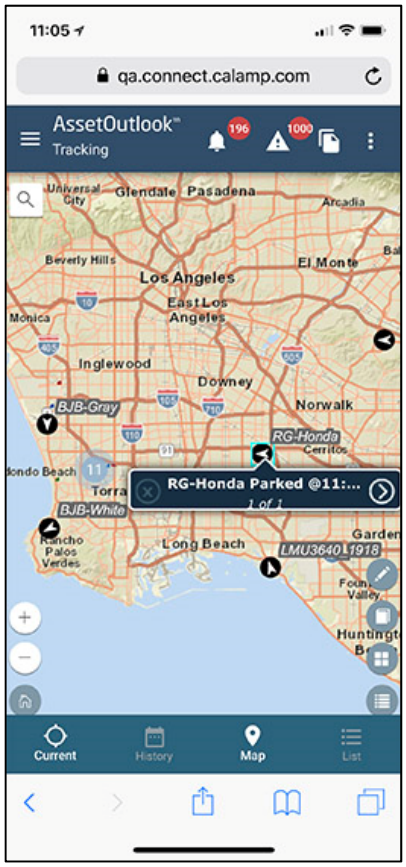
Mobile Device Compatible

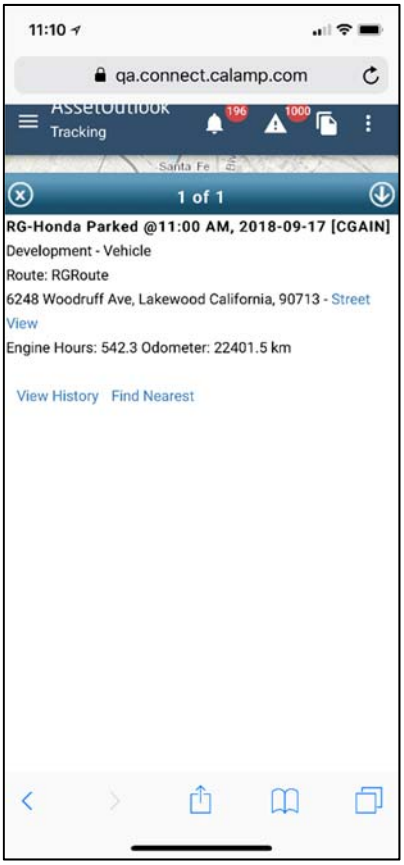
The standard CalAmp AssetOutlook application can be accessed in any web browser including mobile phones and tablets.

Using the latest web programming technology (HTML5 Javascript) allows the application to automatically configure its menus, buttons, orientation, and font size to be user-friendly and navigated with any mobile device, screen size, or operating system.

- No cumbersome apps to download and constantly update.
- No compatibility or functionality issues between operating systems or device types.
- Full function of the system on any mobile device.

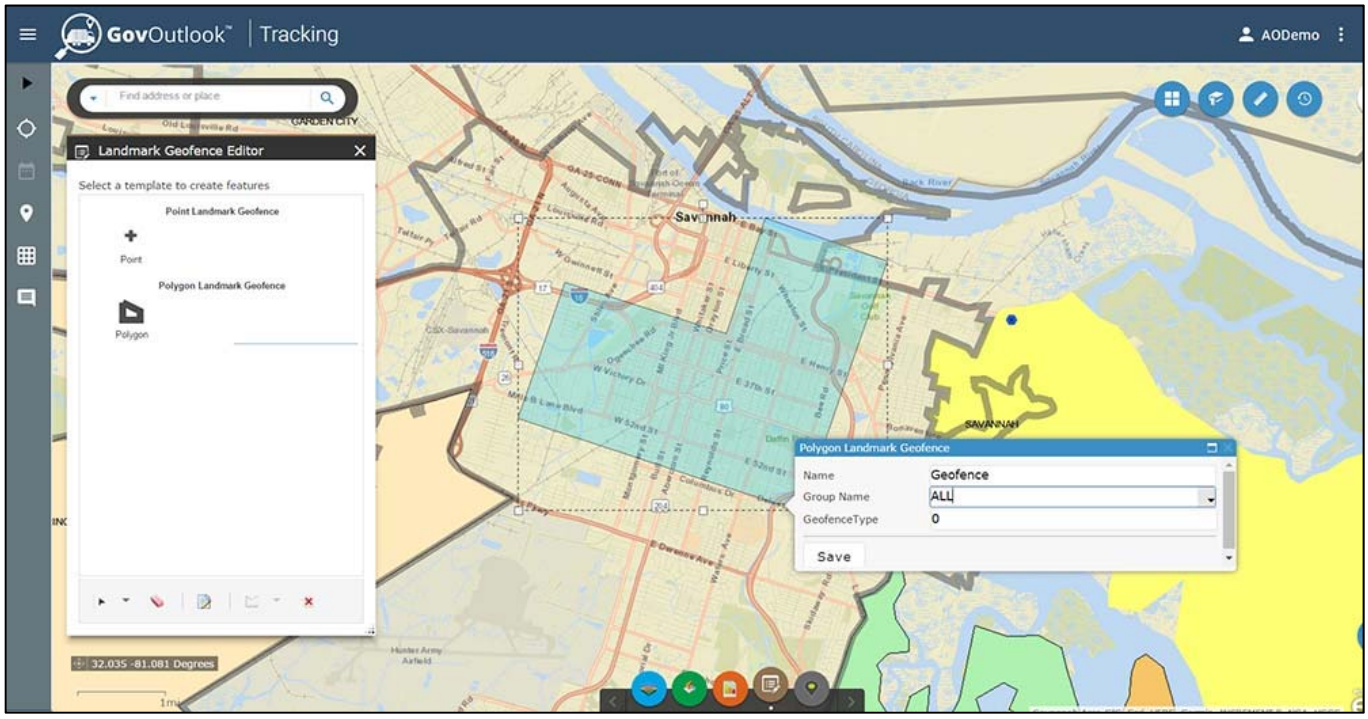


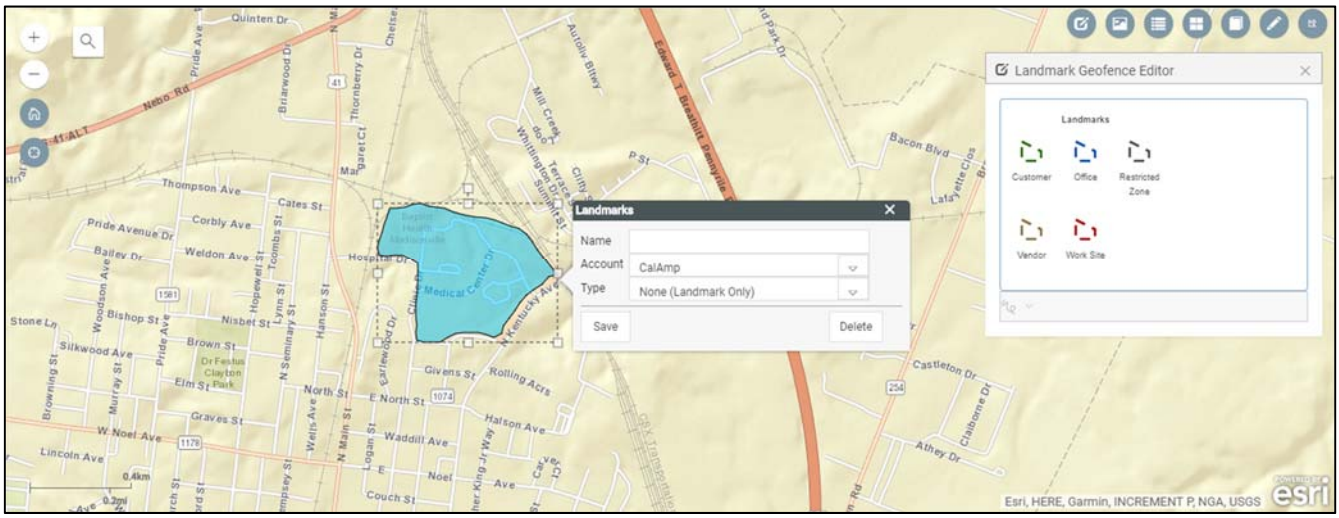




Geo-Fencing

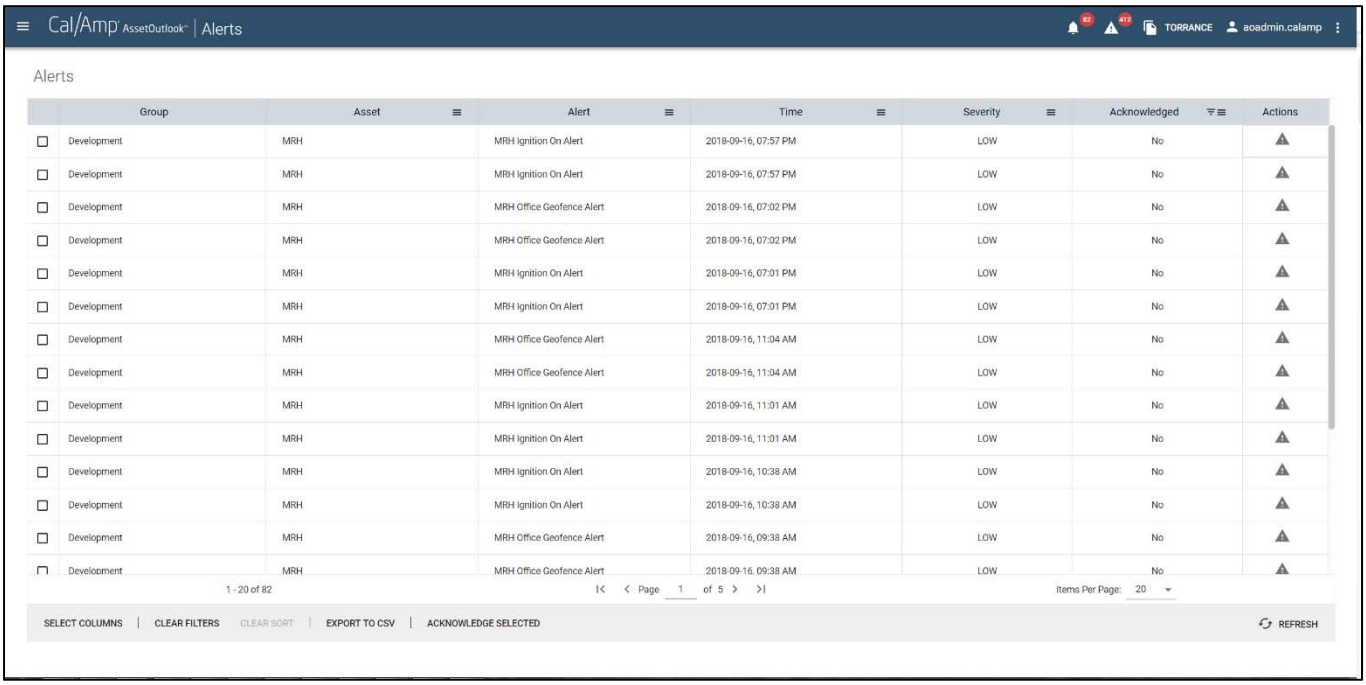
The CalAmp AssetOutlook system allows the user to set geo-fences on the map display. This geo-fences will create an alert and/or exception report when breached and will appear as another item of status data with each vehicle position report. Geo-fences can be created as polygons or a configurable radius from a specific point, as well as created from existing boundaries, landmarks or zones within your GIS.





Real-Time Alerts

The CalAmp AssetOutlook system allows authorized administrators extensive control over system features including alerts and alarms. The system can be configured to notify selected users when specific events occur with any of the vehicles. This includes geo-fences, idle, panic buttons, speeding, harsh driving, etc. Notifications can be sent as an e-mail, SMS, or to the alert screen on the software.

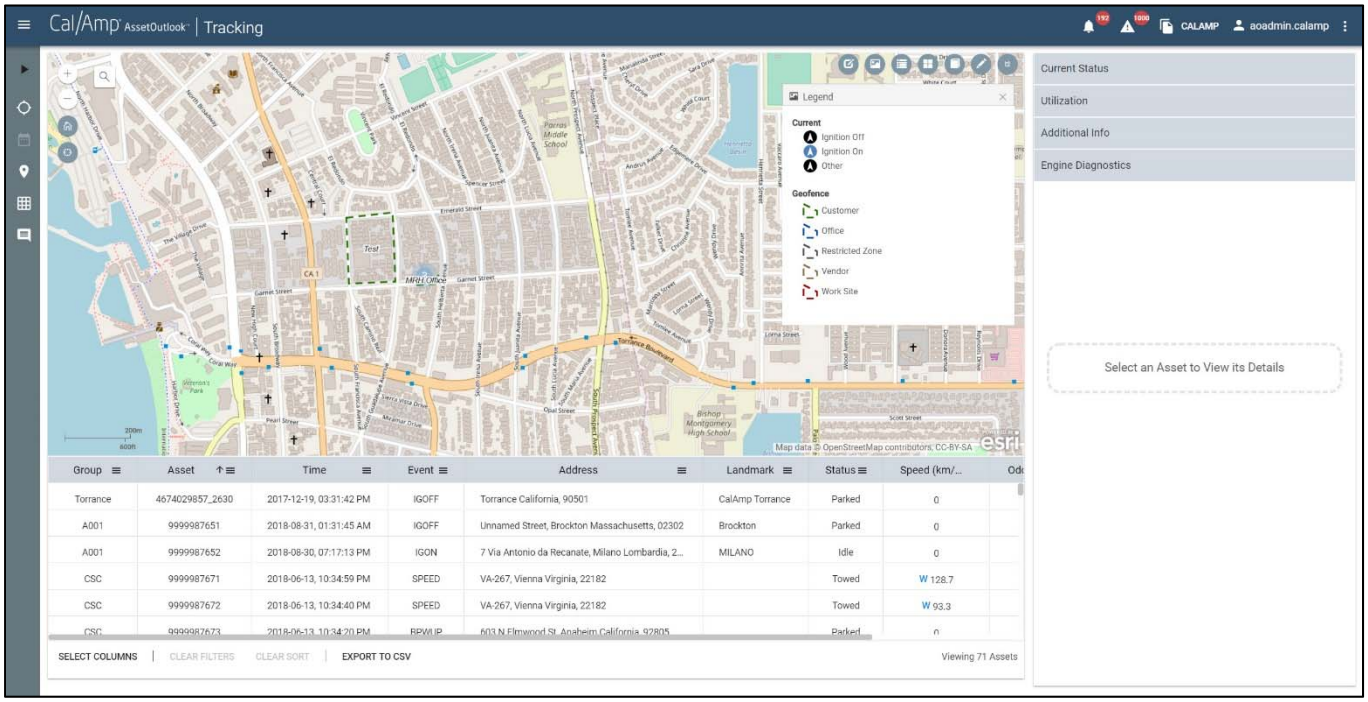


Esri GIS Mapping

The CalAmp AssetOutlook Mapping application is based on Esri ArcGIS Server, the mapping and GIS engine from Esri, the largest GIS software vendor in the world, and a pioneer of the technology. Their systems are in use throughout the world by utilities, governments, and large companies, in thousands of applications, which rely on analysis of spatially referenced data. The CalAmp AssetOutlook application is based on the actual Esri ArcGIS Server mapping engine, but no licenses are needed by the customer.

Using YOUR Map Data

The CalAmp AssetOutlook system can use virtually any type of map data, but in particular our software can overlay our AVL information on your own Esri GIS maps WITHIN our application. CalAmp allows you to utilize your existing investment of time and labor that went into your Esri map data. The CalAmp AssetOutlook system displays real-time vehicle location and status data in relation to the infrastructure, assets, boundaries, updates, routes, parcels, landmarks, and other critical elements of your constantly changing GIS map data. CalAmp has extensive experience working with Esri data and environments in all forms (.shp files, SDE, etc.). As an option, CalAmp can actually access your GIS map data in real time via Map Services.



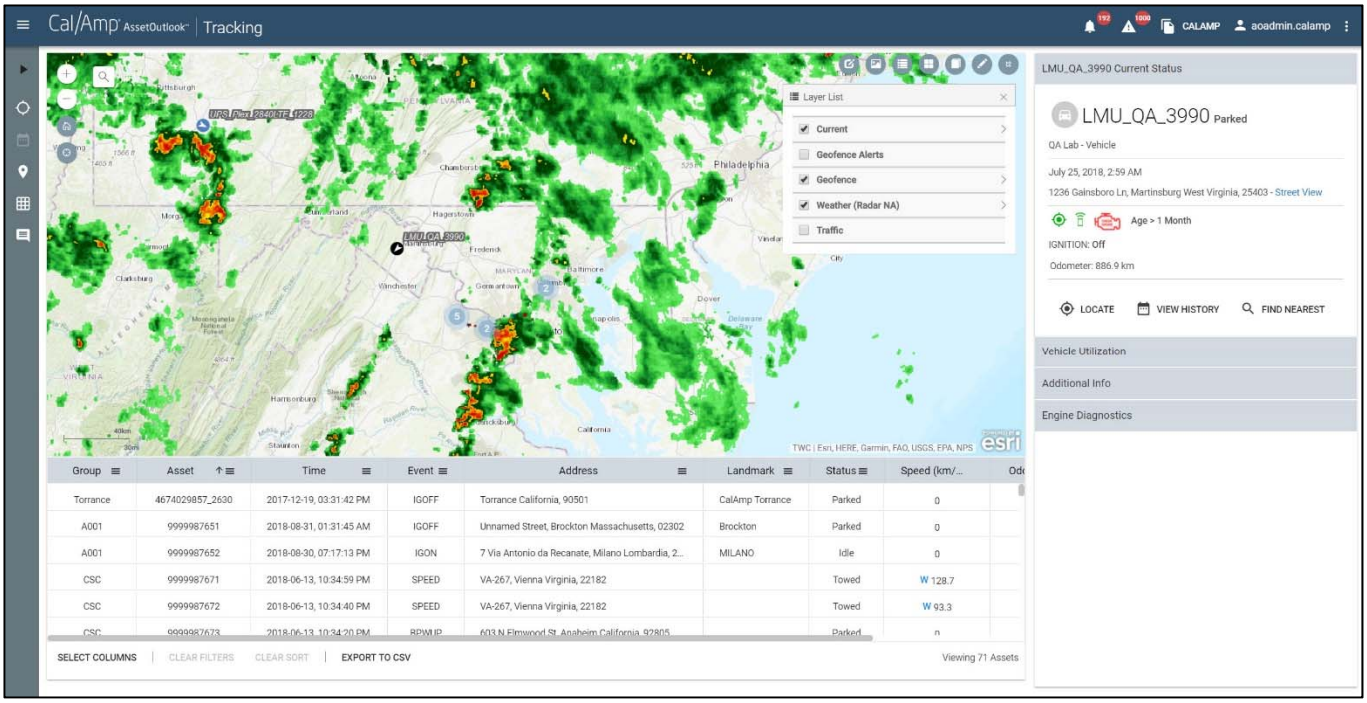
Exchanging Data with GIS

In addition to bringing your GIS data into our AVL application in real-time, we can also provide AVL data outward to your GIS, or any Esri GIS based application using a variety of interface protocols such as Map Services and Esri GeoEvent Processor.

External Data Overlays

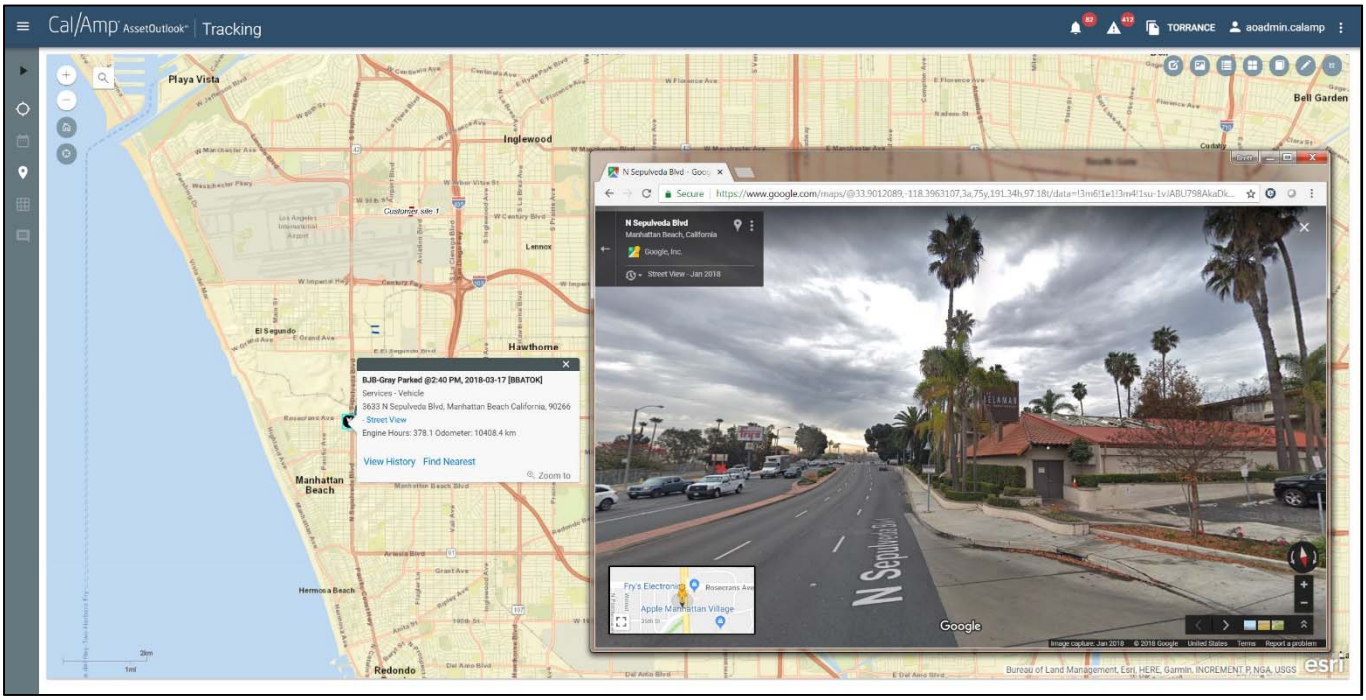
Because of our powerful universally used Esri GIS mapping engine, we can display external data from other map data sources as an option. Data can come from your own GIS sources or external sources and used as a layer in our AVL mapping. Some examples of these sources/feeds are:

- Real-Time Weather
- Real-Time Radar
- Real-Time Traffic



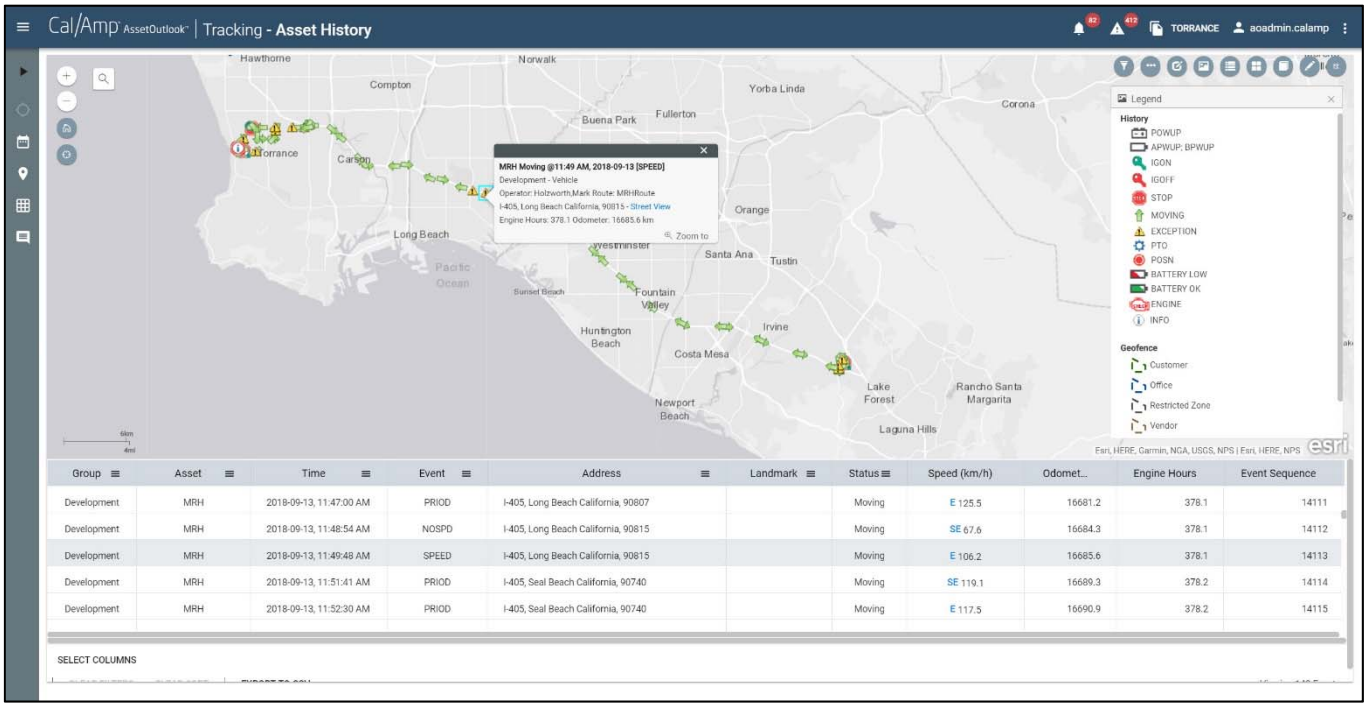
Google Maps Street View Tool

The CalAmp AssetOutlook system has a feature that leverages the highly useful Google Maps Street View tool from the CalAmp AssetOutlook system interface. This CalAmp Google Street View Tool allows the user to click anywhere on the GIS map data within the CalAmp AssetOutlook Map window, and CalAmp AssetOutlook will hyperlink that location to a new pop-up window showing the Google Maps Street View of that exact location. This function allows the CalAmp AssetOutlook user to see the typical real world surroundings of a specific place from their GIS. The Google Maps Street View shows images of the area recently captured (not real-time) by Google's mobile cameras. It allows the users to see things like buildings, road signs, lanes, businesses and other permanent structures that exist at that location that their GIS data does not have.



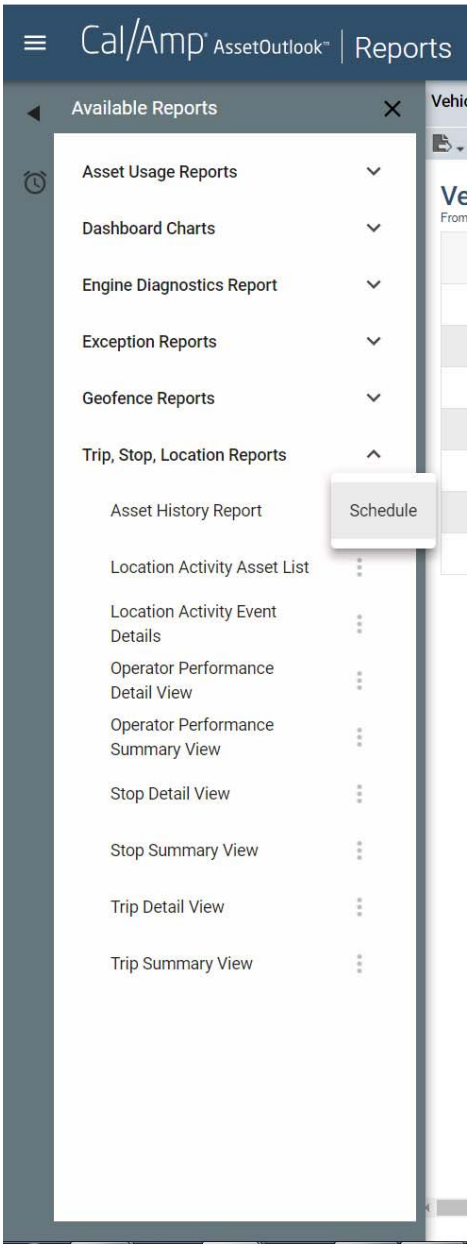
Historical Breadcrumb Replay Feature

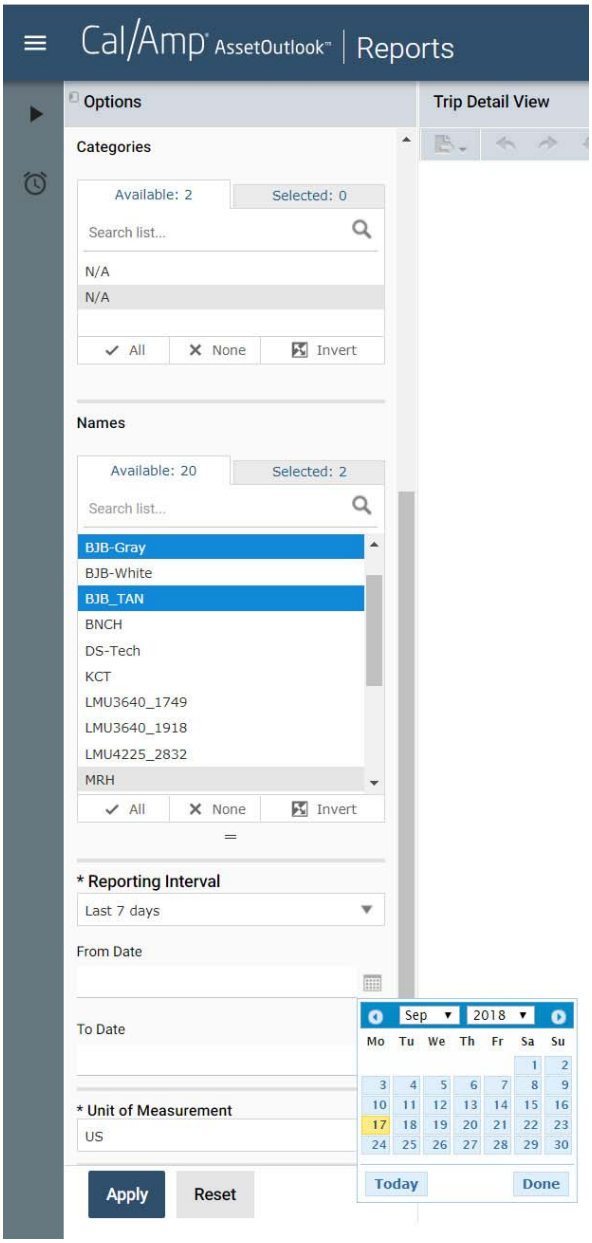
The CalAmp AssetOutlook system allows you to watch a historical "replay" of any portion of a vehicle's, or group of vehicles, activity history at various speeds. Controls let you play, pause, rewind, and fast forward the replay allowing you to watch the vehicles' movement and behavior including location, device activities, alerts, status changes, events, etc. Each breadcrumb icon represents a vehicle position and all its underlying data including address, direction, speed, and status. Breadcrumb icons can represent various statuses and events, such as ignition off/on, or a device is activated (broom, plow, armature, PTO, etc.).



Reporting Functions

The Report Generation component is an extension to the real-time component of CalAmp AssetOutlook described above, and can generate both tabular and graphical map-based reports based on archived vehicle location and status data. Reports may be produced for selected vehicles (or groups of vehicles) according to time, location, and status criteria. The **Map-based report** displays allow users to visually display or re-trace a vehicle's route and status, and include the same map manipulation and query functionality as the real-time vehicle tracking displays. **Tabular reports** display unit location and activity in a text-based spreadsheet or table. Such reports may be exported into virtually any format including .CSV and MS Excel files.





Reports

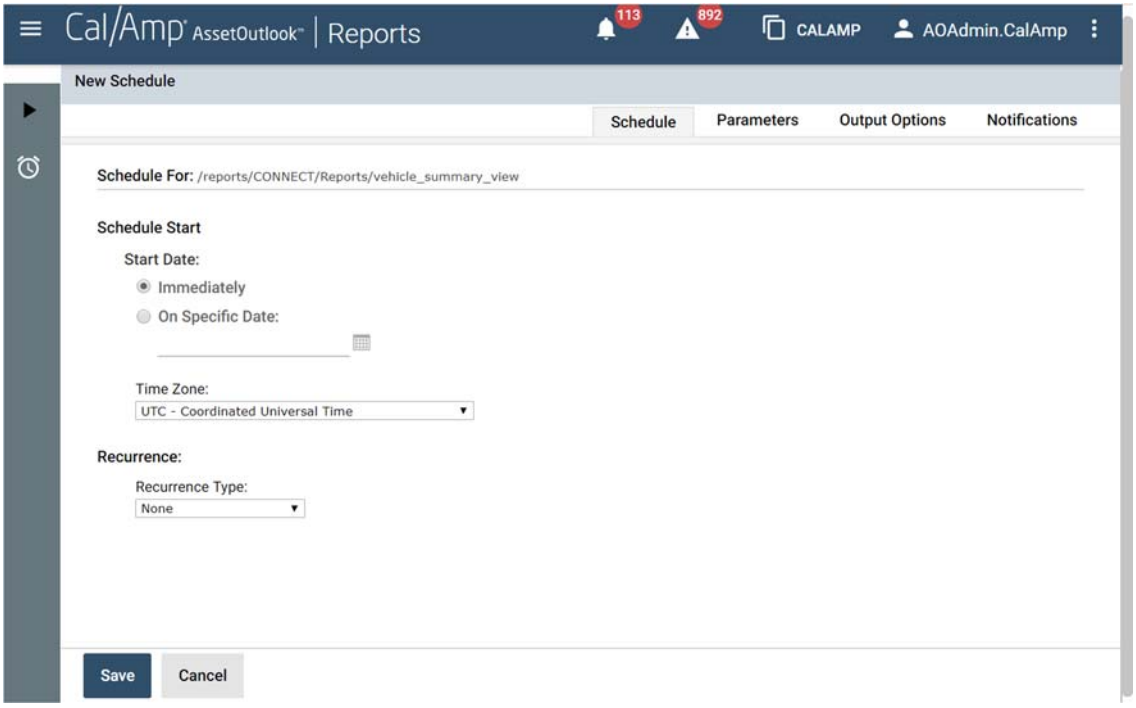
CalAmp AssetOutlook provides a highly customizable and flexible report module for generating reports to help you monitor asset operations and performance. The AssetOutlook system comes with a suite of standard graphical and tabular reports that cover all the main vehicle activities that one would expect from an industry leading AVL system. After you generate a report, you can customize the look and feel. You may want to remove columns from the report, change the sort order or highlight actionable data. Once finalized, you may opt to display report data directly within AssetOutlook or export to 11 different formats.

We have spent years working with hundreds of fleet customers to refine our report offerings to encompass the most useful and important reports.

Some of the data in our standard reports are:

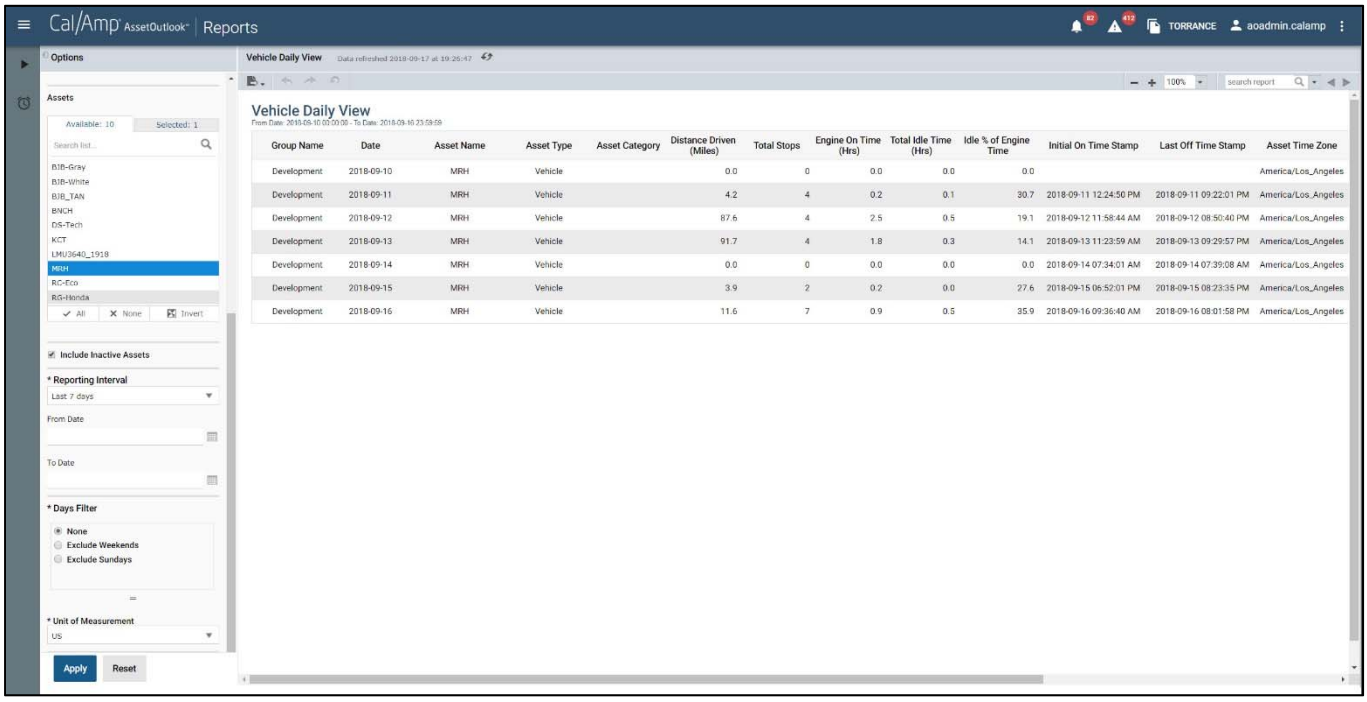
- Vehicle Activity
- Travel & Stop
- Over Speed
- Harsh braking/acceleration
- Geo-fences
- Idle Reports
- Vehicle Usage (Mileage, Idle Time & Engine Hours)
- Vehicle Inactivity
- Sensor Reports (armatures, PTO, broom, plows, etc.)
- Diagnostic Trouble Codes (if equipped)

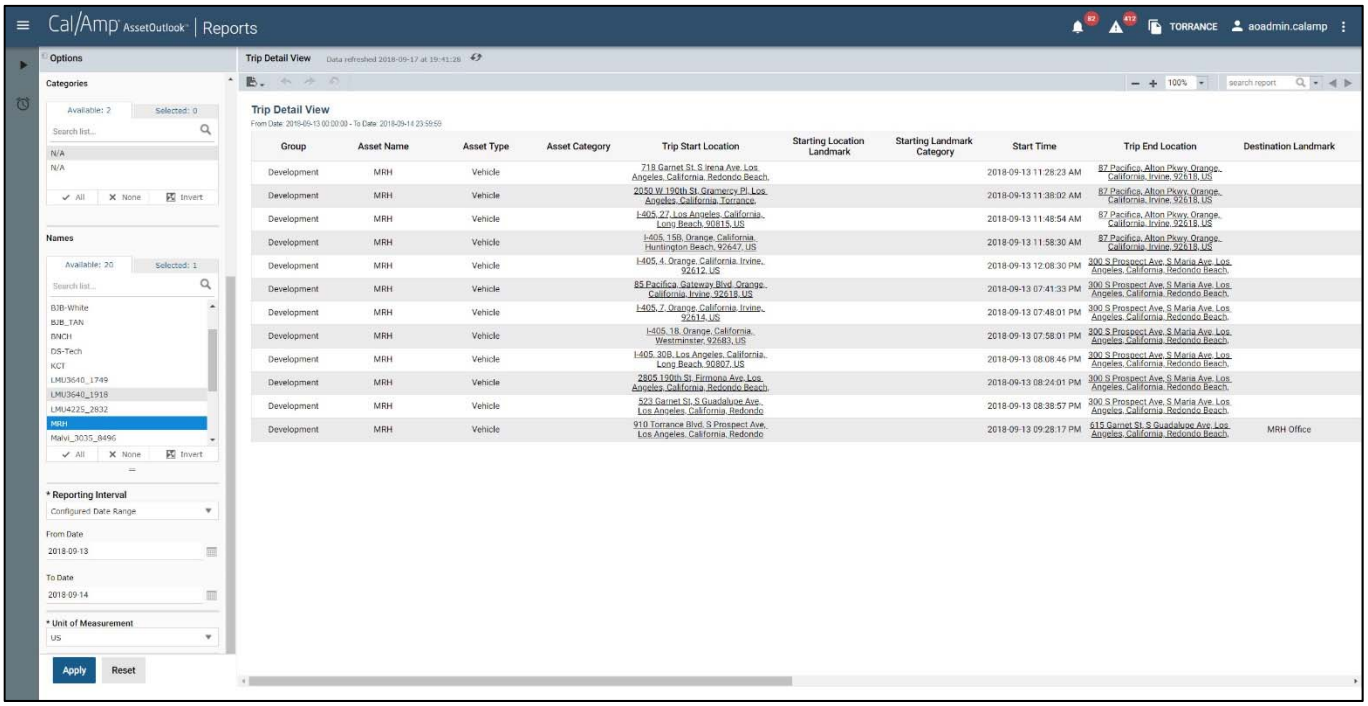
Scheduled Reports

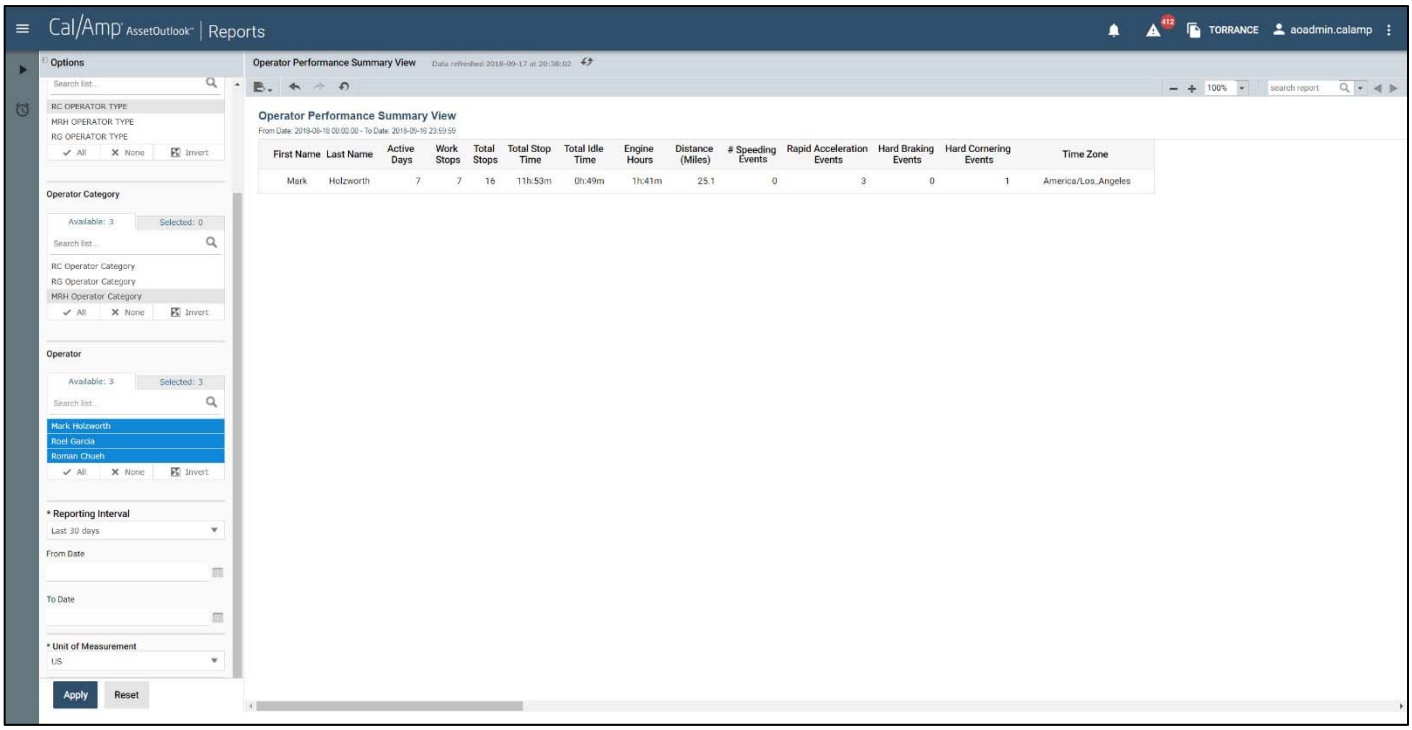


Scheduling a report to automatically generate enables you to receive the results of your report via email without having to log into AssetOutlook and manually generate the report itself.

Report Examples






Cal/Amp AssetOutlook | Reports
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Options
Operator Performance Summary View
Operator Performance Summary View
First Name
Last Name
Active Days
Work Stops
Total Stops
Total Stop Time
Total Idle Time
Engine Hours
Distance (Miles)
Speeding Events
Rapid Acceleration Events
Hard Braking Events
Hard Cornering Events
Time Zone
Mark
Holzworth
America/Los_Angeles
Operator Category
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Roel Garcia
Roman Chueh
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From Date
To Date
* Unit of Measurement
US
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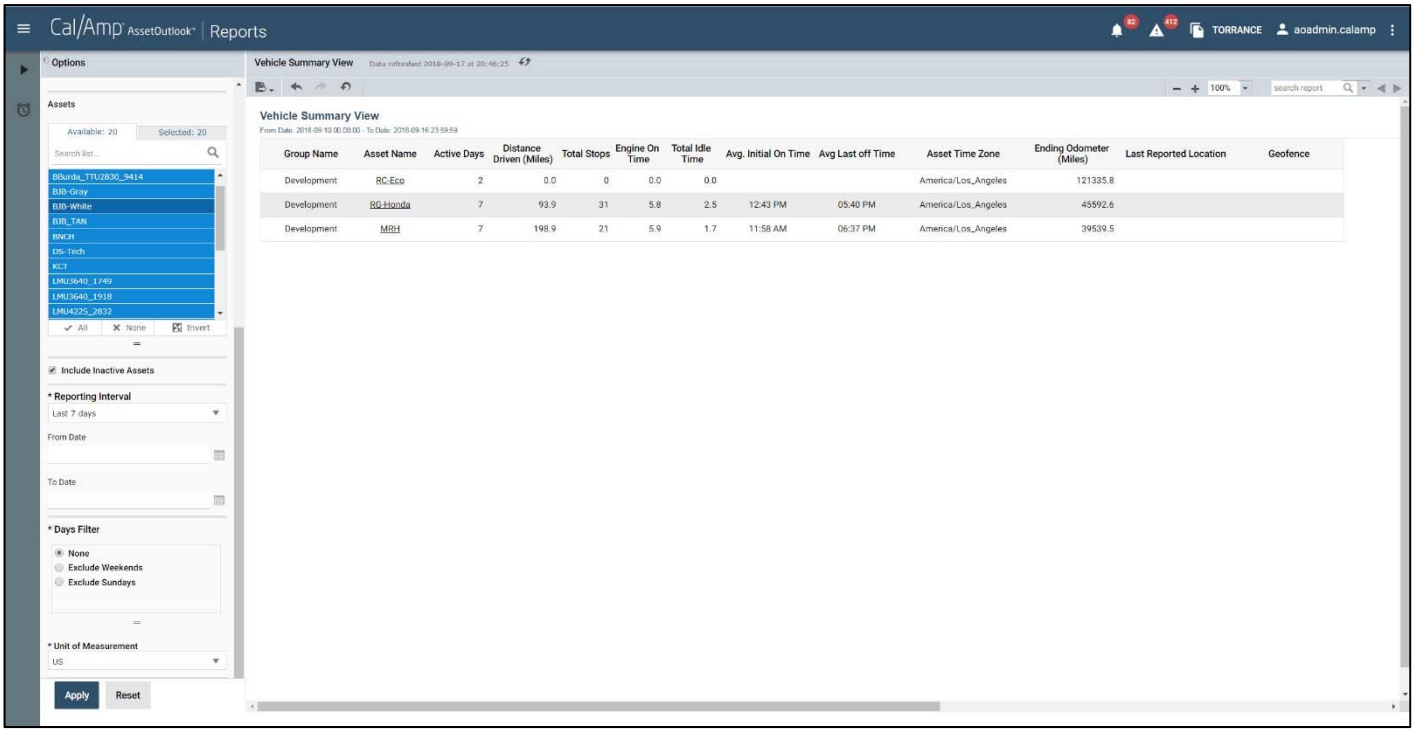
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Asset Name
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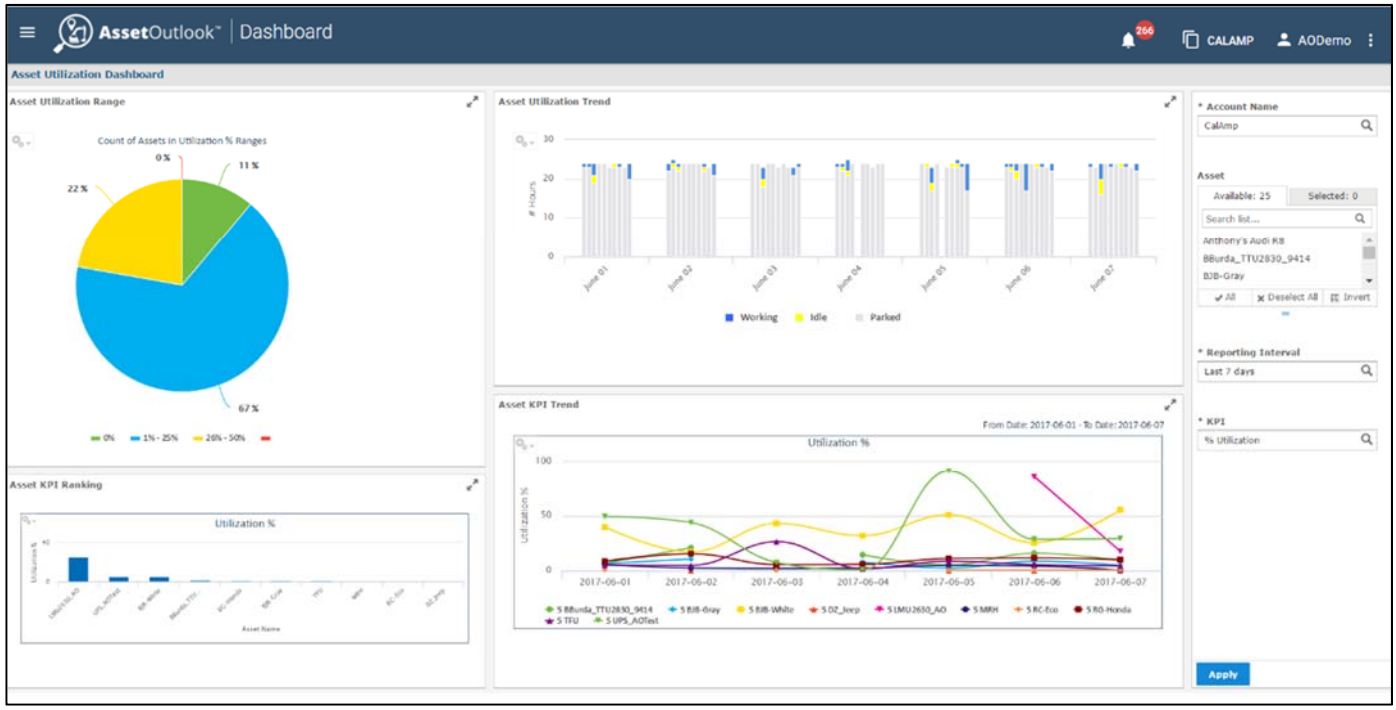
Total Stops
Engine On Time
Total Idle Time
Avg. Initial On Time
Avg Last off Time
Asset Time Zone
Ending Odometer (Miles)
Last Reported Location
Geofence
Development
RC-Eco
RG-Honda
MRH
America/Los_Angeles
Assets
Include Inactive Assets
* Reporting Interval
Last 7 days
* Days Filter
None
Exclude Weekends
Exclude Sundays
* Unit of Measurement
US
Apply
Reset

Dashboard

AssetOutlook's Dashboard provides a quick view into the real-time status and trending of the utilization of your assets. The Dashboard presents Asset Utilization Range, Asset Utilization Trend, Asset Key Performance Indicator Ranking and Asset Key Performance Indicator Trend. The various dashboard charts can be configured to display data based on the user-defined criteria and updates automatically.



CalAmp LMU Mobile Units

CalAmp is a world leader in the design and manufacturing of GPS vehicle tracking hardware, supplying approximately 65% of the market in the United States. Other vendors resell our devices, but we are the original engineering manufacturer of these devices, approximately 2 million per year!

The recommended CalAmp LMU Mobile Unit includes a dual-mode GPS and RF antenna (internal or external) and associated cabling (if necessary).

Each CalAmp LMU Mobile Unit contains a 50 channel GPS receiver (or greater), wireless communications, and optional multiple external data and sensor ports. To ensure reliability and availability of the entire system, the critical mobile units are built to exacting military standards to resist vibration, climate, and electromagnetic interference. First-quality components, extensive RF/EMI shielding, and specialty power conditioning circuits protect the GPS receiver and micro-controller in the "computer hostile" vehicular environment.

Each CalAmp LMU will be equipped with a state-of-the-art 50 channel, WAAS enabled, all-in-view GPS receiver. This GPS receiver delivers superior performance and field-proven reliability and provides for fast signal reacquisition, position accuracy, and the filtering of spurious and erroneous data. The GPS accuracy is 2 meters (7 feet).

CalAmp can offer multiple types of LMU mobile units with similar functionality that may support different wireless technologies as well as quantities and types of inputs/outputs.

The CalAmp LMU product line offers a wide variety of the newest state-of-the-art AVL devices for various customer needs. The CalAmp LMU mobile GPS devices can be equipped with a variety of networks, options, serial ports and sensors that integrate to virtually any devices and external status signals, such as ignition on/off, door open/shut, lights, plow, engine diagnostics, data terminal, ID readers, etc.

Some of the options that are available with CalAmp AssetOutlook hardware are:

- Different wireless carriers.
- Various wireless networks: 3G, 4G/LTE or WiFi
- Engine Diagnostics (Light Duty OBD-II or Heavy Duty JBus)
- Driver ID Readers (RF ID, magnetic stripe cards, or iButton)
- Emergency Panic Buttons (dash mounted or wireless handheld buttons)
- Inputs/Outputs (sensors, serial ports, USB ports, Ethernet ports, WiFi hot spot)

Interface to Devices and Sensors

The CalAmp LMU Mobile Unit is optionally capable of interfacing to a wide variety of in-vehicle peripherals and various sensor systems. The CalAmp LMU Mobile Unit serves as a mobile gateway, paying particular attention to supporting a variety of devices and inputs. The CalAmp LMU Mobile Unit will be connected to the on-board vehicle power and optionally to any sensor signals as desired such as:

- Ignition on/off
- Siren/Light Bar/Flashers
- PTO
- RF ID, Card Swipe Reader, iButton Driver ID
- Vehicle Engine Diagnostics
- Door open/closed
- Lights on/off
- Plows
- Brooms/Sweepers
- Armature/device up/down
- Landmarking

Panic Button Options

The CalAmp LMU Mobile Unit can be equipped with an emergency panic button configuration that is a dashboard-mounted button that sends a priority signal over-the-air to the dispatch interface or real-time alert.

CalAmp can also offer a wireless handheld panic button that can be activated up to 300 feet from the vehicle.

Antennas, Cables, and Connectors

Typically the CalAmp LMU units can be configured with internal antenna, foregoing the need for unnecessary cables, connectors, and installation. The high gain antenna increases the ability for the GPS to receive weak signals under trees or canopy, while its very small design presents little or no profile for tampering or inadvertent damage. If necessary, the CalAmp LMU Mobile Unit comes with all bracketing, cabling, and connectors required for full installation. CalAmp configures the system so it cannot be easily disabled by the driver and/or user.

CalAmp AssetOutlook AVL Driver ID Solutions

CalAmp offers a variety of Driver ID solutions including readers that are compatible with existing customer ID cards such as **RF ID** and **magnetic stripe** cards. We can also provide a stand-alone ID solution using iButton technology.

A Driver ID solution allows the CalAmp AssetOutlook system to assign a driver to a vehicle for various reporting and administrative functions, most importantly, to see who was driving a specific vehicle at any given time.

Attaching to the main GPS Unit via cable, the ID readers can be mounted anywhere on the dashboard for easy access for the driver. To capture maximum driver compliance, we can have an annoying buzzer activated with ignition that requires an ID swipe to turn off the buzzer noise, thereby encouraging the driver to login to the vehicle.

CalAmp can provide an RF ID or magnetic stripe reader that is compatible with your organization's existing ID cards, eliminating the need for managing a separate ID just for driver login.

In addition CalAmp can offer an **iButton key fob solution** for unique stand-alone driver identification with a key fob and reader.

RF ID Reader

Magnetic Stripe Reader

iButton Reader

Back-Up Tamper Alert Battery

Our CalAmp LMU devices come equipped with a small back-up battery that can alert the system immediately if power has been cut to the unit. The priority over the air message can be configured to notify specific users (via text, e-mail, or software) that power has been cut to the unit and its current position.

Engine Diagnostics

As an option, an interface to engine diagnostics can be added to the CalAmp LMU Mobile Unit giving you real-time access to engine trouble codes and other available vehicle information for either light duty (OBD-II) or heavy duty (JBus) vehicle types. The LMU with optional diagnostic interface is capable of capturing all basic (and non-proprietary) diagnostic data that is made available on each specific vehicle. Diagnostic data and trouble codes are far from standard, so certain data may/may not be available on every vehicle depending on make/model/year. This is a universal issue for all AVL providers.
Diagnostic data available from the diagnostic interface varies greatly depending on the specific vehicle make, model, and year. Basic Diagnostic Trouble Codes (DTC), and odometer are typically available from most vehicles but it is not absolutely guaranteed. The availability of data for such things as Fuel Economy and seat belt usage varies greatly and is not available on some vehicle types.

Remote Configurability

Each LMU device employs CalAmp's advanced industry leading on-board alert engine, (PEG™) (Programmable Event Generator) to monitor external conditions and support exception-based rules to meet your application requirements. PEG monitors the vehicle environment and responds instantaneously to pre-defined threshold combinations related to time, date, motion, location geozone, input and other event combinations. These custom behaviors can be programmed by CalAmp before shipment, or over-the-air once the unit has been fielded.

Automated Device Maintenance

Our LMU device leverages CalAmp's management and maintenance system, PULS™ (Programming, Updates, and Logistics System), for over-the-air configuration parameters, PEG rules and firmware. This out-of-the-box hands free configuration and automatic post-installation upgrades can monitor unit health status across the customers' fleets to identify issues before they become expensive problems.

Harsh Driving Behavior Detection

The LMU devices are equipped with an accelerometer that can detect various types of movement anomalies such as harsh acceleration, harsh braking, as well as movement when the vehicle is not on. All of these exception events can be set to alert or appear in a report or dashboard. We have also developed highly advanced crash detection function as described in the following section on **automated instant crash notification.**

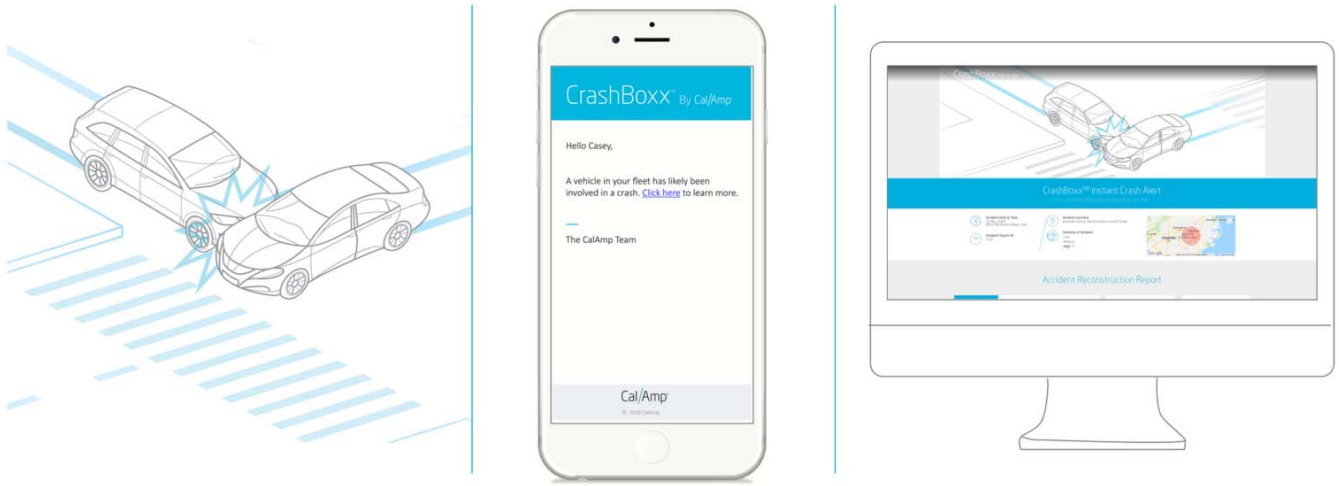
Automated Instant Crash Notification: Crashboxx

CalAmp is pleased to offer our **optional** new automated instant crash notification system that can provide instant notifications for crash events as well as a rich offering of advanced reports and functions.

Our proprietary technology constantly monitors vehicle activity measurements and using powerful algorithms in the device and, more importantly on the server side, is able to provide alerts for likely crash events, and accurately filtering out the false positive alerts. Alerts can be sent via SMS and to mobile devices such as smartphones and tablets.

Advanced optional features include:

- Accident Recreation Reports
- Instant damage and repair estimates
- Predictive bodily injury estimates



Accident Reconstruction Report

These optional advanced reports will provide vehicle accelerations, speed before and after the crash, angle of impact on the vehicle and details on which components of the vehicle are likely damaged and in need of repair or replacement. An example Accident Reconstruction Report from a crash is shown below:

CalAmp LMU-3640 (Advanced Input Vehicle Tracking Unit)

General

Communication Modes	LTE
Location Technology	50+ channel GPS (with SBAS)
Configuration	Automatic over-the-air firmware and configuration updates via PULS™

GPS

Location Technology	GPS, GLONASS, Galileo
Enhancement Technology	SBAS: WAAS, EGNOS, MSAS, GAGAN
Tracking Sensitivity	-162 dBm
Acquisition Sensitivity	-148 dBm
Location Accuracy	2.0m CEP
AGPS capable	

Cellular/Bands

Operating Bands (MHz)	
North America Variant I:	
4G LTE CAT-1	1900 (B2)/AWS (B4) /850 (B5)/ 700 (B12)
3G UMTS/HSPA	1900 (B2)/850 (B5)
North America Variant II:	
4G LTE CAT-1	AWS 1700 (B4)/700 (B13)
Data Support	SMS, UDP, TCP

Comprehensive I/O

Ignition Inputs	1 fixed bias
Digital Inputs	5 (high/low selectable 0-30 VDC)
Digital Outputs	4 (open collector relay 150 mA)
A/D Inputs	2 (0-30VDC, +/-0.1V accuracy)
1-Wire® Interface	1 (driver ID, temperature sense)
Power Output	1 switched V_IN
Status LEDs	4 (GPS, cellular, VBUS, LAN)

Certifications

FCC, IC, PTCRB, Applicable Carriers

Electrical

Operating Voltage	9-30 VDC (Start-up, Operating) 7-32 VDC (Momentary)
Power Consumption	7 mA @ 12V <500 uA (deep sleep) 20 mA @ 12V (idle on network) 150 mA @ 12V (active tracking with VBUS active)

Environmental

Temperature	-30° to +75° C (connected to primary power) -10° to +60° C (operating on internal battery) -40° to +85° C (storage) 0° to +30° C (long term storage with battery)
Humidity	95% R.H. @ 50° C non-condensing
Shock and Vibration	U.S. Military Standards 202G and 810F, SAE J1455

Physical

Dimensions	5.7 x 2.1 x 1.3" (145 x 53 x 33 mm)
Weight	5 oz (142 g)
Integrated Buzzer	

Connectors, SIM Access

Vehicle BUS I/F	16-Pin Molex
Power, I/O	24-Pin Molex
SIM Access	Internal

Interface Standards

Bluetooth	4.0 Dual-Mode Classic, BLE
Wi-Fi	a/g/b client mode
Heavy Duty Truck Data	J1708, J1939
Light Duty Vehicle Data	J1850 PWM, J1850 VPW ISO 9141-2, KWP 2000, ISO-15765, CAN

Product Options

RS-232 serial adapter cable
I/O wiring harness
1000 mAh Lithium-Ion back up battery
Customized hardware and software development available on request

Specifications Subject to Change

Optional CalAmp TTU-2830 Mobile Unit (Multi-Use Tracker)

- Weatherproof and has full tracking capabilities.
- Can be standalone, hardwired, or connected to intermittent power source.
- 500 message cycles on fully charged rechargeable battery pack
- 18 months with 0 messages until a final 30 min tracking session
- 6 months with single message cycle per day on fully charged battery pack

TTU-2830™ Specifications

General

Network Technologies	GSM/GPRS/EDGE/HSPA
Location Technology	56 Channel GPS
Operating Voltage	12/24 VDC Vehicle Systems

GPS

Location Techology	GPS; QZSS capable
Enhancement Technology	SBAS: WAAS, EGNOS, MSAS
Receiver Type	56 channels
Tracking Sensitivity	-162 dBm
Acquisition Sensitivity	-148 dBm
Location Accuracy	2.0m CEP
Location Update Rate	Up to 10 Hz
Anti-jamming	
AGPS / Location assistance capable	

Cellular/Bands

Operating Bands (MHz)	
HSPA/UMTS	800(VI)/850(V)/900(VII)/1900(II)/2100(I)
GSM/GPRS	850/900/1800/1900
CDMA/1xRTT	850/1900
HSPA Data Rates	5.6 Mbps upload/7.2 Mpbs download
HSPA Fallback	EDGE/GPRS/GSM quad band
	EDGE MCS1-MCS9
	3GPP Release 6
Data Support	UDP packet data, SMS

Comprehensive I/O

Digital Inputs	3 (1 fixed, 2 programmable bias)
1-Wire™ Interface	1 (driver ID, temperature sense)
Digital Outputs	3 open collector (150mA)
Analog Input	1 External ADC input
Status LEDs	2 (GPS and Cellular)
Serial Interface	Serial port (TTL Level)

Certifications

FCC, CE, IC, PTCRB, Applicable Carriers

Electrical

Operating Voltage	9-32 VDC (start-up, operating)
	7-32 VDC (momentary)
Power Consumption	Typical 500uA @ 12V (deep sleep)
	Typical 13mA @ 12V (radio-active sleep)
	Typical 41mA @ 12V (SMS+UDP connection, GPS off)
	Typical 86mA @ 12V (continuous tracking)
Battery	5.3 mAh Lithium-ion battery

Environmental

Temperature	-20° to +70° C (operating)
	-40° to +85° C (storage)
Humidity	95%RH @ 50° C non-condensing
Shock and Vibration	U.S. Military Standards 202G and 810F, SAE J1455
EMC/EMI	SAE J1113; FCC-Part 15B; Industry Canada
IP-66 Enclosure	

Physical

Dimensions	2.2 x 4.3 x 1.59", (54 x 110 x 40 mm)
Weight	12oz (340g) (with harness)

Connectors, SIM Access

SIM Access	Internal
Vehicle BUS I/F, Power, I/O	12 wire captive harness
Cellular Antena	Internal
GPS Antenna	Internal
ADC Input	External

Product Options

Customized hardware and software development available on request
Tie-wrap, adhesive, velcro, or screw mounting bracket
OBD-II ECU interface support

Specifications Subject to Change

Optional CalAmp TTU-720 Asset Tracking Unit (Long Term Non-Rechargeable Battery)

- GSM/GPRS, CDMA 1xRTT, or HSPA configurations
- Up to 5000 message cycles on a charged battery pack
- 7 year battery life with a single message per day
- IP67 sealed and rugged enclosure
- Built-in motion sensor
- Built-in cellular and GPS antenna for easy installation

TTU-720™ Specifications

General

Communication Modes	GPRS/EDGE/HSPA, CDMA/1xRTT
Location Technology	50 channel GPS
Operating Voltage	3.6 volt internal battery pack

GPS

Location Techology	GPS
Enhancement Technology	SBAS: WASS, EGNOS, MSAS, GAGAN
Tracking Sensitivity	-162 dBm
Acquisition Sensitivity	-147 dBm
Location Accuracy	2.0m CEP

AGPS / Location assistance capable

Cellular/Bands

Operating Bands (MHz)	SMS, GPRS or HSPA packet data
GSM/GPRS	850/900/1800/1900
HSPA/UMTS	800(VI)/850(V)/900(VIII)/ 1700(IV)/1900(II)/2100(I)
CDMA/1xRTT	850/1900
HSPA data rates	5.6 Mbps upload/ 7.2 Mpbs download
HSPA Fallback	EDGE/GPRS/GSM quad band EDGE MCS1 -MCS9 3GPP Release 6
Data Support	SMS, UDP Packet Data

Certifications

FCC, CE, IC, PTCRB, Applicable Carriers

Product Options

Screw mounting bracket, or magnet mount

Customized hardware and software development available on request

Electrical

Operating Voltage	3.6 internal battery
Power Consumption	<100µA @ 12V (deep sleep) 70mA @ 12V (active standby)
Battery	57 Ah lithium

Environmental

Temperature	-30° to + 75° C (operating) tethered -40° to + 85° C (storage)
Humidity	95% R.H. @ 50° C non-condensing
Shock and Vibration	U.S. Military Standards 202G and 810G, SAE J1455
EMC/EMI	SAE J1113

RoHS Compliant

IP-67 Enclosure

Physical

Dimensions	2.25" x 2.25" x 10.5" (55 x 55 x 260mm)
Weight	32oz (907g)

Connectors, SIM Access

SIM Access	Internal
Cellular Antenna	Internal
GPS Antenna	Internal

Key Features

- Ultra low power sleep mode (<100µA)
- Voltage monitoring and low battery notification
- PEG™ exception-based rules
- Automatic, over-the-air unit configuration on power-up (PULS™)
- Over-the-air firmware download (PULS™)
- Web-based device management (PULS™)

Specifications Subject to Change

Warranty

As an expression of confidence in our products to continue meeting the high standard of reliability and performance that our customers have come to expect, CalAmp products are covered by the following warranty.

CalAmp warrants all products against defects in materials and workmanship for a period of one year from the date of factory sale, or the term outlined in an extended warranty agreement. During the warranty period CalAmp provides the warranty service. CalAmp will, at its option, either repair or replace products which prove to be defective. The Customer shall prepay shipping charges for products returned to CalAmp for warranty service and CalAmp shall pay for return of products to Customer. However, the Customer shall pay all shipping charges, duties, and taxes for products returned to CalAmp from outside the United States. This warranty shall not apply to damage resulting from:

- Improper or inadequate maintenance by the Customer
- Customer-supplied interfacing
- Unauthorized modification or misuse
- Operation outside of the product environmental specifications
- Improper installation, where applicable

No other warranty is expressed or implied. CalAmp specifically disclaims the implied warranties of merchantability and fitness for a particular purpose. Remedies provided herein are Customer's sole and exclusive remedies. CalAmp shall not be liable for any direct, indirect, special incidental, or consequential damages, whether based on contract, tort, or any other legal theory.

Extended Warranty

Extended warranties on hardware are available as an option and can be purchased at the beginning of the contract or annually after year one.

Installation

If desired, CalAmp can be responsible for the installation of all equipment furnished under this contract. CalAmp can perform the installation and provide local support. CalAmp will require the client's cooperation and assistance in coordinating vehicle access and availability.

All work will be executed in the manner best calculated, according to local conditions, to promote rapidity and accuracy; to secure safety to life, personnel and property; to assure safe and continuous operation of the existing dispatch, computer, and daily operations; and, to reduce to a minimum any interference with the public and with other contractors in or about the property.

Management and Installation

The installation team manages all aspects of the installation of these units by working closely with client representatives. Together, the installation team and client will identify vehicles and schedule installations on a on a non-intrusive basis. Installation of CalAmp LMU Mobile hardware units will be verified by inspections. Typically, we perform a physical checkout of the installation, which includes ensuring proper form, fit, security, and location of the unit. In addition, a communications check is performed to ensure that the modem is operational.

Operational Checkout

Upon completion of a small subset of the entire installation, we will perform a complete operational checkout of the hardware and firmware. This checkout will ensure bi-directional communication between the CalAmp LMU Mobile hardware unit and CalAmp AssetOutlook Base Server and verify the accuracy of receive/transmit (RX/TX) event data shared between the CalAmp LMU Mobile hardware units and The CalAmp AssetOutlook Base Server software. Upon successful completion of this test, the units and vehicles are tagged as "ready for integration."

Project Management

The CalAmp project manager will serve as the liaison for CalAmp during the implementation process and through the duration of the system. The project manager will serve as the point of contact for all technical and support issues.

Implementation

The Project Manager will schedule periodic calls/meetings to monitor the initial implementation and installation process. Communication is key in our implementations so we will be using a variety of methods including e-mail and telephone, as well as in person meetings when appropriate. Scheduling and planning will utilize industry standard project management tools such as Microsoft Project and other related systems.

Project Initiation

Introductions

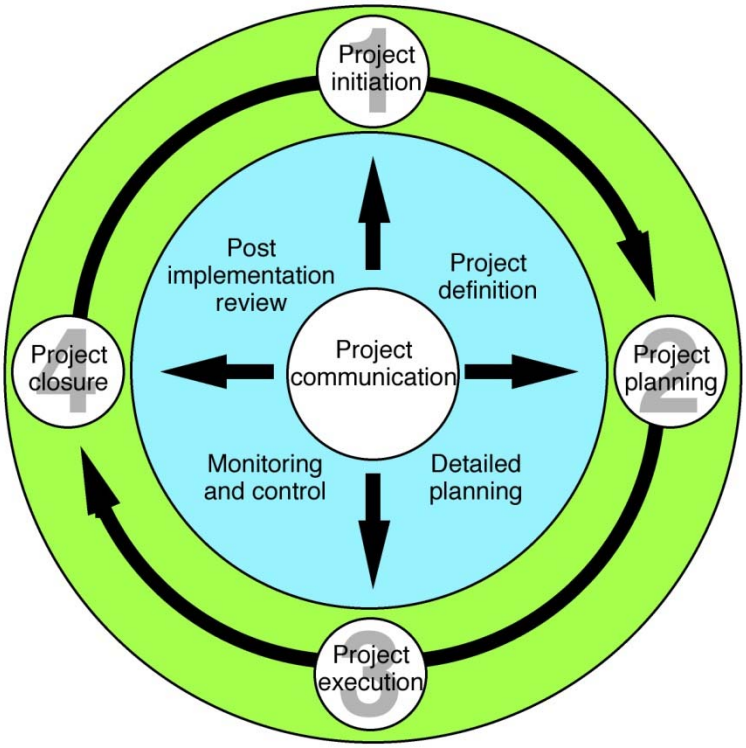
Kick Off Meeting

Project Planning

Design Review

Define Roles and Responsibilities

Expectations



Project Execution

Scheduled Communication

Status Updates

Resolving Issues

Developing Options

Following Up

Project Closure

Acceptance Testing

Final Review

Key CalAmp Personnel

Program Management

Mike Dunn, Director

Experience:

Planning, Implementation and Project management clients include: Commonwealth of Pennsylvania, UPS, Ford Motor, EverSource Energy, and Green Mountain Power

Mike has a team of project managers that adhere to the PMBOK principals of project management. Mike has over 25 years' experience in the telematics arena and has been with CalAmp for 10 years.

Professional Services

Brian Burda, Vice President Professional Services

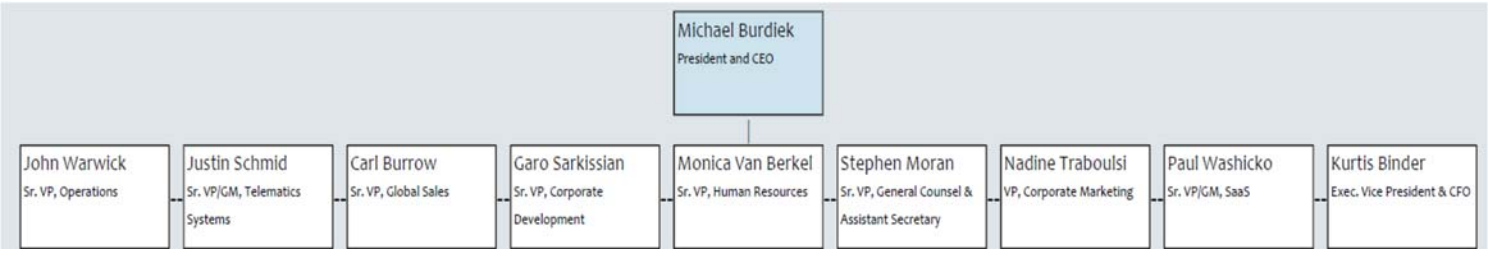
Experience:

Implementation and Project Management clients include: City of San Diego, City of Dallas, State of South Carolina, New York City Transit/MTA, Clark County, and Cook County.

Consultant, Process Control and Software Development clients include: H.J. Heinz, United Airlines, ORE-IDA Foods, Weight Watchers, and the Marriott Hotel Corporation

Brian has 25 years of experience implementing AVL and tracking systems using GPS.

Executive Organization Chart



Implementation Time Line

CalAmp will determine an appropriate implementation schedule for each specific project and customer. Here is a typical schedule to implement the system as outlined below. Some key milestones follow. (This is an example subject to change. A detailed and accurate project work plan cannot feasibly be created without conferring with the customer to determine specific configurations, preferences, processes, priorities, resources, etc.)

AVL System System Implementation Schedule

ID	%	Task Name	Start	Finish	Duration	Predeces	Resource Names
1	**0%**	**AVL Project Completion**	**Tue 5/1/12**	**Thu 8/23/12**	**83 days**		
2	0%	Receipt of Order	Tue 5/1/12	Tue 5/1/12	1 day		Customer
3	**0%**	**Design Review**	**Wed 5/2/12**	**Tue 5/22/12**	**15 days**	**2**	
4	0%	Develop Design Review	Wed 5/2/12	Tue 5/15/12	10 days		RSI/Customer
5	0%	Submit Design Review	Wed 5/16/12	Tue 5/22/12	5 days	4	RSI
6	0%	Design Review Acceptance	Tue 5/22/12	Tue 5/22/12	0 days	5	Customer Project Team
7	**0%**	**Base Station System Install/Config**	**Wed 5/2/12**	**Tue 5/22/12**	**15 days**		
8	0%	GIS Map Data	Wed 5/2/12	Tue 5/8/12	5 days		Customer GIS Department
9	0%	Server Software Installation	Wed 5/9/12	Tue 5/22/12	10 days	8	RSI
10	0%	Base Station System Completed	Tue 5/22/12	Tue 5/22/12	0 days	9	RSI
11	**0%**	**Shipping Phase**	**Wed 5/2/12**	**Mon 6/18/12**	**34 days**		
12	**0%**	**System Delivery**	**Wed 5/2/12**	**Mon 6/18/12**	**34 days**		
13	**0%**	**Mobile Unit Build Procurement**	**Wed 5/2/12**	**Mon 6/11/12**	**29 days**		
14	0%	Mobile Units	Wed 5/2/12	Mon 6/4/12	24 days	2	RSI
15	**0%**	**Testing**	**Tue 6/5/12**	**Mon 6/11/12**	**5 days**		
16	0%	Mobile Units	Tue 6/5/12	Mon 6/11/12	5 days	14	RSI
17	**0%**	**Shipping**	**Tue 6/12/12**	**Mon 6/18/12**	**5 days**		
18	0%	Mobile Units	Tue 6/12/12	Mon 6/18/12	5 days	16	RSI
19	0%	50% System Payment Milestone	Mon 6/18/12	Mon 6/18/12	0 days	18	Customer
20	**0%**	**System Completion**	**Tue 6/19/12**	**Mon 7/9/12**	**15 days**		
21	0%	Training (Installation)	Tue 6/19/12	Thu 6/21/12	3 days	17	RSI
22	0%	Configuration	Fri 6/22/12	Thu 6/28/12	5 days	21	
23	0%	Complete ATP	Fri 6/29/12	Mon 7/9/12	7 days	21,22	
24	0%	25% Payment Milestone	Mon 7/9/12	Mon 7/9/12	0 days	23	Customer
25	**0%**	**User Training**	**Tue 7/10/12**	**Mon 7/23/12**	**10 days**		
26	0%	Develop User Training Plan	Tue 7/10/12	Mon 7/16/12	5 days	23	RSI PM
27	0%	Complete User Training	Tue 7/17/12	Mon 7/23/12	5 days	26	RSI PM / Customer Users
28	0%	25% Payment Milestone	Mon 7/23/12	Mon 7/23/12	0 days	25	Customer
29							
30	0%	Mobile Unit Installation	Fri 6/22/12	Thu 8/23/12	45 days	21	Customer Installation Team

Test and Implementation Plan

The major purpose of the Implementation Plan is to define a process for deploying the technical elements of the CalAmp AssetOutlook Project, and then schedule the integration of these elements into each agency's operating system. This transition calls for the smooth integration and deployment of the AVL technology that is specified in the Scope of Work. In order to make the transition as smooth as possible and overcome any functional, technical, operational, and communication difficulties as they arise, CalAmp will utilize a phased approach.

At the same time, in order to ensure the final delivery of a system that conforms to the Project requirements, significant emphasis will be placed on the importance of achieving the operational and technological functionality defined in this Scope of Work and other 'Contract Documents'. The Implementation and Test Plan represents the vehicle through which CalAmp shall examine each operating function of the CalAmp AssetOutlook system to:

- Verify compliance with the system specifications, level of service standards and operating performance criteria

- Obtain client's acceptance.

CalAmp will be responsible for component specific testing. As integration of the technical components begins, client's Project Manager (& necessary staff) will oversee and coordinate the implementation of the integration testing in order to ensure compliance with the overall project and performance objectives set forth herein. The anticipated dates for conducting the required testing are defined in the Project Work Plan and will be finalized during the Design Review.

Two levels of system testing will be employed during the course of the CalAmp AssetOutlook Project, as follows:

Laboratory: individual module testing followed by integration testing to ensure the functionality of the components and the interoperability of the data interfaces between each component prior to deployment.

Acceptance Testing: the final test to ensure that each technical component of the system as well as the total system (technical components and operating services) conforms to system specifications, level of service standards and operating performance criteria.

As each service element comes on-line during the Test, it will remain on-line at the conclusion of the test and be operated in parallel by the customer with the other elements that are already operational. The same will hold true for the activated functionalities of the project technologies mentioned above. Due to

the linear approach of the project plan, if any of the elements fail during testing, further elements cannot be deployed until the problem has been resolved.

At the conclusion of each formal testing phase, CalAmp will provide client with written certification of the test results and performance compliance for each of the system components. In the event of testing problems, client, CalAmp and the appropriate agencies will meet and confer on the results of the testing performed. Subsequent decisions to proceed with the project must be approved by all parties. All the participants must attend scheduled meetings through means of conference calls or on-site visitations.

Also, final details of the Laboratory and Acceptance Tests will be confirmed with the Stakeholders before implementation of the testing in order to ensure client service level does not degrade below current service levels during the testing process.

Finally, in addition to the above formal testing procedures, there will be a comprehensive demonstration of the operating system to client. This demonstration (Acceptance Test) is necessary in order to satisfy the parties that Substantial Completion has been achieved.

Acceptance Testing

There are two fundamental aspects to the Acceptance Testing – functional and operational. The functionality of the CalAmp AssetOutlook System will have been completely tested by the Test phase of the project. To a lesser extent, the ability of the user to change the operational parameters in order to change the service provided will have also been demonstrated. As a consequence, the Acceptance Test is largely a confirmation of the functional requirements and a stress / full loading test of the operation as the service parameters are changed based upon real time public demand.

Because of the inherent inability to predict the need for service changes, it is only by observing the system over a period of time that we can be reasonably assured that all the possible combinations and scenarios have been considered. During the Acceptance Testing the performance of the System will also be evaluated, with regard to the ability of the system to respond in a timely and efficient manner to customer oversight and customer requests.

Training

CalAmp Training Methodology

CalAmp will provide live training sessions on the entire AVL system sufficient to ensure complete understanding and operations proficiency by the desired client staff and administrative personnel. The client will receive training to be provided to the entire staff exposed to the system, with an intensive "train-the-trainer" approach for selected personnel in order to maximize long-term worker productivity. The training sessions shall be held at locations specified by the client for administrative, driver, dispatch, executive, maintenance, and all other relevant parties. All materials and manuals will be provided in both printed and electronic format.

Training Program Overview

CalAmp and the other team members will work with the customer's team to define the required courses and a reasonable number of attendees/course duration during the implementation phase of the project.

Training Program

The CalAmp AssetOutlook Training Program is designed to indoctrinate all employees in the use of the CalAmp AssetOutlook System.

All training will be specific, where appropriate, to the CalAmp AssetOutlook system, and will include practical user instruction, hands-on sessions using CalAmp AssetOutlook specific equipment and data, and vendor observation of live operations following system startup. The training sessions will be presented over the course of the project, and will enable customer personnel to assume the responsibility of the system upon Substantial Completion.

In concert with the customer Project Manager, CalAmp will develop and conduct a one-time operational overview of the entire CalAmp AssetOutlook operating system, which will provide Management with a practical, working knowledge of the CalAmp AssetOutlook system and its operational, customer, and functional capabilities.

The development of the Training and Orientation Program and the scheduling of the actual training sessions will take into consideration customer staff availability due to shift assignments and logistics. CalAmp AssetOutlook will coordinate with the customer Project Manager to ensure that personnel are available when the Training Programs are to be conducted. Furthermore, it is assumed that all attendees will be familiar with the basic concepts of the Windows Operating System, knowledge that is essential in order to be able to take full advantage of the courses offered. A workable understanding of Windows will be a pre-requisite for all attendees.

Advanced Training

During the installation and testing process there will be a need for certain customer personnel (drivers, dispatchers and supervisors) to become familiar with some of the fundamental aspects of the system so they can participate in the testing process and in the evaluation of the software and system's performance. For this reason, a number of courses will be provided in advance of the Regular Training program. The content of the courses will focus on familiarizing select customer staff with the basic functionality and operational features of the system, together with 'hands-on' training in the use of the hardware to the extent necessary to support the initial Testing. CalAmp will provide Advance Training as necessary to support initial testing and integration.

The customer's Project Manager will designate the specific individuals who will participate in this training when CalAmp indicates it is time to begin the Advance Training Course.

CalAmp will supply the specified manuals and documentation in both hard and soft copy.

Instruction Manuals

User/Operating Procedure manuals, specific to the CalAmp AssetOutlook System, will be provided to each trainee. The User/Operating Procedure manuals will consist of the generic capabilities for each component as well as all the necessary amendments that describe customer's specific modifications and enhancements. Course Training Manuals, for each functional or technological area of training, will be provided to the customer Project Manager, along with master copies of all training and orientation documents in order to facilitate duplication of materials for future training purposes. Vendor equipment manuals relating to the specific software and hardware utilized in the project will also be delivered to the customer's Project Manager. (Note: Any duplication of materials is for internal use on the CalAmp AssetOutlook Project and may NOT be distributed to outside sources without the written approval of the vendor.)

All such printed training/orientation materials will be:

- Approved by the customer Project Manager prior to their use or distribution
- Customized and specific to the CalAmp AssetOutlook Project and the products used therein and the systems operating therein.
- Complete and current as of the date of Substantial Completion of the CalAmp AssetOutlook Project.
- Easily understandable, detailed and focused to the inherent knowledge levels of each of the below-described staff categories based on their individual 'need to know'.
- Updated, as necessary, consistent with any maintenance and support agreements to this Project.

Personnel To Be Trained

There will be several levels of staffing associated with the CalAmp AssetOutlook operation; therefore, the training and orientation program will focus on both the required ('need to know') and inherent technical expertise of each of the employee groups or individuals, as follows:

Drivers

Anticipated staff (final count TBD)

An in depth orientation in the AVL System function, usage, and dispatching requirements at the vehicle level.

A basic orientation in AVL System functionality and trouble shooting (when to ask for help).

A practical orientation in System capabilities as they relate to overall operations and customer services.

Dispatchers

Anticipated staff (final count TBD)

An in-depth orientation in the usage and a practical orientation in the features relating to operations and customer services of all AVL equipment at the vehicle and Dispatch Center levels.

A basic orientation in function trouble shooting (when to ask for help) at both the vehicle and dispatch center levels.

An in-depth orientation in data entry and retrieval, report design, generation and production.

Supervisors

An anticipated staff (final count TBD)

An in-depth orientation in the usage and a practical orientation in the features relating to operations and customer services of all AVL equipment at the vehicle and Dispatch Center levels.

A basic orientation in function trouble shooting (when to ask for help) at both the vehicle and Dispatch Center level.

The ability to train new drivers, dispatchers and supervisors in the use of and overall understanding of system functionality as it relates to all components and features of the CalAmp AssetOutlook technology.

Operator Management

An anticipated staff (final count TBD)

An in-depth orientation in the usage and a practical orientation in the features relating to operations and customer services of all AVL equipment at the vehicle and Dispatch Center levels.

A basic orientation in function trouble shooting (when to ask for help) at both the vehicle and Dispatch Center levels.

An orientation in systems management, the interoperability of the overall CalAmp AssetOutlook system capabilities, customer service features and potential report development and generation.

Maintenance monitoring requirements of the equipment and software and system repair and service procedures.

Client Management

An anticipated staff (final count TBD), including the Director, Information Systems Manager and administrative staff. (final count TBD)

An in-depth orientation in the usage and a practical orientation in the features relating to operations and customer services of all AVL equipment at the vehicle and Dispatch Center levels.

A basic orientation in function trouble shooting (when to ask for help) at both the vehicle and Dispatch Center levels.

An orientation in systems management, the interoperability of the overall CalAmp AssetOutlook system capabilities, customer service features and potential report development and generation.

Maintenance monitoring requirements of the equipment and software and system repair and service procedures.

Note: The Information Systems Manager will be trained to a significantly higher technical level. This individual will perform technical maintenance, hardware repair/replacement, troubleshoot problems, investigate communication system problems (LAN, WAN, etc.) and deal with all technical problems and upgrades in cooperation with CalAmp.

Service Response Plan

1. Customer Onboarding support (If installation by CalAmp is not previously arranged)

1.1. Customer is responsible for the physical installation of the devices in their fleet assets.

1.2. Telephone support will be provided by CalAmp during the installation process.

2. Customer Support Services

2.1. CalAmp will provide level 2 and 3 helpdesk support, accepting calls and/or email ticket requests from the CUSTOMER Level 1 helpdesk

2.2. Features:

24 x 7 x 365 availability via telephone and e-mail to case.

CalAmp support is US based.

Customer Care representatives are fully trained on the function, analysis, and troubleshooting of Telemetric devices.

CalAmp's customer support systems supports email acknowledgement.

3. Technical Support Process

CalAmp anticipates supporting technical issues through a front end gathering process provided by CUSTOMER. CalAmp expects CUSTOMER to identify and outline the problem, attempted resolution, provide any pertinent technical information, and submit the customer information prior to transferring the case to CalAmp. CalAmp will provide support personnel to find resolution through help guidance, problem solving, and debugging of issues. CalAmp will manage its customer service and escalate problems internally to drive the targeted Service Level Responses identified below. Should CalAmp participate in issue resolution around other aspects of the total CUSTOMER solution, CalAmp will use our internal process for escalation but will transfer the case responsibility and case closure to the appropriate solution provider outside CalAmp and the Service Level Response times may not be applicable.

How to contact CalAmp - Technical Support Specialists

Telephone # - (877) 684 - 2040

Email to Case – techspecialists@calamp.com

3.1. Process

3.1.1. With an outline of the nature of the problem and any pertinent technical information the front end gathering process provided by CUSTOMER should contact CalAmp's Technical Support to start the resolution process. This communication can be through a direct telephone call or emails which will auto generate a case in CalAmp's CRM Tool.

3.1.2. Email To Case - Upon receiving the email CalAmp's CRM will send an auto response with the Case #. The CalAmp tech specialist will start working the problem and provide a return response to the sender within 2 hours depending on the nature of the problem and work load. If the problem will take longer than two hours contact will be made with an estimated resolution time.

3.1.3. Telephone - Should the Support personnel want to contact CalAmp's Technical Support Specialists by telephone the number is a hunt line that routes to the first available specialist. If there is high call volume, the call will be routed to voicemail. The Support personnel then have the option of leaving a voicemail with the support person's name and direct phone number.

3.1.4. Regardless of the method to reach CalAmp's Technical Support the response time for an 80% case closure is less than 4 hours.

4. CalAmp Escalation Process

4.1. CalAmp's Case Management process is defined to resolve customer issues or concerns. It is the desire to resolve all customer issues at the lowest level possible in the escalation process, but should an issue or concern not get resolved the process will move the case higher in the organization for support and awareness. All cases entering CalAmp's CRM case management system will enter as a level 1 case for resolution. Cases will escalate accordingly to higher tier support personnel to obtain resolution. Should any case become stale CalAmp's case escalation process will automatically move the case to the next support level. If an issue or concern has been made reproducible in some operating environment it can be requested to move to a level 4 immediately. CalAmp's Technical Support shall formally notify Engineering of a new Level 4 issue by immediate e-mail distribution to Eng.

4.2. In addition to the four-level escalation process, CalAmp identities' cases into four priority classifications. They are: Cosmetic, Minor, Major, and Critical. Appropriate actions for cases identified as Cosmetic, Minor, Major, and Critical will be taken as listed below.

4.3. CalAmp has established response guidelines based upon the severity of the issue. Under these guidelines, problems are first assigned a "Priority Classification", and then resolution efforts are made commensurate with the severity of the problem. Priorities may be reviewed and adjusted as circumstances warrant. CalAmp defines Priority levels in accordance with the following criteria:

System Performance Support

Requirements		Service Levels		
Priority Level	Severity Definition	Milestone	L2 & L3 Combined Response Time	L4 Response Timeframe
Loss of SaaS Enviorment	A problem resulting in complete loss of service, business impacted or halted (Urgent Situation). Response immediate; Technical Support is to assist until resolution has been achieved.	Acknowledged	15 Min	15 Minutes
		Initial Assessment	NA	1 Hour
		Resolve/Transferred	NA	Emergency Response Hourly Reporting Immediate Patch
Critical	A production-inhibiting problem that causes partial loss of service, business impacted however can continue in a restricted fashion.	Acknowledged	15 Min	1 Hour
		Initial Assessment	NA	4 Hours
		Resolve/Transferred	NA	Continuous Response Daily Reporting Patch Fix
Major	A problem that causes some operational inconvenience and only minimal impact to business, productivity or revenue. Defined by multiple units or across the entire application but there is a work around.	Acknowledged	2 Hours	4 Hour
		Initial Assessment	1 Hour	24 Hours
		Resolve/Transferred	24 Hours	Assigned Response Weekly Reporting Unscheduled Patch or Next Release
Minor	A question about a specific usage or feature of the product, or a problem that affects an individual user but there is an alternative.	Acknowledged	2 Hours	24 Hour
		Initial Assessment	1 hour	48 Hours
		Resolve/Transferred	48 Hours	Assigned Response Weekly Reporting Scheduled Maintenance or Next Release
Cosmetic	A question about a specific usage or feature of the product, or a problem that has no affect on an individual user but there is some acknowledged issue about it.	Acknolwedged	2 Hours	Identified to be fixed in next release

5. CalAmp SLR's

CalAmp manages it call center to the following targeted SLRs:

CalAmp's Call Center SLRs			
Call Center	**Definition**	**Response time**	**Target**
Inbound response time	Inbound telephone inquires or "email to case" will be opened and acknowledged back to the customer	2 Hours or less	80% of all cases
Telephone answer time	Time on hold prior to being pickup up by a live agent	20 seconds or less	60% of all calls
	Time on hold prior to being pickup up by a live agent	2 minutes or less	85% of all calls
Case resolution	Time from Case origination to closure	3.5 hours	80% of all cases

6. RMA Support

RMA requests will come from the CUSTOMER Technical Project Manager to CalAmp via email.

CalAmp Quality Management is based on our ISO Management system (ISO-9001: 2008) and deploys resources to maintain the integrity of the processes. These systems influence Supplier Controls, Receiving Inspection, Product Audits, Failure Analysis, RMAs, Training, MRB, Material Segregation, Equipment Calibration, Internal System Audits, the CAR system, and the like. Should any customer have items that need to be returned they can simply contact our Technical Services department or send an Email which will automatically generate a request for Return Authorization Number (RMA).Upon contacting CalAmp we will immediately provide the customer with an RMA. At that time CalAmp will process the RMA and generate the corresponding actions required. CalAmp will initialize the return of Product to our customers upon acceptance of the RMA. Replacement units will be sent out to the customer, updated in our database and managed within CalAmp's back end systems. Upon receipt of the returned customer product CalAmp's depot repair center team will provide board and component level failure analysis via conventional electronics troubleshooting techniques and equipment. RMA's can be processed by contacting customer service.

Response to Specifications

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Proposed Contract Changes

CalAmp would like to request the opportunity to negotiate and/or propose changes to the following contract areas. CalAmp requests the opportunity to have our legal counsel negotiate minor changes with the State to come to mutually agreeable alternative language.

-Term- CalAmp desires a longer base contract term that would result in lower pricing.

-Indemnification- CalAmp desires to negotiate alternative language to possibly cap liability at a multiple of funds paid or other alternative metric.

Virginia Information Technologies Agency

RFP 2019-04 - Automatic Vehicle Location Solution

APPENDIX F - REQUIREMENTS

INSTRUCTIONS

Detailed requirements are presented in questionnaire format to facilitate direct responses and establish accountability regarding delivery of Solution by the Supplier.

VITA has posed some questions. In those instances, Supplier is to provide adequate information to allow VITA to properly evaluate its proposal.

Suppliers are to indicate their capability of fulfilling each specific requirement in the eleven (11) areas. Each Supplier's responses will be reviewed and compared to the requirements to determine the best solution for the Commonwealth.

To respond to each requirement, Supplier is asked to enter, in the space provided in Column E, a code that best corresponds to its intended response for the requirement listed.

The acceptable codes for Column E are as follows:

Y - **"Yes"** - Supplier can fully meet the requirement as documented with its current application or proposed solution. If applicable, Supplier should provide in Column F an explanation of how it will fulfill the requirement. This may include use of alliances with other suppliers. Supplier may also use Column F to cross-reference a detailed explanation included in an attachment of its proposal.

F - **"Yes, Future"** - Supplier will be able to fully meet this requirement in the near future (not longer than six months from the date of the proposal). Supplier should provide a proposed start date and cross-reference any attached documentation in Column F.

N - **"No"** - Supplier cannot meet the requirement and has no firm plans to be in the position to meet this need within six months from the date of the proposal.

Please use Column F to provide explanations, web links, details and references to any attachments.

Table of Contents

ID#	Functional Area	Multi-Source Integration Requirements	Supplier Response	Explanation (Instruction: For each requirement, please provide a detailed description, to include (but not limited to) approach, process, assumptions, diagrams, and/or links. Please indicate any corresponding appendices or attachments to reference.)
MS.1.1	1. Communications & Messaging	Does your solution include Unified Message Management and utilize a single interface or system across all technologies and components identified?	Y	Through JSON API
MS.1.2	1. Communications & Messaging	Does your solution include Broadcast Messaging (Fleet and select Groups/Vehicles)? Please describe broadcast messaging technology used.	Y	With optional driver interface such as a customized Garmin/Messaging Device (MDT, Tablet)
MS.1.3	1. Communications & Messaging	Does your solution include cellular data (3G or latest version) coverage over 90% of the	Y	We are proposing LTE cellular technology.
MS.1.4	1. Communications & Messaging	Does your solution include optional radio / satellite backup communications capabilities? (Innovation point)	Y	Our devices will store and forward data when communication is available. We can offer satellite backup communications as an option with Sat modem dongle (Iridium).
MS.1.5	1. Communications & Messaging	Does your solution include an upgrade plan at no additional cost?	Y	The software application AssetOutlook is contnually being upgraded as part of the contract. Hardware with LTE should be viable and supported for an estimated 8-10 years. If need be, we offer no cost hardware upgrade plans with new contract commitments.
MS.1.6	1. Communications & Messaging	Does your solution include Individual Vehicle Messaging? Please describe the individual vehicle messaging technology used.	Y	With optional driver interface such as a customized Garmin/Messaging Device (MDT, Tablet)
MS.1.7	1. Communications & Messaging	Does your solution include the ability to communicate Vehicle to Dispatch?	Y	With optional driver interface such as a customized Garmin/Messaging Device (MDT, Tablet)
MS.1.8	1. Communications & Messaging	Does your solution include the ability to communicate Route Status reporting (route plowed and clear, not clear, etc.)?	F	Our solution is based on Esri ArcGIS Server and it is currently on our roadmap to provide route completion functions in a future release.
MS.1.9	1. Communications & Messaging	Does your solution include the ability to communicate Roadway Damage collection (struck mailbox, etc.)?	Y	he
MS.1.10	1. Communications & Messaging	Does your solution include the ability to communicate Vehicle Status Reporting (Accident, Material Refill, on break, etc.)?	Y	With optional driver interface such as a customized Garmin/Messaging Device (MDT, Tablet). Specific vehicle events or statuses can be reported/alerted on automatically based on thresholds such as: long idle, speeding, harsh brake/acceleration, geofence activity, etc. We also have a state of the art crash detection and accident reconstruction option available.
MS.1.11	1. Communications & Messaging	Does your solution enable the access of information from any device capable of connecting to the internet?	Y	Our solution is based on HTML5/Javascript and can be accessed by any web browser: desktop, laptop, smartphone, tablet, Safari, IE, Firefox, Chrome, etc.
MS.1.12	1. Communications & Messaging	Does your solution provide a unified two-way communications capability to all devices that support two-way communications (irrespective of AVL Vendor, native format, etc.)?		We cannot claim that our solution would support two-way communication to all devices without knowing to which devices you are specifically referring.
MS.2.1	2. Modularity	Can your solution be accessed by multiple Agencies / Localities?	Y	With proper account access
MS.2.2	2. Modularity	Can your solution be accessed by multiple Business Units?	Y	With proper account access
MS.3.1	3. Multi-Source AVL Integration	Are there component integrations and inter-dependencies within the proposed solution? If so, please identify and describe each integration and inter-dependency.	Y	Our solution is comprised of various components such as our communication and data platform the CalAmp Telematics Cloud (CTC), our front end user interface (AssetOutlook), and our mobile devices (LMU).
MS.3.2	3. Multi-Source AVL Integration	Does your solution integrate with services available to SWAS and CSC (internal / external)?	Y	Our CTC enablement platform has a robust suite of APIs and a data pump that can be configured to provide a data service to virtually any third party application. CalAmp professional services may be required to write/configure the integrations with our standard API services.
MS.3.3	3. Multi-Source AVL Integration	Will your solution be able to integrate with VDOT's existing SWAS (or approved equivalent) no later than July 15, 2019? In your explanation, please include a high level implementation plan and any needs from VDOT required to execute this effectively.	Y	Our CTC enablement platform has a robust suite of APIs and a data pump that can be configured to provide a data service to virtually any third party application. CalAmp professional services may be required to write/configure the integrations with our standard API services.
MS.3.4	3. Multi-Source AVL Integration	Does your solution include the ability to effectively integrate with existing services available to VDOT 511, Smart Roads, and Smarter Roads?	Y	Our CTC enablement platform has a robust suite of APIs and a data pump that can be configured to provide a data service to virtually any third party application. CalAmp professional services may be required to write/configure the integrations with our standard API services.

MS.3.6	3. Multi-Source AVL Integration	Does your solution include a Single standard output API / Format (e.g., REST, Web Services)? Does your solution meet at least one of the standard formats (JSON or XML if Web Service / SOAP Service)? Please provide details and which formats in your explanation.	Y	JSON/XML
MS.3.7	3. Multi-Source AVL Integration	Does your solution enable real time vehicle metadata be uploaded from the agency?	Y	Asset information can be uploaded via platform APIs
MS.3.8	3. Multi-Source AVL Integration	Does your solution integrate with existing and new map services? Please describe your solution's ability to integrate with current agency map services and VDOTplows.org. If this is a new map service, please describe your execution of Real-time Vehicle Status, Snow Clearing Status Search (and map pinning), simultaneous feeds, and refresh time(s).	Y	AssetOutlook is based on Esri ArcGIS Server and so can both consume and publish Map Services.
MS.3.9	3. Multi-Source AVL Integration	Does your solution include the ability to add custom metadata fields in the output?	N	Some metadata can be added such as asset name, ,color, make, model, year etc. These are defined as fixed fields in the application. Notes and files may be added to the asset to provide additional information about the asset.
MS.3.10	3. Multi-Source AVL Integration	Does your solution integrate existing financial systems (e.g., HETTS Invoicing system, Cardinal)? What is your solution's ability to scale?	Y	Our CTC enablement platform has a robust suite of APIs and a data pump that can be configured to provide a data service to virtually any third party application. CalAmp professional services may be required to write/configure the integrations with our standard API services.
MS.3.11	3. Multi-Source AVL Integration	Does your solution integrate with current agency Call Center services application and solutions to account for citizen/resident calls, help issues and tickets during snow events and other emergencies?	Y	Our CTC enablement platform has a robust suite of APIs and a data pump that can be configured to provide a data service to virtually any third party application. CalAmp professional services may be required to write/configure the integrations with our standard API services.
MS.4.1	4. Real-time Notifications	Does your solution provide real-time status monitoring and alerts?	Y	AssetOutlook provides real-time tracking and alerting functions.
MS.4.2	4. Real-time Notifications	Does your solution include Multiple Alert Options (Email, SMS, etc.)? 1.Real time Alerts during events via SMS or Email. 2.What will be the Alert / Notification Frequency? 3. Are there Alert Subscription/Opt In options?	Y	AssetOutlook provides real-time tracking and alerting functions. Alerts can be done through SMS and email.
MS.5.1	5. Real-time Vehicle Status	Does your solution's system have the ability to map and track vehicle routes in real time?	Y	The CalAmp AssetOutlook Application displays the current location and status of the vehicle fleet, along with address, landmark and other attribute information, over your proprietary and publically available Esri GIS map data.
MS.5.2	5. Real-time Vehicle Status	Does it have geo fencing capability? Please include a description of system set-up, constraints, and number of possible connections in your explanation.	Y	The CalAmp AssetOutlook system allows the user to set geo-fences on the map display. This geo-fences will create an alert and/or exception report when breached and will appear as another item of status data with each vehicle position report. Geo-fences can be created as polygons or a configurable radius from a specific point, as well as created from existing boundaries, landmarks or zones within your GIS.
MS.5.3	5. Real-time Vehicle Status	Does your solution include tamper detection? What is the frequency of tamper detection input? Please describe what is included in the AVL feed.	Y	Our LMU device has a backup tamper alert battery enabling the device to notify the system when power is cut.
MS.5.4	5. Real-time Vehicle Status	Does your solution update vehicle data often? What is the GPS update frequency?	Y	Update rates can be configured to adjust dynamically based on status and event. The device can report as quickly as once per second, but we would recommend 30 seconds, plus stops, starts, turns, and events.
MS.6.1	6. Service Availability	Does your solution meet Standard Operations of 99.6% (3hrs / mo for maintenance windows)?	Y	We are compliant with this specification.
MS.6.2	6. Service Availability	Does your solution meet Designated Events (DEs) of 100%?	Y	CalAmp will require specific documented notification of such events with sufficient notice
MS.6.3	6. Service Availability	Do your solution DEs include (but are not limited to): Severe Weather Events, Declared Disasters, Major Public Events, and other similar events as designated at the Commonwealth's discretion?	Y	CalAmp will require specific documented notification of such events with sufficient notice.
MS.6.4	6. Service Availability	Does your solution include schedule Maintenance Windows during non-business hours only?	Y	CalAmp will notify customer for any scheduled maintenance that affect system uptime.
MS.7.1	7. Service Responsiveness	Do your solution Operational Portal / Services meet 95% of service responses within 15 minutes?	Y	See Service Response Plan included in proposal
MS.7.2	7. Service Responsiveness	Do your solution Public Portal / Services meet 90% of service responses within 90 minutes?	Y	See Service Response Plan included in proposal

ID#	Functional Area	Data & Reporting Requirements	Supplier Response	Explanation (Instruction: For each requirement, please provide a detailed description, to include (but not limited to) approach, process, assumptions, diagrams, and/or links. Please indicate any corresponding appendices or attachments to reference.)
DR.1.1	1. Collection & Analysis	Does your solution include the ability to analyze data generated from reports? Please provide a sample with your explanation.	Y	We have a dashboard function that shows trends and graphs of data collected. See Technical Proposal.
DR.1.2	1. Collection & Analysis	Does your solution include the ability to analyze map data based on real-time AVL updates? Please provide a sample with your explanation.	Y	
DR.1.3	1. Collection & Analysis	Does your solution include the ability to analyze vendor truck usage, plow time, idle time, etc.? Please provide a sample with your explanation.	Y	AssetOutlook has a variety of reports and dashboards that can show data trends and totals. We provide reports on plow and spreader time, mileage, as well as idle reports.
DR.1.4	1. Collection & Analysis	Is your solution capable of data collection for at least 12,000 simultaneous reporting Devices?	Y	We have individual customers with 100,000 reporting devices.
DR.1.5	1. Collection & Analysis	Does your solution's data feed collect with a frequency not less than 15 seconds between records? Please include a SLA in Appendix A with your explanation.	Y	Update rates can be configured to adjust dynamically based on status and event. The device can report as quickly as once per second, but we would recommend 30 seconds, plus stops, starts, turns, and events.
DR.1.6	1. Collection & Analysis	Does your solution clearly identify the data elements provided and not provided by the Feed Vendor during Data Feed implementation?	Y	A sample data set can be provided.
DR.1.7	1. Collection & Analysis	Does your solution provide the ability to Group Vehicles (e.g., by Agency / Department / Division, Region / Subregion, custom Fleet Identifiers, Owner, Type, etc.)?	Y	AssetOutlook uses extensive grouping and subgrouping, providing various levels of user access in addition to configurable user roles and permissions.
DR.1.8	1. Collection & Analysis	Does your solution provide a coverage area adequate for the needs of the Commonwealth? Please describe in your explanation.	Y	Cellular coverage is ubiquitous all over the country. Map-wise, we provide several worldwide maps (streets, satellite, topographical, etc.) as a base and can incorporate your own proprietary GIS map data and layers as well.
DR.1.9	1. Collection & Analysis	Does your solution have the ability to integrate various predictive real-time data sources related to plowing events? Can the public track an event by location and/or street name?	Y	Our solution can display planned routes as well as plow activity and real-time location. Map services of any data can be displayed if provided from a third party. Public interfaces can be provided as an option, as well as supported for third parties with a data feed.
DR.2.1	2. Data Integration	Does your solution allow end users to integrate to their own AVL device into your solution environment? Please describe including any limitations.	Y	**If the end user owns an existing CalAmp device we can redirect it to report to our CTC/AssetOutlook system. CalAmp supplies 65% of the AVL market with devices so chances are they are using a compatible device that can be directed to our system.**
DR.2.2	2. Data Integration	Does your solution allow the end user to transfer devices to new vehicles as part of the fleet management and vehicle replacement lifecycles?	Y	Devices are easily swapped and reassigned.
DR.2.3	2. Data Integration	Does your solution provided an integrated communications capability? Please describe in your explanation.	Y	With optional driver interface such as a customized Garmin/Messaging Device (MDT, Tablet)
DR.2.4	2. Data Integration	Does your solution provide unified data feed(s) for all reporting Devices, irrespective of AVL Vendor, native format, etc. as specified by the Commonwealth. (ex: all Snow Removal vehicles)?	N	We currently do not allow end users to do this. **If the end user owns an existing CalAmp device we can redirect it to report to our CTC/AssetOutlook system. CalAmp supplies 65% of the AVL market with devices so chances are they are using a compatible device that can be directed to our system.**
DR.3.1	3. Data Management	Does your solution provide separate Data Feeds, Data Stores, Thresholds, Alerts, and Reporting per Consumer and Consumer Group, as specified by the Commonwealth?	Y	Our CTC enablement platform has a robust suite of APIs and a data pump that can be configured to provide a data service to virtually any third party application. CalAmp professional services may be required to write/configure the integrations with our standard API services.
DR.3.2	3. Data Management	Does your solution provide a logical (entity level) data model or a detailed ER diagram? If so, please attach the data model or diagram to the response.	Y	This can be provided under NDA
DR.3.3	3. Data Management	Are there any data center certifications (e.g. SAS70, ISAE 3402, SSAE16) for the solution? If yes, when was the last audit/assessment performed?	Y	Amazon Web Services AWS- is used as our data center.
DR.3.4	3. Data Management	Does your proposed solution have a completed digital data dictionary on business terms immediately available for review and consumption into an internal VDOT business data glossary? If so, what is the method of consumption? Additionally, how is the glossary maintained and redistributed to consumers upon update?	Y	This is provided via the online API documentation
DR.3.5	3. Data Management	Does your proposed solution provide data quality constraints that limit data entry errors? If so, are these business rules documented and immediately available for review?	N	Not at this time.
DR.3.6	3. Data Management	Does your solution provide data quality reports as part of proposed solution functionality? If so, is documentation available describing the data quality tests and expected outcomes for immediate review?	N	Not at this time.
DR.3.7	3. Data Management	Does your solution provide methods to support external data sharing of 'saved' data and data sets. If so, are the shared data set attributes defined and tied back to the associated digital data dictionary?	Y	Defined in the online platform API documentation
DR.3.8	3. Data Management	Does your solution provide methods which limit data manipulation once data is shared external to the proposed solution, such as controlling Memorandums of Understanding (MOUs) or other policies guiding data sharing functionality.	N	
DR.3.9	3. Data Management	Does your proposed solution use a data structure that enforces referential integrity?	Y	
DR.3.10	3. Data Management	Does your solution include a process to modify and update the underlying data structures to include the model, list of value options, and other global configuration items?	Y	Would be customer request driven through Professional Services.
DR.3.11	3. Data Management	Does your solution provide a mechanism for addressing simultaneous data modifications (concurrency)?	Y	Audit logging
DR.3.12	3. Data Management	Does your solution distribute the data storage in such a manner as to ensure efficient data processing? If so, please describe the proposed solution's data storage methods.	Y	Load balancing, multiiple message queing multi geograhically located data centers and fail over are provided in the architecture.
DR.3.13	3. Data Management	Does your solution offer back-up, recovery and archive processing? If so, what are the expected min-max timeframes, frequency, method and storage requirements for back-up processing, recovery processing, and archive processing.	Y	Multiple archiving from the device to system. Glacial archiving.
DR.3.14	3. Data Management	Does your proposed solution offer a feature to append attachments? If so, please explain the storage method and capacity plan for managing attachments over the long-term? Additionally, please identify the forms of attachments supported by your solution.	Y	Text files, Word file, image files are supported. Flexable data retention data policy, customer defined. Standard is 6 months.
DR.3.15	3. Data Management	Does your solution support a tool to migrate data from an existing system into a new system? If so, what constraints exist, such as the number of rows that can be migrated at once, are data versions and historical data capture accommodated, etc.?	Y	This would require a Professional Services engagement

DR.3.16	3. Data Management	Does your solution offer canned reports? If so, please list each one and provide documentation on the optimal run frequency, data currency, volume, granularity and insight gathered out of the information produced within each report.	Y	CTC and AO - Reports are configurable allowing for scheduling delivery and adhoc- reports can be ran Enterprise, group or device level. also can be ran in summary, and detail format. Dashboards are also available.
DR.3.17	3. Data Management	Does your proposed solution support the capture of historical data in support of trend analysis? If so, in what format?	Y	Via platform APIs and/or reporting.
DR.3.18	3. Data Management	Does your proposed solution consume external data sources? If so, describe the method by which the data sources are consumed and detail the method to maintain the ongoing viability of the data exchange.	Y	Reverse geocoding and other micro services are provided and use API's from extrenal systems. SLAs are in place for each micro service that utilized an external API.
DR.3.19	3. Data Management	Does your solution have a policy and provide a process supporting data portability into an internal VDOT owned data container, such as a warehouse or other database?	Y	This would require a Professional Services engagement
DR.3.20	3. Data Management	Does your solution provide a process to modify and update the underlying data structures, to include the model, list of value options, and other global configuration items. If so, please describe.	Y	
DR.3.21	3. Data Management	Can your solution consume VDOT-controlled services/components/APIs out of the box, if required?	F	Not out of the box, but this could be implemented as a professional services engagement
DR.3.22	3. Data Management	Does your solution provide integration options? If so, please describe each option and identify the preferred option.	Y	Our CTC enablement platform has a robust suite of APIs and a data pump that can be configured to provide a data service to virtually any third party application. CalAmp professional services may be required to write/configure the integrations with our standard API services. Professional Services Engagement or Documentation is provided for customer to implement.
DR.3.23	3. Data Management	Does your solution provide open, standard APIs for the items listed in Attachment 10? If yes, please provide detailed explanation for each.		CTC can provide data elements to the extent as outlined in Att 10.
DR.3.24	3. Data Management	Does your solution expose its services and components through an API for the items listed in Attachment 10? If yes, please identify the available integration options and the preferred methodology.		CTC can provide data elements to the extent as outlined in Att 10.
DR.3.25	3. Data Management	Does your solution include a well-defined and documented process to help integrate VDOT's pre-existing data into proposed solution? Please provide details.	Y	This would require a Professional Services engagement
DR.3.26	3. Data Management	Does your proposed solution include out-of-the-box tools or capabilities for data import/export/migration? Please provide descriptions for each.	Y	Data Export Yes - Importing file would be reviewed by Professional services for feasibility
DR.3.27	3. Data Management	Does your solution utilize industry standards for importing/exporting/migration (e.g. EDI, FGDC-STD-014.7-2008, SDO) ? If yes, please identify the standards provide details on the data formats used.	N	Detailed documentation can be provided for the data formats and protocols used in CTC.
DR.3.28	3. Data Management	Does your solution include sensitive data storage (e.g., PII and CII) capabilities? In your explanation, please describe your encryption at-rest for data storage.	N	Data is stored with AWS, and at rest is not encyrpted.
DR.4.1	4. Reporting	Does your solution provide standardized Reports w/ Filters and Parameters? Please provide details specifically for: 1. Standard Reports, 2. AdHoc Reports, and 3. Crystal Reports vs Business Objects.	Y	CalAmp AssetOutlook provides a highly customizable and flexible report module for generating reports to help you monitor asset operations and performance. The AssetOutlook system comes with a suite of standard graphical and tabular reports. The Report Generation component is an extension to the real-time component of CalAmp AssetOutlook described above, and can generate both tabular and graphical map-based reports based on archived vehicle location and status data. Reports may be produced for selected vehicles (or groups of vehicles) according to time, location, and status criteria.
DR.4.2	4. Reporting	Does your solution provide standard Output Formats (PDF, Excel, etc.)? Please describe, including export capabilities.	Y	Reports may be exported into virtually any format including PDF, CSV and MS Excel files.
DR.4.3	4. Reporting	Does your solution provide scheduling capability? For daily, monthly, weekly, quarterly or yearly reports? Please describe standard and customized options.	Y	Reports can be scheduled.
DR.4.4	4. Reporting	Does your solution include user-selectable criteria? Can it support specific agency criteria for such selection (e.g., By District or Area Headquarter)?	Y	CalAmp AssetOutlook provides a highly customizable and flexible report module for generating reports to help you monitor asset operations and performance. The AssetOutlook system comes with a suite of standard graphical and tabular reports
DR.4.5	4. Reporting	Does your solution have the ability to leverage and integrate VDOT's existing reporting COTS environments? Does your solution propose alternative reporting solution?	Y	AssetOutlook can provide export files that may be further analyzed with third party reporting tools such as Crystal Reports.
DR.4.6	4. Reporting	Are your solution's reports compatible with Microsoft Office Products?	Y	Yes
DR.4.7	4. Reporting	Does your solution provide user friendly and system program reports (daily, weekly, monthly and annually cumulative statics)? Please provide samples with your explanation.	Y	Reports may be produced for selected vehicles (or groups of vehicles) according to time, location, and status criteria.
DR.4.8	4. Reporting	Does your solution's reports have built in calculation ability?	Y	Some reports will provide occurences as well as totals, percentages, etc.
DR.5.1	5. Retention & Storage	Does your solution have AVL Replay capability for at least 24 months?	N	Data is typically available for instant reports and replays for approximately 6 months. All data is archived and can be provided upon request or on a periodic automatic basis.
DR.5.2	5. Retention & Storage	Does your solution meet the specific data retention standards for each data set in accordance with VDOT, Commonwealth, and/or individual Agency compliance standards, whichever is longer?	Y	Data can be archived for the duration of the contract.
DR.5.3	5. Retention & Storage	Does your solution ensure that all data and intellectual property collected, stored, and produced by this solution shall be the sole property of the Commonwealth?	Y	All data collected is the property of the client.
DR.5.4	5. Retention & Storage	Does your solution provide a Data Warehouse or Cloud storage? If yes to either or both, what is stored in the data warehouse and what is stored in the cloud?	Y	Amazon Web Services AWS- is used as our data center.
DR.5.5	5. Retention & Storage	Does your solution include the ability to archive and purge in accordance with VDOT, Commonwealth, and/or individual Agency compliance standards? Please describe your solution (e.g., SharePoint, etc.)?	Y	Data can be archived for the duration of the contract.
DR.5.6	5. Retention & Storage	Does your solution provide historical data storage capabilities that can be accessed by the agency? Please describe in your explanation capabilities for adhoc, standard, and dashboard reporting.	Y	Our CTC enablement platform has a robust suite of APIs and a data pump that can be configured to provide a data service to virtually any third party application. CalAmp professional services may be required to write/configure the integrations with our standard API services.

ID#	Functional Area	AVL Services & Interfaces Requirements	Supplier Response	Explanation (Instruction: For each requirement, please provide a detailed description, to include (but not limited to) approach, process, assumptions, diagrams, and/or links. Please indicate any corresponding appendices or attachments to reference.)
AS.1.1	1. Cameras	Does your solution include forward facing cameras?	F	CalAmp hardware can support cameras, and is currently developing its solution to offer off the shelf camera capabilities as an option. This camera functionality can be made available as a priority if selected for this project.
AS.1.2	1. Cameras	Does your solution rear-facing cameras with night vision capability?	F	CalAmp hardware can support cameras, and is currently developing its solution to offer off the shelf camera capabilities as an option. This camera functionality can be made available as a priority if selected for this project.
AS.1.3	1. Cameras	Does your solution include video or periodic / event images?	F	CalAmp hardware can support cameras, and is currently developing its solution to offer off the shelf camera capabilities as an option. This camera functionality can be made available as a priority if selected for this project.
AS.1.4	1. Cameras	Does your solution include on-demand feeds?	F	CalAmp hardware can support cameras, and is currently developing its solution to offer off the shelf camera capabilities as an option. This camera functionality can be made available as a priority if selected for this project
AS.1.5	1. Cameras	Does your solution include metadata capabilities?	F	CalAmp hardware can support cameras, and is currently developing its solution to offer off the shelf camera capabilities as an option. This camera functionality can be made available as a priority if selected for this project
AS.1.6	1. Cameras	Does your solution include GPS capabilities?	F	CalAmp hardware can support cameras, and is currently developing its solution to offer off the shelf camera capabilities as an option. This camera functionality can be made available as a priority if selected for this project
AS.1.7	1. Cameras	Does your solution include timestamp capabilities?	F	CalAmp hardware can support cameras, and is currently developing its solution to offer off the shelf camera capabilities as an option. This camera functionality can be made available as a priority if selected for this project
AS.1.8	1. Cameras	Can your solution be stored at an off-site data warehouse with internet access? If so, what mechanism would the solution provide for retrieving the images?	F	CalAmp hardware can support cameras, and is currently developing its solution to offer off the shelf camera capabilities as an option. This camera functionality can be made available as a priority if selected for this project
AS.1.9	1. Cameras	Is your solution compliant with PII / CII and FOIA standards and regulations? If so, please specify specifically.	F	CalAmp hardware can support cameras, and is currently developing its solution to offer off the shelf camera capabilities as an option. This camera functionality can be made available as a priority if selected for this project
AS.1.10	1. Cameras	Does your solution include storage services? Please describe data storage limitations and data back up practices in your explanation.	F	CalAmp hardware can support cameras, and is currently developing its solution to offer off the shelf camera capabilities as an option. This camera functionality can be made available as a priority if selected for this project
AS.1.11	1. Cameras	Does your solution meet VDOT and COV retention policies?	F	CalAmp hardware can support cameras, and is currently developing its solution to offer off the shelf camera capabilities as an option. This camera functionality can be made available as a priority if selected for this project
AS.2.1	2. Device / Hardware	Does your solution provide a complete AVL solution including the following? Please describe all options for: - Hardware - Software - Connectivity - Support and Maintenance - Operator Interface - Installation and Configuration - Service and Support - Equipment Connectivity (e.g., plows, spreaders, etc.) - Storage	Y	CalAmp is proposing a turn-key, full function AVL system that can be integrated to existing VDOT systems. Using our line of cellular based GPS devices, the CalAmp AssetOutlook system will provide real-time vehicle location and other status data on our Web based AVL map software interface from our remotely hosted servers. The CalAmp AssetOutlook uses the robust CalAmp Telematics Cloud (CTC) platform can direct and communicate two way data with virtually any variety of third party database or application via a rich offering of APIs and a data pump.
AS.2.2	2. Device / Hardware	Does your solution include a complete list of all hardware with specifications, model number, etc.?	Y	Please see Technical Proposal attached for the proposed devices and specifications.
AS.3.1	3. Device Availability	Does your solution Device Availability target meet 96%?	Y	Please see Technical Proposal attached for the proposed devices and specifications.
AS.3.2	3. Device Availability	Does your solution accomdate communications coverage gaps where data collected on the Device and uploaded once communication is restored?	Y	Our devices will store and forward data when communication is available. The proposed device can store up to 20,000 positions for store and forward capabilities.
AS.4.1	4. Device Catalogue	Does your solution provide a Device Catalog, including those that are not supporting VDOT's current fleet assets? If No, do your solution envision working with requesting Consumer(s) to develop an enhanced Catalog of Devices to include asset types not currently supported (Post-VDOT Implementation(s))?	Y	Please see Technical Proposal attached for the proposed devices and specifications.
AS.4.2	4. Device Catalogue	Does your solution enable both new and currently supported devices / models (unless an exception is specifically approved by the Commonwealth)?	Y	The CalAmp system can support a wide variety of CalAmp devices and models.
AS.4.3	4. Device Catalogue	Does your solution enable consumers to purchase devices?	Y	Devices can be purchased or leased through CalAmp.
AS.5.1	5. Device Installation	Does your solution's device Installation units include delivery all required harnesses, mounts, antennas, modules, hardware, and activations in accordance with the manufacturer's requirements?	Y	We can provide all necessary mounts and cabling for basic installation. Optional functions/integrations may require additional cabling and accessories, also available from CalAmp.
AS.5.2	5. Device Installation	Will the Supplier ensure that all units installed are operational?	Y	If desired, CalAmp will be responsible for the proper and complete installation of the devices.
AS.5.3	5. Device Installation	Does your solution provide device installation instructions in both English and Spanish for all devices and equipment?	Y	This can be provided.
AS.5.4	5. Device Installation	Does your solution support device installation by the Supplier at a Commonwealth or Contractor facility?	Y	This is the preferred installation process.
AS.5.5	5. Device Installation	Does your solution support device "plug and play" installation by the Commonwealth or their designee and include shipment and installation instructions (both in person and by video)?	Y	When possible, the basic devices can be plugged in and secured for installation. Some options and functions require a hardwire installation such as sensors and user interfaces.
AS.5.6	5. Device Installation	Does your solution support device "plug and play" installation by a Third-Party (vehicle owner) and include shipment and installation instructions (both in person and by video)?	Y	When possible, the basic devices can be plugged in and secured for installation. Some options and functions require a hardwire installation such as sensors and user interfaces.
AS.5.7	5. Device Installation	Does your solution support device installation by Vehicle OEM at factory or point-of-sale?	Y	This is possible.
AS.5.8	5. Device Installation	a. Does your solution provide telephonic technical support during installation, configuration, and relocation to a new vehicle? b. Will telephonic technical support be available in both English and Spanish?	Y	We offer full support for both installation and user assistance. Spanish can be made available and can be scheduled for specific sessions and needs.
AS.5.9	5. Device Installation	Will your solution provide telephonic technical support after normal work hours and on the weekends? Please describe your support methods and approach, including times.	Y	We offer full support for both installation and user assistance. We recommend scheduling installation support.
AS.5.10	5. Device Installation	Does your solution's installation Support includes relocation from one vehicle to another?	Y	We offer full support for both installation and user assistance. We recommend scheduling installation support.

AS.5.11	5. Device Installation	Will your complete AVL solution be implemented and fully operational by July 1, 2019? In your explanation, please include a high level implementation plan and any needs from VDOT required to execute this effectively.	Y	Please see Implementation section of proposal. There are a significant number of variables and unknowns that affect the roll out such as contract execution date, PO data, and the availabilty of vehicles for installation.
AS.6.1	6. Device Support	Does your solution's Warranty Coverage expire not less than three (3) years from date of installation and include all costs associated with Device replacement?	F	Standard warranty is one year and does not include installation costs. Extended annual warranties are available. CalAmp is willing to negiotitate warranty terms and conditions further into the sales process.
AS.6.2	6. Device Support	Does your solution include Remote, Over the Air (OTA) software updates with No Agency/Operator interaction required?	Y	Our LMU device leverages CalAmp's management and maintenance system, PULS™ (Programming, Updates, and Logistics System), for over-the-air configuration parameters, PEG rules and firmware. This out-of-the-box hands free configuration and automatic post-installation upgrades can monitor unit health status across the customers' fleets to identify issues before they become expensive problems.
AS.6.3	6. Device Support	As the Supplier, will you manage and apply all software, firmware, and other updates to the Devices remotely?	Y	Yes
AS.6.4	6. Device Support	a. Does your solution include telephonic technical support to troubleshoot operation and configuration of the Device? b. Will telephonic technical support be available in both English and Spanish?	Y	We offer full support for both installation and user assistance. Spanish can be made available and can be scheduled for specific sessions and needs.
AS.6.5	6. Device Support	Does your solution provide 24/7 telephonic technical support? Please describe your support methods, approach, and times in your explanation.	Y	We offer full support for both installation and user assistance. We recommend scheduling configuration support.
AS.6.6	6. Device Support	Does your solution support repair or replacement within 1 business day? Please list all options for repair / replacement.	Y	CalAmp typically recommends that customers keep a pool of spare devices at their shop that allows for quick, simple, and as-needed self-performed swaps of GPS units that require repair or replacing. CalAmp will provide training for your fleet staff on the simple swapping of the devices, who can then send the removed devices back to CalAmp for repair or replacement without extensive vehicle downtime or expensive rush shipping. This provides for the most efficient process and doesn't require subcontractor or CalAmp access to your vehicles or facilities.
AS.7.1	7. In-Vehicle Hardware (Device)	Does your solution provide hardware that is ISO (e.g. hardened, waterproof, etc.) compliant? If so, please specify specifically.	Y	Devices are typically installed up inside the dashboard away from the risks of weather and the environment. We can optionally provide weatherproof devices, designed for tracking assets and trailer but can be used on vehicles.
AS.7.2	7. In-Vehicle Hardware (Device)	Does your solution hardware tamper-proof?	Y	Our CalAmp LMU devices come equipped with a small back-up battery that can alert the system immediately if power has been cut to the unit. The priority over the air message can be configured to notify specific users (via text, e-mail, or software) that power has been cut to the unit and its current position.
AS.7.3	7. In-Vehicle Hardware (Device)	Does your solution device(s) support on-device data retention for not less than 48 hours for all feeds?	Y	The proposed device can store up to 20,000 positions for store and forward capabilities.
AS.7.4	7. In-Vehicle Hardware (Device)	Does your solution include the automatic upload of "gap" data after communication loss once communication is restored, with no operator action required?	Y	Our devices will store and forward data when communication is available. The proposed device can store up to 20,000 positions for store and forward capabilities.
AS.7.5	7. In-Vehicle Hardware (Device)	Does your solution collect all data elements specified in **Attachment 1. Vehicle Data Elements**?	Y	Our system can support these data elements, however it must be noted that we can support them only if they are provided by the standard vehicle data bus or necessary equipment, such as the appropriate spreader controller interface. Some Vehicle bus data is not available on certain makes/models and some spreader controllers have limited data availability.
AS.8.1	8. Operator Interface	Does your solution device(s) use third party UI hardware that is commonly available in iOS or Android versions (for tablets and phones)?	Y	Primarily we support the Garmin FMI interface. Android options are available.
AS.8.2	8. Operator Interface	If your solution's device has its own dedicated physical UI, is it usable with gloves (wet and dry)?	Y	Variable.
AS.8.3	8. Operator Interface	If your solution's device has its own dedicated physical UI, is it usable in direct, bright sunlight?	Y	Yes.
AS.9.1	9. Portal	Does your solution provide separate Presentation Environments (e.g. Portals, Apps) and data sets per customer and customer-identified Fleet, as specified by the Commonwealth?	Y	Optional Public Portal will support this.
AS.9.2	9. Portal	Will your solution able to remain available and functional through potential unanticipated excessive loads or malicious activity on the Public Portal so not to adversely affect operations?	Y	Optional Public Portal will support this.
AS.9.3	9. Portal	Can your solution provide Operational Portal / Services for at least 3,000 simultaneous users (desktop and mobile)?	Y	Optional Public Portal will support this.
AS.9.4	9. Portal	Can your solution provide Public Portal / Services for at least 50,000 simultaneous users?	Y	Optional Public Portal will support this.
AS.9.5	9. Portal	Does your solution have the ability to archive and post updates to VDOT's internet website to provide citizens work progress?	F	This could be supported with customization.
AS.10.1	10. Route Planning	Does your solution offer real-time planning and response via AVL Data? Please describe in your explanation the ability to provide a centralized operations management solution for real time resource scheduling, vendor scheduling and disaster planning during snow and other events.	N	High density and snow plow route planning are very complex operations that we do not provide, as we understand that it is very specialized and not our core competency. We highly recommend that you use high density routing specific companies for the development of route creation and optimization such as RouteSmart or C2Logix. Any "AVL" company that tells you they also do high density routing should not be trusted!
AS.10.2	10. Route Planning	Does your solution include maps and reports to be used by supervisors to ensure route completion and to reschedule missed streets on route, as well as improve work efficiency? Please provide a sample with your explanation.	N	High density and snow plow route planning are very complex operations that we do not provide, as we understand that it is very specialized and not our core competency. We highly recommend that you use high density routing specific companies for the development of route creation and optimization such as RouteSmart or C2Logix. Any "AVL" company that tells you they also do high density routing should not be trusted!
AS.10.3	10. Route Planning	Does your solution provide route planning for internal VDOT management during snow and other emergency events by using maps services, vendor data and real time AVL data? Please provide a sample with your explanation.	N	High density and snow plow route planning are very complex operations that we do not provide, as we understand that it is very specialized and not our core competency. We highly recommend that you use high density routing specific companies for the development of route creation and optimization such as RouteSmart or C2Logix. Any "AVL" company that tells you they also do high density routing should not be trusted!
AS.11.1	11. Vendor Registration	Does your solution offer vendor registration for AVL Devices, in both English and Spanish? Please describe any centralized portal options forvendors to register AVL devices and	Y	Devices can be added to the system with proper administrative access and user roles.
AS.11.2	11. Vendor Registration	Does your solution enable vendor ordering for new AVL Devices? Please describe any centralized portal options for vendors to order AVL devices.	Y	Devices can be added to the system with proper administrative access and user roles.

ID#	Functional Area	Detailed Technical & Other Requirements	Supplier Response	Explanation (Instruction: For each requirement, please provide a detailed description, to include (but not limited to) approach, process, assumptions, diagrams, and/or links. Please indicate any corresponding appendices or attachments to reference.)
TO.1.1	1. Architecture	Does your solution include a description of the physical, application-level, database, and encryption practices? If yes, please explain and provide any Solution Architecture Diagrams.	N	Specific details can be shared with customers under NDA
TO.1.2	1. Architecture	Does your solution include multiple application layers, n-tier architecture, etc.? If so, please identify the layers in your explanation.	Y	Platform, micro-services & application are layered on each other. Within the application are features & screens that access is restricted through a multi-tennant priveledge schema
TO.1.3	1. Architecture	Is your solution composed of multiple components? If so, please identify each component and identify the functionality provided by each component.	Y	Platform, micro-services & application are layered on each other. Within the application are features & screens that access is restricted through a multi-tennant priveledge schema
TO.1.4	1. Architecture	Is your solution composed of multiple technologies? If so, please identify each of these technologies and the functionality provided by each to include, but not limited to, server technologies, open source software components, client technologies and configuration details, as well as all developer pc configuration details supported/required for configuring/customizing/deploying/supporting your proposed solution.	Y	See Technical Proposal
TO.1.5	1. Architecture	Does your solution require that all bundled technologies be indemnified by the solution provider (to protect VDOT or any Virginia State Agency from potential lawsuits related to improper usage)? If not, please provide a full list of technologies not indemnified by the solution provider.	Y	The product is sold as a complete package with all undlying technologies, unless specifically, covered by the MSA
TO.1.6	1. Architecture	Does your proposed solution leverage a Service Oriented Architecture (SOA)? If so, please identify those components/services that may be reused by VDOT or any other agency of Virginia.	Y	SOAP & Restful API are available for all data, produced results and entity services.
TO.2.1	2. Catalog Approach	Does your solution offer a “Menu” of Services? If yes, please identify the services offered.	Y	AssetOutlook, Crashboxx, CalAmp Telematics Cloud are all components of the solution, some are available a la carte
TO.2.2	2. Catalog Approach	Does your solution offer minimal Statement of Work (SOW) and Contract Modifications? Please describe in your explanation the criteria used to identify a chargeable contract modification for your solution.	Y	Any SOW is specifically noted in the proposal
TO.3.1	3. Cloud-Based (SaaS)	Does your proposal support a "Fully Hosted" solution?	Y	All services are hosted in by vendor controlled AWS instances
TO.3.2	3. Cloud-Based (SaaS)	Is your solution considered highly scalable? Please describe in your explanation each component, including limits and/or constraints of scalability for your solution. Please identifythe least scalable component of the architecture and provide pertinent benchmark statistics about proposed solution’s performance and throughput, including the degree of cloud elasticity supported by each cloud component.	Y	Application, platform and micro-services are all hosted in AWS and feauture redundancy and scalability
TO.3.3	3. Cloud-Based (SaaS)	Does your solution require that all components / sub-components be hosted on infrastructure controlled by solution provider? If No, please identify any components / sub-components that are not hosted or controlled on the infrastructure. Please attach any related diagrams or description of the physical architecture and provide examples of any clients / customers utilizing your fully hosted deployment solution.	Y	All services are hosted in by vendor controlled AWS instances
TO.3.4	3. Cloud-Based (SaaS)	Does your solution include SaaS architecture with multi-tenant deployment? If Yes, how is client data segregated (e.g., logically, physically)? Please describe the mechanism for separating the deployment for each client, how is data access controlled, and availabilty of testing environments (including how many and refreshing process).	Y	SaaS architecture is full multi-tennant. Data access priveldges are assignable via role or right
TO.4.1	4. Configuration / Customization	Does solution include documentation of default or out-of-box configurations?	Y	See Technical Overview
TO.4.2	4. Configuration / Customization	Does your solution provide configurable components? If yes, which components can be configured by VDOT or any Virginia State Agency without impacting warranty & support?	Y	AssetOutlook uses extensive grouping and subgrouping, providing various levels of user access in addition to configurable user roles and permissions.
TO.4.3	4. Configuration / Customization	Does your solution have any capability to modify look and feel based on VDOT standards (e.g. color schemes, fonts, logos, banners, footers, etc.)?	Y	We can optionally modify minor look and feel changes.
TO.4.4	4. Configuration / Customization	Does your solution require customizations? If so, please attach a copy of any documentation that describes these steps in your explanation.	N	Customizations are not required. Configurations and optional customizations may be requested by customer.
TO.4.5	4. Configuration / Customization	Does your solution include documented best practices or customer support for customization so as not to impact upgrade path? If so, please attach a copy of any documentation to this response.	Y	CalAmp offers Technical Account Managers who can facilitate any requests for customization that would be completed by our Professional Services group.
TO.5.1	5. Mobile Technology	Does your solution provide Backup Channels (Radio, Satellite)? Please describe in your explanation. For areas that have weak or impeded cell phone data service, can your solution provide alternate radio or satellite back up?	Y	Our devices will store and forward data when communication is available. We can offer satellite backup communications as an option with Sat modem dongle (Iridium).
TO.5.2	5. Mobile Technology	Does your solution include mobile device functionality based on native or HTML5 technologies? If yes, is mobile functionality delivered as a proprietary app? Please include in your explanation how the mobile / tablet solution delivered to the end-user and UI adaptiveness / responsiveness. Please identify all mobile devices and configuration details supported / required, as well as all Mobile Device Management software.List all app store registries (Apple iTunes, Google Play Store, Microsoft) where proposed mobile / tablet solution is available?	Y	Our solution is based on HTML5/Javascript and can be accessed by any web browser: desktop, laptop, smartphone, tablet, Safari, IE, Firefox, Chrome, etc.
TO.6.1	6. Product Support & Enhancements	Does your solution include often physical AVL units refreshes? Please describe frequency of refresh, including AVL device software upgrades.	N	The software application AssetOutlook is contnually being upgraded as part of the contract. Hardware with LTE should be viable and supported for an estimated 8-10 years. If need be, we offer no cost hardware upgrade plans with new contract commitments.
TO.6.2	6. Product Support & Enhancements	Does your solution include a major / minor release cycle?	Y	We have minor version updates on a periodic basis.
TO.6.3	6. Product Support & Enhancements	Does your solution support older versions supported by the solution provider, including extended support available for un-supported versions of the solution? Please provide details in your explanation.	Y	Our solution can support CalAmp devices from other providers.
TO.6.4	6. Product Support & Enhancements	Does your solution offer application logging capabilities for product support? If yes, please describe.	Y	Available to support personnel only

TO.6.5	6. Product Support & Enhancements	Does your solution operate / execute in a debug mode?	Y	Available to support personnel only
TO.6.6	6. Product Support & Enhancements	Does your solution provide an in-application capability to access/analyze log files?	Y	Audit log report will soon be available
TO.6.7	6. Product Support & Enhancements	Does your solution provide exception handling capabilities? If so, please describe. Moreover, how does proposed solution handle exception scenarios?	Y	The CTC Platform provides alerts and notficiations to support personnel
TO.6.8	6. Product Support & Enhancements	Does your solution enable error messages to be configured/customized based on VDOT needs?	N	
TO.6.9	6. Product Support & Enhancements	Does your solution provider's have a standard definition for support/error severity levels and corresponding SLAs for response and resolution? If so, what is it?	Y	Please see the attached Service Reponse Plan included in the Technical Proposal.
TO.6.10	6. Product Support & Enhancements	Does your solution provider have a mechanism for notifying VDOT of security issues and other errors that are discovered and/or corrected in releases? If yes, please describe.	Y	This type of information is provided by the Technical Account Manager assigned to the account - audit log report
TO.6.11	6. Product Support & Enhancements	Does your solution include an SLA for addressing identified vulnerabilities? If yes, please include it to Appendix A.	Y	High 30 days, Medium 90 days, low 180 days
TO.6.12	6. Product Support & Enhancements	Does proposed solution have publicly available (or customer-only) support materials? For each, please provide the method of access. 1. Bug/defect database 2. White Papers 3. Up-to date and version-specific support FAQs?	Y	Online access to white papers. There is an internal wiki and Jira tciketing system available to customersTechnical Account Managers
TO.6.13	6. Product Support & Enhancements	Does your solution include technical administration facilities (e.g., administrative UI, desktop clients etc.) as part of the solution? Please list all available options in your explanation.	Y	Users with Administrative access will be able to configure/add/delete users, groups, units, alerts, geofences, and other system configurations on the Administrative section of the system.
TO.6.14	6. Product Support & Enhancements	Does the solution provide standard technical training for the client / customer in both in English and Spanish? If so, describe the training method, location, timing, total recommended training hours, frequency of classes, and any other appropriate information.	Y	All components of CalAmp's system have been designed for optimal functionality as well as intuitive-user-friendly interfaces. The system was engineered paying specific attention to offering a powerful but usable tool for all levels of technical expertise. CalAmp is dedicated to providing unlimited support and training for all system users. CalAmp will provide live training sessions on the entire AVL system sufficient to ensure complete understanding and operations proficiency by the desired client staff and administrative personnel. Spanish can be made available and can be scheduled for specific sessions and needs.
TO.6.15	6. Product Support & Enhancements	Does the solution convey ownership of all source code and configuration or will all source code and configuration be placed in escrow? If yes, please explain.	N	Source code will remain the property of CalAmp. We are a NASDAQ traded company and have very little risk of ceasing operations. The cost for source code escrow as well as the cost for VDOT to recreate our entire system using this source code far outweigh the option of simply selecting another AVL vendor.
TO.6.16	6. Product Support & Enhancements	Is there a solution roadmap, including forthcoming features and technology upgrades? If yes, please attach to this response.	Y	This is highly confidential information but can be shared in part under NDA.
TO.6.17	6. Product Support & Enhancements	Does the solution provider have a well-defined process for a client to request an enhancement to the solution? If yes, please explain the process and identify how such requests are prioritized across customers.	Y	You will be assigned a Technical Account Manager who will be the conduit for any technical issues, configuration, and customization requests. The TAM will provide the interface and communication with our Professional Services group for further action.
TO.6.18	6. Product Support & Enhancements	Does your solution provide tunable event tracing written to a central log (debug, info, warning, error)?	Y	
TO.6.19	6. Product Support & Enhancements	Does your solution provide instrumentation for performance monitoring?	Y	
TO.7.1	7. Security & Encryption	Is your solution compliant with VITA and MSSP Security Requirements?		
TO.7.2	7. Security & Encryption	Does your solution offer Single Sign-on? What kind of single sign on authentication is provided? Please descriptions and any limits and/or constraints for 1. SAML, 2. FIM, 3. OTP, and 4. Active Directory (vs. Windows Authentication) in your explanation.	Y	Active Directory and SAML
TO.7.3	7. Security & Encryption	Does your Solution lockout access to the system after 3 failed login attempts, for a customer determined lockout periods? Please describe your process for re-authenticating lock outs, as well as any self-service password reset and/or admin user unlocking capabilities in your explanation.	N	Contact system admin/support
TO.7.4	7. Security & Encryption	Does your solution include secure access, encrypted data and alert authentication? If yes, please, please identify any secured network connectivity mechanisms (e.g. VPN, SSL) that are included in the solution.	Y	Data is encrypted on the VPN - access control - data is not encrypted at rest.
TO.7.5	7. Security & Encryption	Does your solution support data security? If so, at what level? At the column/attribute level or at some higher level? Describe the level at which data security can be applied; be specific.	Y	CTC platform has a wide range of user profiles that restrict access at the TAB, page and column level including read/write atrributes to areas of data.
TO.7.6	7. Security & Encryption	Does your Solution include security audits along with the results of those audits? If yes, please describe any use of audit solution capture event logs (including date / time stamp, user actions), audit log transactions and query on demand capabilities, and preservation of historical audit log transactions.	Y	Audit logs are stored and maintained within Splunk
TO.7.7	7. Security & Encryption	Does your Solution include a description of the physical, application-level, database, and encryption practices? If yes, please provide a description of the physical, application-level, and database encryption practices.	Y	Some database level encryption, though no physical or application level. Roadmap for DAR encryption.
TO.7.8	7. Security & Encryption	Does your solution support user authentication and/or mutual authentication? If Yes, please describe and include details related to deployment infrastructure.	Y	User authentication is supported. SSO supported in CTC
TO.7.9	7. Security & Encryption	Does your solution undergo routine 3rd party vulnerability assessment or ethical hacking? If yes, how often? Additionally, please provide the documented details of the last assessment.	Y	Annually
TO.7.10	7. Security & Encryption	Does your solution support ADFS integration for authentication, AD for authentication, and SAML / OAuth assertion capability, and/or Multifactor authentication? Please describe in your explanation and identify which items not supported.	Y	For internal CalAmp users yes, for external/customers no, but it is a roadmap feature.
TO.7.11	7. Security & Encryption	Does your solution support detecting, alerting for, and restricting simultaneous logon		
TO.7.12	7. Security & Encryption	Does your solution support authorization based permissions such as role-based access control? Please provide a description, including any pre-defined roles,ability to add new, custom roles, limitations / constraints, level of granular access control (e.g., field level, form level, section level), and "Deny by Default" principle from end-user data access, if applicable.	Y	AssetOutlook uses extensive grouping and subgrouping, providing various levels of user access in addition to configurable user roles and permissions.

TO.7.13	7. Security & Encryption	Support for continuous audit capabilities (e.g., transactional audit, unauthorized access attempts) to track end-user interactions, including which activities are tracked and audited; describe audit capabilities and which activities are tracked and audited	Y	Authentication logs are kept. CTC admins, any others?
TO.7.14	7. Security & Encryption	Does your solution consider any third-party developed components (e.g., Commercial Off-the-Shelf, Open Source, and/or Custom Software)? If Yes, please descrbe what security criteria (if any) are considered when selecting third-party components / suppliers?	N	We look at 3rd party securty results, SOC2 reports, etc.
TO.7.15	7. Security & Encryption	Does your solution have any known vulnerabilities to hacking in the current release? Please elaborate on Security and Vulnerability testing capability and practices	N	We conduct testing throughout our SDLC and perform annual 3rd party vulnerability scan. We conduct internal scans monthly.
TO.8.1	8. System Availability	Does your solution support a system availability level of 99.99%+? In your response, please identify the total percentage of anticipated downtime required for your solution, how that percentage was determined, and describe the processes and procedures in place to measure and achieve service level objectives (SLO). In your description, include recovery point objectives (RPO), recovery time objectives (RTO), version retention, and geographical redundancy, as well as identifying your solutions minimum RPO and RTO markers. Please include a SLA in Appendix A with your explanation.		System Availability - CalAmp has a 99.5% SLA Downtime - CalAmp's CalAmp Telematics Cloud and AssetOutlook are not planned to be down. CTC and AO do not require outages for almost all component upgrades leveraging our ZTD (Zero-Downtime Deployment) approach. Database changes may require an outage depending on the type of change. Data provider and AWS changes may also require an outage. SLO Procedures - When an alert fires that indicates a serious issue, the CalAmp Command and Control Center is notified. The C3 immediately opens a technical bridge with the appropriate resources. Those resources attempt to resolve the issue before it becomes SLA-impacting. If the issue becomes SLA impacting, the C3 opens a ticket in the CalAmp ticketing system noting the start time and impact. Once the issue is resolved or mitigated, the ticket is closed. Each week the leaders of the C3, Engineering, Production Operations and Reporting meet to review any tickets and verify the impact/outage times. That approved outage time is then updated in the report dB and is used to generate the weekly SLA report for all platforms. RPO/RTO - RPO and RTO vary by issue From a high RTO of 16hr/RPO of <24hrs for an extended loss of full SQS services in an AWS region To a low RTO of 0/RPO of 0 for a loss of the API gateway services used for the CalAmp factory. For a full list of Recovery Scenarios please review the current CalAmp BCP. Geographical Redundancy - CalAmp AssetOutlook and CTC are hosted in AWS East today. The infrastructure can easily and quickly be spun up in another AWS region when and if required.
TO.8.2	8. System Availability	Does your solution include the ability to identify anticipated scheduled down time? Please describe examples of past clients / customers utilizing the proposed solution (or previous versions), including the cause, minimum / maximu duration, frequency, and triggers for unscheduled down time	Y	Scheduled maintenance on the platform is perofrmed. Any anticipated downtime or outages are communicated to all active customers via Techincal Account Managers.
TO.8.3	8. System Availability	Is your solution based on data center certifications (e.g. SAS70, ISAE 3402, SSAE16)? If Yes, which one(s) and when was the last audit / assessment performed?	Y	AWS
TO.8.4	9. Software / Hardware	Does your solution have the capability to integrate existing AVL hardware by other manufacturers into your system? Please describe all options available to the Commonwealth including any limitations.	N	
TO.8.5	9. Software / Hardware	Does your Solution include an overview of the software and hardware security utilized by the system? If yes, please explain and attach an overview of the software and hardware security utilized by the system.	Y	We utlize AV software, IDS/IPS, and Firewall technology to protect the system. Along with native AWS controls
TO.8.6	9. Software / Hardware	Are future versions of the solution anticipated? If so, please elaborate. For example, if the proposed solution has multiple versions, which version are you proposing? Additionally, when was the version of the solution initially released, and when will subsequent versions scheduled to become available? What are the differences between the proposed solution version and the next version scheduled to be released?	Y	Monthly updates to the exising system to increase functionality
TO.10.1	10.Software Maintenance	Does your solution provide software maintenance and support services?	Y	Included with monthly service agreement
TO.10.2	10.Software Maintenance	Does your solution's software maintenance include (but is not limited to) annual upgrades for improved software functionality and technical support?	Y	Included with monthly service agreement
TO.10.3	10.Software Maintenance	Does your solution's proposed pricing include maintenance / support services for the initial contract term? If applicable, please provide details for renewal pricing for years X – 7.	Y	Included with monthly service agreement
TO.11.1	11. Implementation & Deployment	Does your solution require any elevated privileges on server machine(s) to run/execute under normal circumstances? If yes, please provide details (e.g. Service Accounts should not require admin/root privileges to run/execute).	N	CTC is a SaaS platform
TO.11.2	11. Implementation & Deployment	Does your solution require any elevated privileges on end-user device to run/execute under normal circumstances? If yes, please provide details (e.g. User Accounts should not require admin/root privileges to run).	N	CTC is a SaaS platform
TO.11.3	11. Implementation & Deployment	Does your solution include deployment scripts for first time deployment?	N	CTC is a SaaS platform
TO.11.4	11. Implementation & Deployment	Does your solution include deployment scripts to automate promotion of configuration from one environment to other?	N	CTC is a SaaS platform
TO.11.5	11. Implementation & Deployment	Does the solution provide a Help Desk, in both English and Spanish? If yes, please identify the means of contact, hours of operation, number of personnel assigned, expected response times for each level of criticality, and the type of support provided for both the end user and technical resources. Additionally, please describe your call prioritization process and how do calls get escalated? Is there a designated single point of contact provided by the solution for escalations?	Y	SEE Service Response Plan included in Technical Proposal and Tab 12

TO.12.1	12. Standards-Based	Does your solution offer common API formats? Please describe any API formats offered (and excluded) by your solution, including: Direct Data Formats (e.g., JSON, XML, YAML), Feed Data Formats (e.g. RSS, Atom, SUP), Manipulation Data Formats (e.g., PDF, KML), and	Y	JSON/XML
TO.12.2	12. Standards-Based	Does your solution offer common Data formats? If yes, please identify the data formats offered by your solution.	Y	CSV and XML
TO.12.3	12. Standards-Based	Does your solution offer Cross-platform Integration? Please include in your explanation an identification of all integrated platforms and any limitations and/or constraints for each of the identified platforms.	Y	This would be covered under a Professional Services Engagement
TO.12.4	12. Standards-Based	Is your proposed solution compliant with VA Section 508, and the overarching Americans with Disabilities Act (ADA)?		N/A
TO.13.1	13. Technical Requirements	Does your solution support all major web browsers, to include but not limited to: Internet Explorer, Chrome, Firefox, and Safari?	Y	Our solution is based on HTML5/Javascript and can be accessed by any web browser: desktop, laptop, smartphone, tablet, Safari, IE, Firefox, Chrome, etc.
TO.13.2	13. Technical Requirements	Does your solution support iOS/Android Apps? (Innovation point)	F	Our solution is based on HTML5/Javascript and can be accessed by any web browser: desktop, laptop, smartphone, tablet, Safari, IE, Firefox, Chrome, etc. Using the latest web programming technology (HTML5 Javascript) allows the application to automatically configure its menus, buttons, orientation, and font size to be user-friendly and navigated with any mobile device, screen size, or operating system. A true mobile app is being developed for those who require a separate app.
TO.13.3	13. Technical Requirements	Does your solution support Open Web Services API	Y	Our CTC enablement platform has a robust suite of APIs and a data pump that can be configured to provide a data service to virtually any third party application. CalAmp professional services may be required to write/configure the integrations with our standard API services.
TO.13.4	13. Technical Requirements	Are your solution's technical requirements fully documented?	Y	Detailed user manuals and release notes are provided for all applications.
TO.13.5	13. Technical Requirements	Does your solution include a published lifecycle and API deprecation / removal dates of at least 12 months in advance?	Y	Software
TO.13.6	13. Technical Requirements	Does your solution enable the acceptance of attachments? If Yes, please describe any related virus scanning mechanisms and type / size limitations.	Y	Software
TO.13.7	13. Technical Requirements	Does your solution provide redundant site capabilities and seamless failover processing? If yes, please describe.	Y	Data centers in separate geographical locations are provided for fail over and disaster recovery.
TO.14.1	14. Training & Documentation	Does your solution provide training on the AVL Solution (Software and Devices), in both English and Spanish?	Y	Training is currently offered in English - arrangements can be made for Spanish
TO.14.2	14. Training & Documentation	Does your solution provide customized training based on the Consumer's requirements to allow users to utilize the AVL System in their normal functions, in both English and Spanish? Will training be made available in both English and Spanish?	Y	CalAmp is dedicated to providing unlimited support and training for all system users. CalAmp will provide live training sessions on the entire AVL system sufficient to ensure complete understanding and operations proficiency by the desired client staff and administrative personnel. Spanish can be made available and can be scheduled for specific sessions and needs.
TO.14.3	14. Training & Documentation	Does your solution include all costs associated with training? Please provide specific details for	Y	Training costs are outlined in our proposal.
TO.14.4	14. Training & Documentation	Does your solution include all documentation in a digital format necessary for the proper and successful use and implementation, including (but not limited to): copyright information, operator/user manuals, training materials, reference manuals, administration guides, specifications, warranties and other materials, in both English and Spanish?	Y	All training materials and manuals will be provided in electronic format. Spanish can be made available on an as-needed basis.
TO.14.5	14. Training & Documentation	Will solution provider deliver defined and documented steps for the implementation/deployment of proposed solution? If yes, please provide high level steps documented steps for a typical deployment.	Y	Deployment and implementation will be led by a project manager and technical account manager.The CalAmp project manager will serve as the liaison for CalAmp during the implementation process and through the duration of the system. The project manager will serve as the point of contact for all technical and support issues. The Project Manager will schedule periodic calls/meetings to monitor the initial implementation and installation process. Communication is key in our implementations so we will be using a variety of methods including e-mail and telephone, as well as in person meetings when appropriate. Scheduling and planning will utilize industry standard project management tools such as Microsoft Project and other related systems. CalAmp will determine an appropriate implementation schedule for each specific project and customer. A detailed and accurate project work plan cannot feasibly be created without conferring with the customer to determine specific configurations, preferences, processes, priorities, resources, etc.
TO.14.6	14. Training & Documentation	Is standard technical documentation provided as part of the solution (e.g. training guide, technical reference manual, administrator's guide, etc.)?	Y	All training materials and manuals will be provided in electronic format. The major purpose of the Implementation Plan is to define a process for deploying the technical elements of the CalAmp AssetOutlook Project, and then schedule the integration of these elements into each agency's operating system. This transition calls for the smooth integration and deployment of the AVL technology that is specified in the Scope of Work. In order to make the transition as smooth as possible and overcome any functional, technical, operational, and communication difficulties as they arise, CalAmp will utilize a phased approach.
TO.14.7	14. Training & Documentation	Does your proposed solution include dedicated post implementation support? Please provide a detailed description with your explanation.	Y	Deployment and implementation will be led by a project manager and technical account manager.The CalAmp project manager will serve as the liaison for CalAmp during the implementation process and through the duration of the system.
TO.14.8	14. Training & Documentation	Is standard end user training provided as part of the solution, in both English and Spanish?	Y	CalAmp is dedicated to providing unlimited support and training for all system users. CalAmp will provide live training sessions on the entire AVL system sufficient to ensure complete understanding and operations proficiency by the desired client staff and administrative personnel. Spanish can be made available and can be scheduled for specific sessions and needs.
TO.14.9	14. Training & Documentation	Is standard end user documentation (training guide, user's guide, administrator's guide, etc.) provided as part of the solution, in both English and Spanish?	Y	CalAmp is dedicated to providing unlimited support and training for all system users. CalAmp will provide live training sessions on the entire AVL system sufficient to ensure complete understanding and operations proficiency by the desired client staff and administrative personnel. Diocumentation in Spanish can be made available on an as-needed basis.
TO.15.1	15. VITA	Does your Solution comply with all current COV ITRM Policies and Standards, as applicable, found at: http://www.vita.virginia.gov/library/default.aspx?id=537 If proposed solution does not, please provide details that specify the Standard/Policy and how Supplier's solution does not comply.		If awarded, CalAmp engineering will work with VITA to comply with the applicable standards for items where we may not comply.

ID#	Functional Area	Severe Weather Application System (SWAS) Requirements	Supplier Response	Explanation (Instruction: For each requirement, please provide a detailed description, to include (but not limited to) approach, process, assumptions, diagrams, and/or links. Please indicate any corresponding appendices or attachments to reference.)
SW.1	SWAS	Does your system provide hired equipment data warehousing?		CalAmp is proposing a robust integration to the existing SWAS system.
SW.2	SWAS	Does your system track hired equipment work and standby hours of work?		CalAmp is proposing a robust integration to the existing SWAS system.
SW.3	SWAS	Does your system provide inventory data warehousing?		CalAmp is proposing a robust integration to the existing SWAS system.
SW.4	SWAS	Does your system provide map data warehousing?		CalAmp is proposing a robust integration to the existing SWAS system.
SW.5	SWAS	Does your system provide chemical routes data warehousing?		CalAmp is proposing a robust integration to the existing SWAS system.
SW.6	SWAS	Does your system provide pavement temperatures data warehousing?		CalAmp is proposing a robust integration to the existing SWAS system.
SW.7	SWAS	Does your system provide call center data warehousing?		CalAmp is proposing a robust integration to the existing SWAS system.
SW.8	SWAS	Does your system provide duty information data warehousing?		CalAmp is proposing a robust integration to the existing SWAS system.
SW.9	SWAS	Does your system provide all of the data that is warehoused in a summary format?		CalAmp is proposing a robust integration to the existing SWAS system.
SW.10	SWAS	Does your system provide this data in an exportable Microsoft format?		CalAmp is proposing a robust integration to the existing SWAS system.
SW.11	SWAS	Does your system generate invoices based on the hired equipments work and standby hours?		CalAmp is proposing a robust integration to the existing SWAS system.
SW.12	SWAS	Does your system provide administration capabilities for role access and assignments?		CalAmp is proposing a robust integration to the existing SWAS system.
SW.13	SWAS	Does your system provide Ad Hoc reports for all capabilities above? Are they exportable to Microsoft?		CalAmp is proposing a robust integration to the existing SWAS system.
SW.14	SWAS	Does your system provide a yearly Archive capability that is accessible in the future?		CalAmp is proposing a robust integration to the existing SWAS system.

Attachment 1. VDOT Vehicle Data Elements List

ID#	Functional Area	Requirements
MS.3.5	Multi-Source AVL Integration	Does your solution include the ability to aggregate and normalize Multiple Source Feeds? Please reply 'Yes' or 'No' in Cell I5 and provide an explanation in Cell J5. Please describe in your explanation the consolidation of all data, outputs, and aggregation into a single data feed (inclusive of your data)?
AS.7.6	In-Vehicle Hardware (Device)	Does your solution collect the data elements specified in the Vehicle Data Elements table below? Please reply 'Yes' or 'No' in Column F below. If Yes, provide a detailed description or explanation of your solution approach; include references or links to any examples or appendices, as applicable.
DR.1.10	Collection & Analysis	Does your solution collect multiple data elements, per vehicle per update record? Please reply 'Yes' or 'No' in Column G below. If Yes, provide a detailed description or explanation of your solution approach; include references or links to any examples or appendices, as applicable. Provide detailed information regarding how each of these elements will be collected, and what (if any) limitations or

ID#	Category	Type	Description	Supplier Response to Question AS.7.6	Supplier Response to Question DR.1.10	Explanation
c1	Common Data Element	Required	Unique Vehicle ID	Y		Yes
c2	Common Data Element	Required	Record Timestamp (1-Second precision)	Y		Yes
c3	Common Data Element	Required	Update Frequency in seconds (ex: 15, 30, 120)	Y		Update rate is configurable and dynamic
c4	Common Data Element	Required	Vehicle VIN	Y		If available can be captured through diagnostics, or entered manually.
c5	Common Data Element	Operator Status	Unique Operator ID	Y		Can be captured through ID reader or entered manually.
c6	Common Data Element	Location Status	Location: 5 meter precision	Y		2 meter CEP
c7	Common Data Element	Location Status	Azimuth: 5 degree precision	Y		Yes
c8	Common Data Element	Location Status	Speed: 1 mile per hour precision	Y		Yes
c9	Common Data Element	Location Status	Location Precision Radius in feet	Y		6-7 feet CEP
c10	Common Data Element	Location Status	Last Good Location Timestamp: 1-Second precision	Y		Yes
c11	Common Data Element	Vehicle Status	Engine on / off	Y		Yes
c12	Common Data Element	Vehicle Status	Headlights on / off	Y		If available through standard diagnostic port feed.
c13	Common Data Element	Vehicle Status	Wipers on / off	Y		If available through standard diagnostic port feed.
c14	Common Data Element	Vehicle Status	Hazard Lights on / off	Y		If available through standard diagnostic port feed.
c15	Common Data Element	Vehicle Status	Engine Trouble Light on / off	Y		If available through standard diagnostic port feed.
c16	Common Data Element	Vehicle Status	Diagnostic Trouble Codes (DTCs)	Y		If available through standard diagnostic port feed.
c17	Common Data Element	Vehicle Status	Odometer Value	Y		If available through standard diagnostic port feed.
c18	Common Data Element	Vehicle Status	Hour Meter Value	Y		If available through standard diagnostic port feed.
c19	Common Data Element	Vehicle Status	External Temperature	Y		If available through standard diagnostic port feed.
e1	Equipment-Specific	Safety Options	Service Lights on/off	Y		If available through standard diagnostic port feed.
e2	Equipment-Specific	Powered Options	Plow up / down	Y		If plow mechanism can be equipped with sensor.
e3	Equipment-Specific	Powered Options	Dry Spreader on / off	Y		If spreader controller can provide data feed via serial port.
e4	Equipment-Specific	Powered Options	Wet Spreader on / off	Y		If spreader controller can provide data feed via serial port.
e5	Equipment-Specific	Powered Options	Front Power Take-Off (PTO) mode	Y		Yes
e6	Equipment-Specific	Powered Options	Rear Power Take-Off (PTO) mode	Y		Yes
e7	Equipment-Specific	Material Distribution	Dry Material Type	Y		If spreader controller can provide data feed via serial port.
e8	Equipment-Specific	Material Distribution	Dry Material Total Capacity	Y		If spreader controller can provide data feed via serial port.
e9	Equipment-Specific	Material Distribution	Dry Material Distribution Rate	Y		If spreader controller can provide data feed via serial port.
e10	Equipment-Specific	Material Distribution	Dry Material Volume Remaining	Y		If spreader controller can provide data feed via serial port.
e11	Equipment-Specific	Material Distribution	Wet Material Type	Y		If spreader controller can provide data feed via serial port.
e12	Equipment-Specific	Material Distribution	Wet Material Total Capacity	Y		If spreader controller can provide data feed via serial port.
e13	Equipment-Specific	Material Distribution	Wet Material Distribution Rate	Y		If spreader controller can provide data feed via serial port.
e14	Equipment-Specific	Material Distribution	Wet Material Volume Remaining	Y		If spreader controller can provide data feed via serial port.

Attachment 2. Alerts & Notifications

ID#	Functional Area	Requirements
MS.4.3	Real-time Notifications	Does your solution provide a configurable alerting framework that can be modified by customers (including thresholds, etc.) and alert notification delivery options for the category areas listed (but not limited to) in the table below? Please reply 'Yes' or 'No' in Column E and provide a detailed explanation of your solution approach for each item, or indicate "N/A" if Not Applicable.

ID#	Category	Description	Supplier Response to Question MS.4.3	Explanation
n1	Delivery Options	Email	Y	Alerts can be sent via email or SMS
n2	Delivery Options	SMS/Text Message	Y	Alerts can be sent via email or SMS
n3	Delivery Options	In-App Notifications	Y	Alerts create a notification icon on the screen.
n5	Delivery Options	Highlights, color codes, or similar changes to map icons and reporting records	Y	Icons change color based on status.
n6	Alert Types	Route Deviation	Y	If route is set up as geofence.
n7	Alert Types	GeoFence Deviation	Y	Yes
n8	Alert Types	Missed Routes/Stops	Y	If route is set up as geofence.
n9	Alert Types	Actual speed vs. identified thresholds	Y	Yes
n10	Alert Types	Arrival / Departure times at designated locations/routes	Y	Yes
n11	Alert Types	Material Distribution off-route	Y	If route is set up as geofence.
n12	Alert Types	Device Tampering Detected	Y	Yes
n13	Alert Types	Device Disabled / Unreachable longer than identified threshold	Y	Yes
n14	Alert Types	Excessive Idle Time	Y	Yes
n15	Alert Types	Unusual Driving Behavior (e.g., hard braking, fast acceleration, hard cornering, etc.)	Y	Yes
n16	Alert Types	Engine Trouble Light Activated	Y	Yes
n17	Alert Types	Vehicle Indicator (i.e, alarm when outside operating conditions or exceeding set idling limit)	Y	Yes

Attachment 3. Reports

ID#	Functional Area	Requirements
DR.4.9	Reporting	Does your solution provide modules for preset and adhoc data queries, reporting capabilities, and email notifications, including for the data elements listed in the table below? Please reply 'Yes' or 'No' in Column D; provide a detailed explanation of your solution approach for each item, or indicate "N/A" if Not Applicable.

ID#	Description	Supplier Response to Question DR.4.9	Explanation
r1	All data elements for the alert and notification types listed in Attachment 2	Y	Yes
r2	Stop times, locations, and durations	Y	Yes
r3	Collection Device off / unavailable total time	Y	Yes
r4	Collection Device off / unavailable specific times	Y	Yes
r5	Overall Idle Time	Y	Yes
r6	Overall Engine Off Time	Y	Yes
r7	Vehicle Hours of Service	Y	Yes
r8	Operator Hours of Service	Y	Yes
r9	Dry Material Distribution Total by Type	Y	If spreader controller can provide data feed via serial port.
r10	Wet Material Distribution Total by Type	Y	If spreader controller can provide data feed via serial port.
r11	Operator ID(s)	Y	Yes
r12	Pre / Post trip electronic inspections	Y	DVIR is available as an option.

Attachment 4. Data Sets

ID#	Functional Area	Requirements
TO.13.8	Technical Requirements	Is your solution fully compatible with all ESRI-supported releases of ESRI software and services and support existing Commonwealth data sets, services, and software, as listed in the table below? Please reply 'Yes' or 'No' in Column D and provide a description of your solution approach or framework. If No, please provide any details for your solution's alternative and reasoning.
DR.2.5	Data Integration	Does your solution provide an integration capability that aggregates data feeds from all AVL Data sources designated by the Commonwealth and produce unified, standardized data feeds for internal and external consumption listed in the table below? Please reply 'Yes' or 'No' in Column E and provide a detailed explanation of your solution approach for each item, or indicate "N/A" if Not Applicable.

ID#	Description	Supplier Response to Question TO.13.8	Supplier Response to Question DR.2.5	Explanation
d1	ESRI Map services	Y	Y	The CalAmp AssetOutlook Mapping application is actually based on Esri ArcGIS Server, the mapping and GIS engine from Esri. CalAmp can easily display, provide, exchange, and integrate map data and layers with any Esri ArcGIS based technology in the inherent functionality of the system.
d2	ArcGIS Enterprise	Y	Y	The CalAmp AssetOutlook Mapping application is actually based on Esri ArcGIS Server, the mapping and GIS engine from Esri. CalAmp can easily display, provide, exchange, and integrate map data and layers with any Esri ArcGIS based technology in the inherent functionality of the system.
d3	GeoEvent Server	Y	Y	The CalAmp AssetOutlook Mapping application is actually based on Esri ArcGIS Server, the mapping and GIS engine from Esri. CalAmp can easily display, provide, exchange, and integrate map data and layers with any Esri ArcGIS based technology in the inherent functionality of the system.
d4	ArcGIS Online	Y	Y	The CalAmp AssetOutlook Mapping application is actually based on Esri ArcGIS Server, the mapping and GIS engine from Esri. CalAmp can easily display, provide, exchange, and integrate map data and layers with any Esri ArcGIS based technology in the inherent functionality of the system.
d5	Identity Management and Single-signon (OKTA, ADFS, etc.)	Y	Y	Active Directory and SAML
d6	MS Office (2010 and above)	Y	Y	Reports can be exported in various MS document formats.
d7	MS SharePoint (On-Premise and Online)	Y	Y	Reports can be exported in various MS document formats.
d8	MS Dynamics (On-Premise and Online)	N/A	N/A	Our CTC enablement platform has a robust suite of APIs and a data pump that can be configured to provide a data service to virtually any third party application. CalAmp professional services may be required to write/configure the integrations with our standard API services.
d9	PeopleSoft	N/A	N/A	Our CTC enablement platform has a robust suite of APIs and a data pump that can be configured to provide a data service to virtually any third party application. CalAmp professional services may be required to write/configure the integrations with our standard API services.
d10	MS Power BI (On-Premise and Online)	N/A	N/A	Reports can be exported in various MS document formats.
d11	Tableau	N/A	N/A	Our CTC enablement platform has a robust suite of APIs and a data pump that can be configured to provide a data service to virtually any third party application. CalAmp professional services may be required to write/configure the integrations with our standard API services.

d12	IBM IIB	N/A	N/A	Our CTC enablement platform has a robust suite of APIs and a data pump that can be configured to provide a data service to virtually any third party application. CalAmp professional services may be required to write/configure the integrations with our standard API services.
d13	Gmail	Y	Y	The CalAmp system can generate emails alerts and scheduled reports to any email address

Attachment 5. VDOT Data Management API and Out of the Box API Components

ID#	Functional Area	
DR.29	Data Management	Does your solution provide open, standard APIs for the items listed in the table below? Please reply 'Yes' or 'No' in Column D; provide a detailed explanation of your solution approach for each item, or indicate "N/A" if Not Applicable.
DR.30	Data Management	Does your solution expose its services and components through an API for the items listed in the table below? Please reply 'Yes' or 'No' in Column E; or indicate "N/A" if Not Applicable. If yes, please identify the available integration options and the preferred methodology.

ID#	Description	Supplier Response to Question DR.29	Supplier Response to Question DR.30	Explanation
a1	Data exchange protocol – SOAP, REST, ETL, MQ, others.	Y		REST API with JSON content type for request and response
a2	Multiple interfaces for same service (e.g. REST and SOAP)	N		REST/JSON only
a3	Documentation detailing API usage (e.g., WSDL, Swagger, XML Schema, XSD Schema, Exchange Schema, Canonical Schema, Sample Xml files etc.)	Y		Swagger API documentation, developer portal with sample code (JavaScript - Angular and Backbone,
a4	API Solution Documentation (e.g., Data Flow Diagram, Interface Control Document, etc.)	Y		Connect Knowledge Base: https://connect.calamp.com/deviceoutlook/help/index.htm#t=Home.htm
a5	Service Elements to Data Elements mapping document	Y		CTC portal provides developer sandbox including API examples
a6	Orchestration requirement during data exchange	N		
a7	Exchange Type (Request-Response or One way)	Y		Request- Response
a8	Exchange Mode (Synchronous or Asynchronous)	N		
a9	Security classification of the data included in the exchange (e.g., CII, PII, PCI, PHI, etc.	N		
a10	Non-repudiation information kept within the system (Please include how such information can be accessed and queried in your explanation.)	N		
a11	Service invocation auditing (e.g., sender, operation, time of request, time of response	Y		Stored internally, not exposed through API at this poin
a12	Logging of all integration activities involved (Please describe log access in your explanation.)	Y		Any entity modification operations are stored in system audit log, not exposed via API
a13	Checks and balances to verify sender is not malicious via AuthN / AuthZ	Y		Initial authentication via username and password returns an authToken that can be used for the session. Roles and permissions are assigned and enforced at entity level
a14	NACKs / Errors returned (Please describe standard format, error handling, processing, and notification availabilty in your explanation.)	Y		API request errors are returned in JSON format in the response. The general type of error can be determined by the HTTP status code.
a15	System Landscape Directory (SLD) information (e.g., average response time, availability, high availability, average messages per day, maximum messages per day, minimum messages per day, peak message rate, peak message rate daily time, and peak message rate daily duration)	N		Measured through internal metrcis, not exposed to customers
a16	Validation of a message's structural integrity	Y		Device messages are validated against the LMDirect specification and rejected if invalid, HTTPS API requests are similarly rejected if invalid.

ID#	Information Security (applicable to the SaaS component)	Supplier Response	Explanation
IS.1	Is any personally identifiable information (PII) required?	Y	VIN
IS.2	Is any personally identifiable information stored? If yes then answer questions 3 through 5	Y	
IS.3	Where is PII data stored?	Y	AWS
IS.4	Is PII data encrypted in transit?	Y	TLS
IS.5	Is PII data encrypted at rest?	N	Roadmap 2019, but protected through access control and least privledge.
IS.6	Is any other data (non-PII) collected? Please describe		
IS.7	Is the data (non-PII) stored in the United States? Please describe	Y	AWS East
IS.8	Where is the solution going to be hosted? Please describe	Y	AWS East
IS.9	Does your solution enable the client to store the data in-house on client owned and managed servers? Please explain.	N	Data can be provided in real time and captured for client use and storage, via data pump
IS.10	Can the solution be hosted at a Commonwealth facility?	N	Not an option
IS.11	Please list the software requirements required to host your solution at Commonwealth Enterprise Solution Center (CESC)	N/A	Not an option
IS.12	Please list the hardware requirements required to host your solution at CESC	N/A	Not an option
IS.13	Does the solution have the capability to keep commonwealth data within the continental United States at all times?	Y	AWS
IS.14	Please provide format(s) in which data will be provided by the proposed solution.	Y	Data can be provided in a variety of formats. See technical overview

Detailed Security Questions for SaaS solutions
Please refer to vendor responses listed in 'Appendix G - Security Assessment for Non-premise based Services'

SAAS helpdesk support-
Language- English only
Hours of operation (reporting purposes only) 24x7x365 8am to 8pm EST
Type of support- website, Phone based, e-mail , Web to case
Means Contact :
Website - https://www.calamp.com/support/ (see site for specific product/numbers)
Phone-866-456-7522
e-mail – solutionsupport@calamp.com
Number of personnel – Shift dependent and augmented by full time CalAmp personnel M-F
Call Prioritization: Severity 1-3 see matrix
Escalation- Automated within case management sysem from level 1-2/3 . Manual to level 4 with management oversight
Management escalations- See matrix

a. Escalation and Resolution Matrix:

Severity	Acknowledgment	Example	Response By agent	Resolution Updates	Target Resolution	Escalate to
S1	Email acknowledgement within 5 minutes of opening ticket	Cloud Down, System not available	30 minutes from case creation	2 Hours	8 Hours	(1) Relationship Manager (Opt) (2) Director, Customer Support (3) Operations VP (4) CalAmp SaaS GM
S2	Email acknowledgement within 5 minutes of opening ticket	System degraded, but available. Major function not working as designed	4 Hours from case creation	8 Hours	16 Business Hours During normal work week	(1) Relationship Manager (Opt) (2) Director, Customer Support (3) Operations VP (4) CalAmp SaaS GM
S3	Email acknowledgement within 5 minutes of opening ticket	All others. Minor , isolated impact to customer	8 Business Hours from case creation	2 Business days	Next Scheduled Patch Release	(1) Relationship Manager (Opt) (2) Director, Customer Support (3) Operations VP (4) CalAmp SaaS GM

Commonwealth of Virginia Follow Up Questions

CalAmp

Item#	Requirements Tab / Area	Summary	ReqID#	Question / Clarification Point	CalAmp Answer
CAL 1	1. Multi-Source Integration	Communications & Messaging		Communications and Message Section – Clarify what the "optional device" is	Tracking and telematics is done with our LMU-3640 (or similar) device which is typically installed up inside the dashboard away from the elements, inadvertent damage, and tampering. It has no inherent driver interface. If a customer wants to add a driver interface to receive or send messages to the telematics system it would require an optional driver interface. For this, we offer a customized Garmin personal navigation device that is dash-mounted, tethered to our LMU device, and allows for the driver to send and receive messages with the telematics system operators. We use specific Garmin devices which typically have 5" LCD screens with intuitive and user-friendly messaging functions.There are optional locking mounts as well different sized Garmins if desired.
CAL 2	1. Multi-Source Integration	Communication & Messaging	MS 1.6 - 1.12	Describe in detail how MS1.6 through 1.12 will be handled.	The customized Garmin interface allows the driver to send and receive both pre-programmed canned messages and free form messages. The canned messages can be configured to be standard status reporting such as: Accident, On Break, Pot Hole, Damaged Sign, etc.
CAL 3	1. Multi-Source Integration	5G		Describe the capability of your AVL units to support 5G. List any customers where your AVL units are currently operational with 5G.	The use of 5G wireless networks for AVL is neither necessary nor available at this time. The amount and size of data packets sent for all AVL systems is so relatively small that there is little discernible difference in speed. We are proposing LTE/4G technology which is more than enough for AVL applications and will be appropriate and supported for at least 8 years, probably more. 5G (when available) is for handsets and other data intensive functions. To give you an idea of the data needs of an AVL system, each device will send in the neighborhood of 4-5 megabytes per MONTH- which hardly calls for a 5G network.
CAL 4	1. Multi-Source Integration	Mapping		Explain if you can map where a truck has been (ex. bread crumb) – Demonstrate if possible	Yes- We have full breadcrumbing capabilities that also display events and status as part of the breadcrumb. CalAmp AssetOutlook provides robust breadcrumb trail reporting for individual and groups of vehicles for specified time periods. Breadcrumbs show specific locations, directions, status, turns, and events such as on/off, hard brake, long idle, etc.
CAL 5	1. Multi-Source Integration	Mapping		How and where are your using Amazon and ESRI and Google maps? How are these three being utilized and how is it working with AWS?	CalAmp AssetOutlook and the platform it is based upon, CalAmp Telematics Cloud (CTC), are hosted with Amazon Web Services. The mapping engine is based on Esri ArcGIS Server so mapping is all done with Esri tools. Standard base map data (streets, addresses, speed limits, etc.) is a combination of Esri and commercial sources like HERE (similar to Google Maps). We provide a Google Street View tool that hyperlinks specified locations to the appropriate Google Street View window. AssetOutlook can overlay and display your own custom GIS map data layers such as routes and zones.
CAL 6	1. Multi-Source Integration	Operations		Please demonstrate snow operations use cases, potentially using the NoVa snow maps, to showcase your capabilities.	Our solution can show extensive breadcrumbing and historical paths to assist in snow plow management. Snow plow activity can be displayed on top of VDOT owned plow routes or other proprietary map data such as highway mile post markers, etc. We can also provide data and reporting that includes plow activity, plow mileage, plow time, as well as interfacing to spreader controllers for reporting of their data.
CAL 7	1. Multi-Source Integration	GPS		What are you proposing for integral GPS update for your solution?	Our devices can be configured to send location/status data at various rates and events. All update rates can be set as a default time (ie. 10, 30, or 60 seconds) plus events such as on/off, start/stop, turns, harsh brake/acceleration, long idle, sensors, etc.
CAL 8	1. Multi-Source Integration	Hardware		What Carrier is proposed and how is this going to be accomplished?	CalAmp can work with virtually any carrier. For this project we have proposed using the AT&T network with LTE devices.
CAL 9	1. Multi-Source Integration	Operations		Describe the maximum concurrent number of active vehicles that your solution has been proven to support in field conditions.	The CalAmp platform can support an unlimited number of units. For example, we currently have a single customer with over 100,000 units in their fleet.
CAL 10	2. Data & Reporting	Standard Reports		Please explain what standard reports are available – please list what the standard reports are and what they accomplish?	CalAmp Asset Outlook provides a wide variety of standard reports covering various vehicle and driver utilization, activities and metrics both in detail and summarized. We have approximately 26 canned reports divided into categories: Vehicle and Operator Usage, Engine Diagnostic, Exception, Geofence, and Trip, Stop, & Location Reports (which include performance, fuel efficiency, State mileage, and other reports).
CAL 11	2. Data & Reporting	Data Migration		Do you have the ability to ingest VDOT's historical data from prior seasons?	Although not a standard offering, it may be possible to incorporate third party historical data for reporting in our application with an optional Professional Services engagement. The CalAmp "Professional Services" group can provide custom work and configuration for projects and functionality that fall outside of our standard offerings. Professional Services can assist customers and third parties leverage the tools and data provided by the CalAmp system to achieve unique and advanced organizational goals and objectives. We would need to examine the data contents, format, and structure to ascertain the scope of work and level of effort to accomplish this.
CAL 12	2. Data & Reporting	Data Retention		Data archive information was not clear – please clarify the time frame that this will be available.	Historical data for reporting within the application is typically available for 6 months but can be made available for 12 months for VDOT if necessary. However if additional retention is needed, it is possible but there may be an additional cost associated with this request.
CAL 13	2. Data & Reporting	Data Retention		Describe how you will ensure that Commonwealth of Virginia data is retained within the United States.	Systems or US customers are hosted, and associated data stored, in AWS regions within the United States.
CAL 14	2. Data & Reporting	Custom Reports		How do you handle requests for custom reports?	Custom Reports can be requested and developed with the support of the Professional Services group at CalAmp. There may be a cost associated with any Customer Specific Report requests depending on the scope and level of effort.
CAL 15	2. Data & Reporting	Data Dictionary		If selected by VDOT, can you provide a complete data dictionary of your data fields within 30 days of contract award?	Data dictionary for platform data is available via Platform API Docs
CAL 16	2. Data & Reporting	Data Management		Please describe how the complete data set could be transferred to a VDOT managed cloud tenant.	Several options are available: o Ingest from Data Pump (real-time included with AO/CTC) o Report exports to FTP (daily/weekly/monthly included with AO/CTC) o Data Dump/Data "Lake" features (to be defined through optional Professional Services)
CAL 17	2. Data & Reporting	Data Analytics		Please describe the data analytics capability of your solution.	AssetOutlook offers wide variety of configurable reporting as well as dashboarding for high level graphical display. Data can be provided in a raw exportable format which can be easily entered into advanced analytics templates for deeper, more specialized manipulation by individual end users with unique business needs.

CAL 18	2. Data & Reporting	Hosting		Where is the data being hosted?	AWS regions within the US
CAL 19	3. AVL Services & Interfaces	Cameras		Camera was all future – please discuss this solution in detail with a timeline.	CalAmp does not currently offer an integrated camera system, but the development of such an solution is in the future for a roadmap item. Optional CalAmp AVL/router devices can be provided that support both advanced AVL functions as well as the broadband wireless backhaul of video and image data to from third party camera solutions.
CAL 20	3. AVL Services & Interfaces	Work Groups		Demonstrate how user friendly it is to create and manage work groups.	Both users and vehicles are assigned to groups/subgroups for easy fleet and user organization. Users within groups are assigned configurable User Roles, enabling the customization of system access and capabilities.
CAL 21	3. AVL Services & Interfaces	Operations		How do you handle vehicle/contractor check-in before a snow event?	A driver ID solution can be incorporated that has unique driver ID readers for RF ID tags/fobs/cards or iButton solutions A loud buzzer would prompt drivers to log into the vehicles, which would then allow the VDOT to ascertain specific divers and contractors associated with vehicle data and reporting.
CAL 22	3. AVL Services & Interfaces	Operations		VDOT winter operations is between November 1 and April 30. VDOT snow plow vendor onboarding starts on July 1 of every year. How will your 99% up time and system maintenance activities be scheduled so that there is no operational impact to VDOT during these times?	CalAmp will work with VDOT to determine mutually agreeable schedules for onboarding as well as any scheduled system maintenance related to system availability or performance.
CAL 23	3. AVL Services & Interfaces	Interfaces		What technology is available to create interfaces? Please describe in specific detail.	Rest over HTTP APIs into core platform can support development of interfaces in any modern web technology
CAL 24	4. Technical Requirements	Software		Describe the foundational technology of your solution. Is the technology custom developed software (such as .Net or J2EE) or commercial off the shelf COTS software (such as ESRI ArcGIS server)?	Primarily it is a J2EE stack with COTS components as needed, including Esri ArcGIS Server.
CAL 25	4. Technical Requirements	Testing		Describe the maximum concurrency upper limit that your solution has achieved through performance testing. Please provide a sample of your performance test results demonstrating the upper limit achieved.	Since it is a micro-service architecture, different parts of the system have different concurrent load handling requirements and maximums achieved. Also, since the services are stateless and horizontally scaling, our load testing shows the current setup can handle 150-250% of live load (depending on which part of the system is being measured), without needing to scale up. Briefly, the core services have shown capacity to handle a little over 300 http requests/s while the messaging pipeline (which includes receiving, decoding, enriching, persisting and passing on data from devices) can handle ~500 msgs/s at this time.
CAL 26	4. Technical Requirements	Limitations		Describe the technical limitations on your solution. Specifically the: - Limits on amount of data stored - Number of vehicles supported concurrently, - Number of interfaces allowed, - Frequency of interface triggers (example, real time, hourly, daily, nightly), and - Frequency of AVL vehicle reporting (example, every 30 seconds).	- Limits on amount of data stored - Again, depends on which part of the system is to be looked at. The Account, Device, Asset, Users, Roles etc. (configuraiton data) has no limit. Messages from devices are stored max 90 days in the live data store. Beyond that, device data is available via the reporting platform for 1+ years. - Number of vehicles supported concurrently, - No limit. - Number of interfaces allowed, - No limit - Frequency of interface triggers (example, real time, hourly, daily, nightly), and - No restriction currently, though based on the load profile, in future there might be different tiers. - Frequency of AVL vehicle reporting (example, every 30 seconds). - Typically the devices are configured with a time-distance-heading profile with 2min-1mile-45degree values, meaning the if moving (location change) device will report every 2 minutes, or 1 mile traveled, or the heading changes by 45 degrees or more. We would recommend faster (ie 15-30 seconds) for snow plows. These parameters are configurable and can be changed as needed. **SaaS Solution Service** AssetOutlook + CTC / CTC Only Data Access Via AO GUI: Yes / No Data Access Via CTC APIs: Yes / Yes CTC API AVL data retrieval • DataPump: * 1 request /second and maximum of 1000 messages per request / 10 requests /second and maximum of 10000 messages per request • Results Service: * 1 request/second / 10 requests/second CTC API Entity data retrieval (Users, Roles, Permissions, Accevents etc.): * 5 requests/second / 25 requests/second CTC Alerts: * 1 request/second / 10 requests/second CTC Data Access
CAL 27	4. Technical Requirements	Active Directory		How can your solution support and enable single sign on (SSO) with VDOT's active directory?	The CTC platform has our own SSO solution but does not currently support federated SSO. It is in development as a roadmap item currently but could possibly be fast tracked if necessary.
CAL 28	4. Technical Requirements	Upgrades		How will upgrades be handled? Will this be an additional cost or is it scalable?	The CalAmp system is a hosted platform and application that in continually upgraded and maintained by our industrious engineering team. Regularly scheduled version releases of system updates and upgrades occur approximately every month or so. These system updates and upgrades are included in the core system costs. Customization requests will be considered on a case by case basis and may be included at no charge or quoted by our Professional Services group depending on scope.

CAL 29	4. Technical Requirements	Mobile Capabilities		Mobile web – clarify that it is a mobile web and not a mobile app.	The AssetOutlook application is HTML5/Javascript so it is viewable in all web browsers, including mobile devices. Menus, fonts, and site navigation all automatically "adjust" to browser type and screen resolution allowing core system functionality in a mobile environment without the need for various "Apps".
CAL 30	4. Technical Requirements	Mobile Capabilities		Please describe the mobile capabilities of your software.	The AssetOutlook application is HTML5/Javascript so it is viewable in all web browsers, including mobile devices. Menus, fonts, and site navigation all automatically "adjust" to browser type and screen resolution allowing core system functionality in a mobile environment without the need for various "Apps".
CAL 31	4. Technical Requirements	Warranties		Please discuss in detail the one year warranty. Are additional warranties available?	All CalAmp hardware come with a one year warranty. Extended annual warranties are available as an option for subsequent years after year one.
CAL 32	4. Technical Requirements	Training		Please provide details on different types and categories of training provided to operators, systems users, and systems administrators. Is it one time, or an annual refresher.	CalAmp offers comprehensive training for all user levels. Live remote (WebEx) training is provided on an unlimited basis. Onsite training can be provided as an option.
CAL 33	4. Technical Requirements	Devices		What are the technical requirements for end user devices (computer and tablet and smartphone)?	Any device with normal internet connectivity can access the application.The AssetOutlook application is HTML5/Javascript so it is viewable in all web browsers, including mobile devices. Menus, fonts, and site navigation all automatically adjust to browser type and screen resolution allowing core system functionality in a mobile environment without the need for various "Apps".
CAL 34	4. Technical Requirements	Training		What written and training material will be available in Spanish? Device information needs to be bilingual, but reports does not (just training/install information and troubleshooting)	CalAmp provides systems, training, and materials to customers all over the world including a large presence in Latin America. User and installation manuals will be provided in Spanish during system roll out.
CAL 35	5. SWAS (Optional)	SWAS		Optional SWAS tab – no direct response – please provide clear statements on each of the questions in the proposal under this section.	CalAmp is proposing to provide a rich offering of data integration to the existing SWAS system. The CTC platform that our solution is based upon offers a robust set of APIs for various data integration needs. The comprehensive set of API Services enable device communication, data delivery, device, asset, account, user and access management. Stateless RESTful web services enable access to Delete, Put, Get and Post functions for platform entities and message data with responses in JSON format. The Services API are broadly grouped as • Core Service • Data Pump Service • Results Service
CAL 36	6. Vehicle Data Elements	Operations		Vehicle data elements - Provide in details how this is accomplished in regards to snow operations (such as plow up/down)	The CalAmp device can support a variety of inputs such as digital, analog, and serial connections. CalAmp has vast experience integrating plow up/down sensors as well as collecting data from a wide variety of third party spreader controllers such as RexRoth, Dickey-John, Force America, and more. Reports can be provided that show plow up/down, plow miles, plow time, materials used, etc.
CAL 37	10. API Components	Reporting		API reporting – please provide additional details on what specific API are available and are they public?	CTC API Documentation is extensive. You will need a a valid CTC user to be able to access all the API documentation, sample applications and Javascript code examples and access to Private Connect Services. Additional information provided in answer CAL 38.
CAL 38	10. API Components	Components		List the specific APIs available with your solution.	The comprehensive set of API Services enable device communication, data delivery, account and user management. RESTful web services enable access to Delete, Put, Get and Post functions for platform entities and message data with responses in JSON format. The API Services Set consists of three services. • Entity Services • Data Pump Services • Results Services Product Specification ENTITY SERVICES Entity Services enable the definition of and retrieval of information for the following platform resources. Configure and organize accounts and devices to consume information. Accounts - Attributes can be defined and retrieved and sub-account hierarchy can be defined. Assets - Attributes can be defined and retrieved. Assets can be associated with Devices. Contacts - Contact information can be defined and retrieved and associated with Accounts or Users. Device Commands - Services are provided to send commands to devices including: • Requests to read/write PEG parameters. • Request an ID Report • Request a device reboot • Define or request the definition of a geo-zone • Enable / Disable defined geo-zones • Request a Location Report Devices Resources - Attributes of Device Resources (downloadable files) can be defined and retrieved including download jobs, download schedules and completion status. Devices - Attributes can be defined and retrieved including device status, and association with Assets. Download Jobs - Services to create and monitor requests to download files to selected devices. Roles - Security roles can be defined for Users including the definition of extended permissions used by the client application. Users - User attributes can be defined and retrieved including contact information and Security Roles. KEY ADVANTAGES: Enrich device data with metadata, accounts and alerts. Apply fine-grain access control around resources. DATA PUMP SERVICES Data Pump Services enable the retrieval of messages from devices. The service is a FIFO (First In, First

<table>
<tr><td>CAL 39</td><td>Other</td><td>Project Management</td><td></td><td>Are you going to dedicate a project manager? What are qualifications? Please provide a copy of the resume.</td><td>Yes - Client Relationship Account Manager would be discussed as a dedicated resource for the contract. This person's responsibilities would consist of but not limited to: Project Management: Owns and drives weekly VADOT/CalAmp program calls to address:
• Oversee Implementation - Existing Product Support Items
• New Product Development items
• Commercial items
• Weekly Schedules, milestones and project reporting
• KPIs
• Existing Product Support: Manages AO, CTC and Hardware Support Related Activities with CalAmp Engineering and VADOT
• Oversees Product Support Investigations with VA and CalAmp engineering as required.
• HW (local device debug, installation & connectivity issues)
• SW (User issues including Log-ins, PW resets, etc.)
• Engineering Ticket Tracking
• Communicates CalAmp software releases and impacts to VADOT
• PEG script support: Script modifications including changes to support debug, logging, modem AT commands, etc.
• New Product Development: Works with VA and CalAmp Engineering to help define, test and deploy new products and feature/functions for Hardware, AO and CTC
• Documents and tracks VA reported hardware, platform and application issues.
• PEG script support: Script modifications including changes to support New Product Introductions including debug, logging, modem AT commands, etc.</td></tr>
<tr><td>CAL 40</td><td>Other</td><td>Staffing / Resources</td><td></td><td>Describe the number of staff available to support 12,000 deployed VDOT vehicles during an emergency management event. Please list the number of staff available for field support in VA and the number of remote technical staff for Tier 1, Tier 2, and Tier 3.</td><td>CalAmp has a wide network of technicians throughout the country and in Virginia. Local Client relationship managers with our 24x7 operation would be available to support VDOT. Depending on the nature and severity of the event CalAmp can deploy the appropriate staff. CalAmp has approximately 850 employees, all dedicated to the telematics and IoT industry.</td></tr>
<tr><td>CAL 41</td><td>Other</td><td>Staffing / Resources</td><td></td><td>Do you have dedicated support teams, with expert knowledge of all deployed technologies, to triage problems 24 x 7 during snow operations. This support is required until the issues are resolved, irrespective of contract terms, or equipment or devices warranty.</td><td>Yes - Please see the following service reponse plan:
<table><tr><th>Severity</th><th>Acknowledgment</th><th>Example</th><th>Response By agent</th><th>Resolution Updates</th><th>Target Resolution</th><th>Escalate to</th></tr><tr><td>S1</td><td>Email acknowledgement within 5 minutes of opening ticket</td><td>Cloud Down, System not available</td><td>30 minutes from case creation</td><td>2 Hours</td><td>8 Hours</td><td>(1) Relationship Manager (Opt)
(2) Director, Customer Support
(3) Operations VP
(4) CalAmp SaaS GM</td></tr><tr><td>S2</td><td>Email acknowledgement within 5 minutes of opening ticket</td><td>System degraded, but available. Major function not working as designed</td><td>*4 Hours from case creation</td><td>8* Hours</td><td>*16 Business Hours During normal work week</td><td>(1) Relationship Manager (Opt)
(2) Director, Customer Support
(3) Operations VP
(4) CalAmp SaaS GM</td></tr><tr><td>S3</td><td>Email acknowledgement within 5 minutes of opening ticket</td><td>All others. Minor , isolated impact to customer</td><td>*8 Business Hours from case creation</td><td>*2 Business days</td><td>Next Scheduled Patch Release</td><td>(1) Relationship Manager (Opt)
(2) Director, Customer Support
(3) Operations VP
(4) CalAmp SaaS GM</td></tr></table></td></tr>
<tr><td>CAL 42</td><td>Other</td><td>SDLC</td><td></td><td>How do you manage the software development life cycle (SDLC) of your solution?</td><td>We follow an iterative agile process for our SDLC.</td></tr>
<tr><td>CAL 43</td><td>Other</td><td>Staffing / Resources</td><td></td><td>How many people will staff your customer service? Is this available 24/7? Is it available 24/7 on holidays?</td><td>Yes 24x7 364 ticket escalation table provided in row CAL41</td></tr>
<tr><td>CAL 44</td><td>Other</td><td>Transition / Implementation</td><td></td><td>How will you implement the transfer of devices and service by the July deadline?</td><td>CalAmp Installation/Implementation team would rely on project management processes when initiating/executing the VDOT project of the transfer of the VDOT vehicles.
Time management:
• Plan Schedule management
• Define Activities
• Sequence Activities
• Estimate Resources
• Estimate Durations
• Develop Schedule
• Control Schedule
Continually monitoring and controlling the cycle.

Some Discovery information that will be required to initiate the project:
• VDOT Locations of all vehicles
• Devices needed and functionality expected requirements pre-define
• Accurate vehicle list of all vehicles to be installed (age, type, GPS needs)
• Point of contact list for each location/group of vehicles
• Priority of install by location / vehicle type
• Work schedules of vehicles
• Days/Hours of install per location
• Facilities available to install team (covered, heat, a/c)
• Secure control of devices, storage</td></tr>
</table>

CAL 45	Other			In several locations you state “Need professional engagement” – What does this mean? Please describe in detail.	CalAmp "Professional Services" group can provide custom work and configuration for projects and functionality that fall outside of our standard offerings. Professional Services can assist customers and third parties leverage the tools and data provided by the CalAmp system to achieve unique and advanced organizational goals and objectives. Professional Service work is quoted on a project by project basis.
CAL 46	Other	Replay		Replay capability – please clarify.	CalAmp AssetOutlook provides robust breadcrumb trail reporting for individal and groups of vehicles for specified time periods. Breadcrumbs show specific locations, directions, turns, status, and events such as on/off, hard brake, long idle, etc.
CAL 47	Other	Transition / Implementation		Throughout the proposal you state “in the future” – What does “in the future” mean – what is the time frame for these implementations for each item?	CalAmp is continually developing new and additional funcitonality in our offerings. Items listed as future have been identified as potential roadmap items that are being considered or currently developed with no specific time frame available.

3/3/2019

Commonwealth of Virginia: CalAmp – Points of Negotiation:

Commonwealth Request:	CalAmp Response:
NOTE: All answers assume full VDOT contract award to CalAmp.	
1. Device / Service:	
We would like to see pricing for the following:	
a. Plans for both ATT and Verizon service:[VS1]	See updated pricing sheet. For Verizon data, please add $1 per unit per month
i. 30 second data plan	
ii. 10 second data plan	
iii. 1 minute data plan	
iv. 2 minute data plan	
b. Need to add pricing for hardwiring the device into vehicles before 1996 or vehicles that are not OBDII or JBus compliant	With further understanding of the Commonwealth's business case, CalAmp is pleased to offer an expanded variety of hardware options, including some that were not presented in our initial proposal. Devices with simpler function and lower cost (or self) installation might be of interest for subcontractor needs. Installation costs (if needed) are in the separate attached pricing document.

Name	Description	Installation Type	Photo	Cost with 1 Year Service	Cost with 3 Years Service	Cost with 5 Years Service
LMU-3640	Supports sensors, data inputs, ID readers, and either diagnostics (OBDII or Jbus) if availble.	Advanced (CalAmp). Can be hardwired for power/ignition on older vehicles, or plugged up inside the dashboard through diagnostic port		$128.75	$51.45	No charge
LMU-3030	Plug and Play device for light duty OBD-II ports. No sensor/input support.	Simple, can be done by anyone in 30 seconds if there is an OBD-II diagnostic port (light duty post 1996)		$149.35	$56.65	No charge
TTU-2830	Portable, rugged, rechargable battery backed, and powered through cigarette lighter port. No ignition/idle, sensor, data, or diagnostic support.	Simply plugged into cigarette lighter accesory port for power and midrange battery.		$200.85	$128.75	No charge

c. Need to add price of Garmin for 2 way communication installation (need to clarify if need for hardwiring)	Hardwire installation is needed for the Garmin. For additional install cost, please additional pricing sheet. **However**, with a new understanding of VDOT's needs, CalAmp can commit to having two-way messaging support available within the app itself. Users/drivers will be able to message each other whether accessing the app on their computer or mobile device, thereby making the need for a Garmin messaging device unnecessary.
d. iButton/Key Fob Readers	See updated pricing
e. iButton/Key Fob Programmers	No programming is needed. Each fob/sticker has a unique ID number and you simply associate that number with a name within our system. A table or spreadsheet can be used for bulk upload/import of driver ID and assigned numbers
f. Hourly rate for Development and Customization Services	The hourly rate for development and customization is $200. All projects and quotations will require a detailed and specific scope of work to determine an accurate hours estimate and delivery time line.

2. Reporting needed by August 1st, 2019:	
a. Total number of trucks in each status of Moving, Not Moving (by time period & by geofence), and Not Reporting (not pinging) by Area Head Quarters/Residency/Interstate Maintenance Office/District.	These reports can be included with no additional cost, and delivered by August 1 assuming 90 days lead time.
b. AVL status by vehicle of Moving, Not Moving, or Not Reporting AVL by AHQ/ Residency/IMO/District.	These reports can be included with no additional cost, and delivered by August 1 assuming 90 days lead time.
c. AVL status with cumulative time for the event as Moving, Not Moving, and Not Reporting AVL by AHQ/Residency/IMO/District (Total time spent in one day moving, not moving) and outside of geofence	These reports can be included with no additional cost, and delivered by August 1 assuming 90 days lead time.
d. AVL status showing cumulative time trucks are outside of assigned AHQ/Residency/District and outside of geofence.	These reports can be included with no additional cost, and delivered by August 1 assuming 90 days lead time.
e. Ability to generate reports at the district level. Need to have super user roles who have visibility and access to all user groups and all reports.	Currently supported.
f. Report to indicate idle time of:	
i. Greater than 30 minutes	Currently supported.
ii. Greater than 2 hours	Currently supported.
iii. Greater than 4 hours	Currently supported.
g. A check-in report whereby vehicles are identified when they report to a location.	Currently supported.
h. A check-out report whereby vehicles are identified when they exit a location.	Currently supported.
i. A report to establish when vehicles are in plow mode vs. stand-by mode. Describe how this will be accomplished. Add any additional sensors or hardware needed to accomplish this.	We can provide reports that show the break down of various statuses over specified time periods. The key aspect is to determine how you want to derive the statuses. "Plow mode" can be captured via plow sensor or a simple on/off toggled illuminated status button pushed by the driver. You can have multiple buttons for multiple statuses. Keep in mind the plow sensors can be complicated and costly to install. Depending on the plow mechanism additional install costs could be significant. The manual status button would require driver interaction and self-reporting- additional installation cost would be $50. Both would require the LMU-3640 with hardwire installation.
j. Develop a Notification Program to the operator via a cell phone and to VDOT (to defined user) and to truck operator of a vehicle when the vehicle ceases to transmit	Currently supported with similar mechanisms. We can notify when power is cut to a device, and we have a report that shows the last time we heard from a device.

3. Forms:	
a. Please provide a copy of your presentation from the demonstration.	Done.
b. Need pricing and process for development (standby and push)	We can provide reports that show the break down of various statuses over specified time periods. The key aspect is to determine how you want to derive the statuses. "Plow mode" can be captured via plow sensor or a simple on/off toggled illuminated status button pushed by the driver. You can have multiple buttons for multiple statuses. Keep in mind the plow sensors can be complicated and costly to install. Depending on the plow mechanism additional install costs could be significant. The manual status button would require driver interaction and self-reporting- additional installation cost would be $50. Both would require the LMU-3640 with hardwire installation.
4. Alerts:	
a. Need ability to add notes to alerts and notes need to be searchable and should retain the history of events.	CalAmp is willing to develop and provide the alert notation function at no additional charge. This function can be included with no additional cost, and delivered by August 1 assuming 90 days lead time.
5. Contractor facing portal:	
a. A bi-lingual direct ordering system for contractors to purchase the AVL device and one year of data service via phone or online (English and Spanish).	A bilingual contractor portal will be set up and managed by CalAmp to provide for online ordering of service and equipment, as well as scheduling for installation. In addition, CalAmp provide these same services through an 800 number. The lead time for the contractor portal is a minimum of 90 days. We are still researching the costs involved.
b. Ecommerce site/ charges/ set-up/ ordering process	A contractor portal will be set up and managed by CalAmp to provide for online ordering of service and equipment, as well as scheduling for installation. In addition, CalAmp provide these same services through an 800 number.
c. Contractor needs to be able to schedule installation and activation	A contractor portal will be set up and managed by CalAmp to provide for online ordering of service and equipment, as well as scheduling for installation. In addition, CalAmp provide these same services through an 800 number.
d. Develop a contractor invoice system to capture plow mode vs. stand-by mode.[VS4]	This would be supported by data gathered from the AVL system, and would require the previously discussed mechanism for determining plow on/off activity such as a plow sensors or a manual status button. We would like additional specifications on what exactly is needed in an invoice generated. We assume a custom formatted report with status totals and calculated charges would work.
e. Future: Ability for contractors to generate their own invoices. The invoices could then be submitted, verified and paid by VDOT.	This could be a report created by the system based on standby and plow time, and specific compensation rates. This would be supported by data gathered from the AVL system, and would require the previously discussed mechanism for determining plow on/off activity such as a plow sensors or a manual status button. We need to discuss further how a report generated by the tracking system will be accessed by the contractors, as the portal and tracking system will probably be separate systems with different accessibility.
f. Update pricing to include this.	**TBD**

6. Service Level Agreements:	
a. For the system and controllers (availability, reliability)	See attached SLA with details on our service response plan.
b. Help Desk and support metrics (incident and service support)	See attached SLA with details on our service response plan.
c. Quality of service (VDOT customer satisfaction)	Each customer support ticket logged by CalAmp Customer Support prompts the customer for a post-call survey to measure CSAT and CES. Those metrics are measured and reported weekly, monthly and quarterly. CalAmp could provide a specific report of just the CWoVA tickets worked and their satisfaction scores to meet this requirement although responses and participation by the CWoVA team would be required to populate the data.
d. Delivery time after placing order	Although we are the largest manufacturer of AVL devices in the country, for an order of this size (10K+) we will need as much lead time as possible. Ideally VITA & VDOT will keep us apprised (non-binding) of the likelihood of an award pre-contract/pre-order to give us the longest runway possible. As the manufacturer, CalAmp will need to source parts and plan for the build. We do not keep 10K units of the various units types and configurations without some preliminary knowledge or forecasting so your cooperation is essential for a timely delivery. We would have no problem keeping inventory awaiting purchase from the contractors, assuming VITA/VDOT plans to award that portion of the contract to us.
e. Appointment scheduling	CalAmp will provide an installation scheduling process supported by both the contractor portal and 800 phone line. If you refer to the attached installation pricing you will see there are different price tiers based on the number of installations to be completed at one time and location. We must also have a no-show fee for the smaller quantity installations arrangements.
f. Installation time after scheduling appointment	Installation time after scheduling will vary greatly depending on fleet size, location, type of install, and other installations in the area. Typically we suggest scheduling as far in advance as possible, with an estimated lead time of 1 week for small fleets.

7. Implementation:	
a. Implementation plan / milestones with dates and charges.	A detailed implementation plan will be developed once it has been determined which unit types, installations types, options, and configurations are selected. These variables affect the speed and complexity of the roll out significantly. For instance a simple plug-and-play device is self installed in seconds. A hardwired device with ID fob reader and plow sensor could take several hours for each install.
By July 1, 2019 all of VDOT trucks (3,750 trucks) and all of NOVA's contractor's trucks (4,500 trucks) need to have AVL units available for purchase and installation. All of these AVL units need to be fully operational no later than September 15, 2019.[VS5]	We will ideally have a 90 day lead time to fully deploy the contractor portal. If not, orders and scheduling can be accommodated with an 800 number. Implementation timeline assumes the parties (VDOT & contractors) place their orders and show up for the installations in the necessary and timely manner.
By September 15, 2019 all of the other contractor trucks (4,000 units) in the other 8 Districts need to have AVL units available for purchase and installation. All of these AVL units need to be fully operational no later than October 15, 2019.	We will ideally have a 90 day lead time to fully deploy the contractor portal. If not, orders and scheduling can be accommodated with an 800 number. Implementation timeline assumes the parties (VDOT & contractors) place their orders and show up for the installations in the necessary and timely manner.
b. Installation into vehicles (LoJack, locations, logistics, timeline)	Depending on the size, location, and other variables of the fleets and orders, CalAmp will provide installation in a variety of ways. A large fleet (VDOT) installation will be planned out in coordination with the fleet and facilities managers to insure availability of personnel, bays, and most importantly, vehicles. Timing will vary based on options, but a fleet of 4000 vehicles could take as much as 2-3 months. Assuming VDOT decides to move forward with a device that cannot be self-installed by contractors, CalAmp has a team of installation coordinators to assist smaller contractor customers with setting up installation appointments and can generally accommodate a 3 day turnaround from request to installation. However, this timeframe depends greatly on the location of the vehicle (urban, remote), its availability window (8-5, off-hours, weekends), if the install is a one-off or part of a larger installation effort, and the ownership of the location (operator house, Commonwealth depot, etc.). For small orders (5 or fewer installs) we will generally need to schedule the installation to occur at a central installer facility or perhaps a VDOT facility.

8. Training and support:	
a. Ongoing training - 9 Training Sessions each contract year at VDOT Districts[VS6]	On-site training is $620 for a day (7 hours) of training, not including travel and expenses. This includes either user and admin software training or hardware installation training. Live remote training is available at no additional cost. FYI- Our head trainer is located in Virginia.
b. Field support (the district or user will define what type of training)	On-site training is $620 for a day (7 hours) of training, not including travel and expenses. This include either user and admin software training or hardware installation training. Live remote training is available at no additional cost. FYI- Our head trainer is located in Virginia.
c. Bilingual Advanced support during portions of the year, including 24/7 during emergency operations. A representative in Virginia. This coverage needs to continue during vacation and sick days etc. This support needs to be technical not just customer relations.	We can arrange for advanced 24/7 technical support. As you may realize, 24/7 and total coverage will require multiple individuals for this, which we can provide with some staffing and scheduling changes to our current processes, resources, and offerings. To provide this in Virginia will be significantly more costly. Please see pricing.
i. Extra support during check-in time, emergency events, - maybe set up as on-call, must be 24/7. Must be active until issue is resolved.	We have a 24x7 call center today and could make adjustments and arrangements to add staff if we had 1-2 days notice to arrange the shifts
d. Bilingual Videos on How to Install AVL device for OBDII and JBus Compatible vehicles.	Will be provided.
e. Bilingual Videos on How to Install AVL device for OBDII and JBus on Non- Compatible vehicles.	Will be provided.
f. Bilingual Videos on How to Troubleshoot AVL device for OBDII and JBus Compatible vehicles.	Will be provided.
g. Bilingual Videos on How to Troubleshoot AVL device for OBDII and JBus on Non- Compatible vehicles.	Will be provided.

9. Data:	
a. Do we have access to the full data set real time or near real time? Are there any associated charges?	In addition to a robust suite of APIs for real time data integration or capture (JSON Data pump), we can provide an arrangement where your data can be provided to the VDOT Amazon Web Services account with proper set up and cooperation.
10. Pricing:	
a. Needs to add eVA fees and VITA IFA	Please see updated pricing.
b. Obsolescence plan for the duration of the contract, including existing devices.	CalAmp is proposing LTE devices for the system which should have an expected life time of around 8 years. If for some reason the devices become obsolete during the contract, CalAmp can make upgrade offers/arrangements which may vary in nature based on the length of time remaining on the contract.
c. Clarity on what professional services are included in base price.	CalAmp "Professional Services" is the group that coordinates custom specialized projects for functionality that typically falls outside our standard offerings. Some of the custom work for this project will be included in the base price (reporting), but other items may need to be charged separately from Professional Services, (such as the contractor portal) or where additional work is identified that falls outside of the original scope of work. As for system integration, our CTC platform has robust and well documented APIs that allow for organizations such as VDOT to create interfaces on their own. If VDOT wants us to get involved we would need to know to what extent and we would quote you a number of hours from our Professional Services group.
d. Training on site - $600.00 per day. We need a breakdown of what is included.	On-site training is $620 for a day (7 hours) of training, not including travel and expenses. This include either user and admin software training or hardware installation training. These sessions can be customized to your specific needs if you want small groups, large groups, classroom, train the trainer, hands on, recorded, etc. Live remote training is available at no additional cost. FYI- Our head trainer is located in Virginia.
11. Statewide pricing:	
a. tiered pricing	See pricing. We have added tiers for various service contract lengths as well as quantity tiers.
b. For statewide contract: Any other devices? For example: DGS, VSP, Schools, DOC etc.	See optional items added for other fleets needs.

LMU-3640™ Technical Specifications

Cellular/Network

North American Variant I	
LTE Cat 1	1900 (B2)/AWS 1700 (B4)/850 (B5)/700 (B12) MHz
HSPA/UMTS	850 (V)/1900 (II) MHz
North American Variant II	
LTE Cat 1	AWS 1700 (B4)/700 (B13) MHz
Global Variant	
HSPA/UMTS	800 (VI)/850 (V)/900 (VIII)/1800 (III)/1900 (II) MHz
GSM/GPRS	850/900/1800/1900 MHz

Data Support

SMS, UDP Packet Data, TCP, CalAmp Telematics Cloud API

Satellite Location (GNSS)

Constellation Support	Hybrid GPS, GLONASS, SBAS Engine (WAAS, EGNOS, MSAS)
Channels	55 Channel
Tracking Sensitivity	-162 dBm
Acquisition Sensitivity	-156 dBm (hot start) -148 dBm (cold start)
Location Accuracy	~2.0m CEP Open Sky (SBAS 24 hours static)
Location Update Rate	Up to 4 Hz
AGPS Location assistance capable	

Comprehensive I/O

Ignition Input	1 (fixed bias)
Digital Inputs	4 (high/low bias selectable 0-30 VDC)
Digital Outputs	3 (open collector relay 150mA)
Analog Inputs	2 external ADC inputs
Accelerometer	Built in, triple-axis (driver behavior, impact detection, motion sensing, tilt detection)
1-Wire® Interface	1 (driver ID/temperature sense)
Power Output	1 switched VIN
Status LEDs	4 (GPS, cellular, VBUS, LAN)
Serial Interface	2 TTL ports
Integrated Buzzer	Programmable audible alert
External ADC Inputs	2 (reference voltage - 3.3V)

Certifications

Industry Certifications	FCC, IC, PTCRB, RoHS

Device Management

PULS™	Monitor, manage, upgrade firmware, configure and troubleshoot devices remotely

Embedded Intelligence Engine

PEG™	Update device functionality or develop new on the edge applications

Electrical

Operating Voltage	12/24 VDC Vehicle Systems 9-30 VDC (start-up, operating) 7-32 VDC (momentary)
Power Consumption	Typical 450uA @ 12V (deep sleep) Typical 15mA @ 12V (radio-active sleep) Typical 100mA @ 12V (active tracking w/GPS and cell enabled)

Battery Pack

Battery Capacity	Up to 1000 mAh
Battery Technology	Lithium-Ion
Charging Temperature	0° to +45° C

Environmental

Temperature	-30° to +60° C (connected to primary power) -10° to +60° C (operating on internal battery) -20° to +25° C ≤ 6 months (long term storage with battery)
Humidity	95% RH @ 50° C non-condensing
Shock and Vibration	U.S. Military Standards 202G, SAEJ1455
ESD	SAE J1113-13 (4 KV Limit)

Physical/Design

Dimensions	5.7 x 2.1 x 1.3" (145 x 53 x 33 mm)
Weight	5 oz. (142 g) (w/ 1000mAh battery)

Connectors/SIM Access

Vehicle BUS I/F	16-Pin 3mm Pitch
Power, I/O	24-Pin 3mm Pitch
SIM Access	Internal (2FF SIM)

Interface Standards

Bluetooth	Classic Bluetooth v2.1+EDR and BLE v4.0
Heavy Duty Truck Data	J1939, J1708
Light Duty Vehicle Data	J1850 PWM, J1850 VPW, SW-CAN ISO 9141-2, KWP 2000, ISO 15765 CAN

Product Options

RS-232 on Aux 2
I/O wiring harness
200mAh Lithium-Ion backup battery
Wi-Fi 802.11 a/g/b/n client mode

CALIFORNIA PROPOSITION 65

WARNING: This product can expose you to chemicals including Carbon black and Nickel, which are known to the State of California to cause cancer, and including Bisphenol A and 1,3-Butadiene, which are known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov

LMU-3030™ LTE Technical Specifications

Cellular/Network

North American Variant I LTE Cat 1	1900 (B2)/AWS 1700 (B4)/700 (B12) MHz
North American Variant II LTE Cat 1	AWS 1700 (B4)/700 (B13) MHz

Data Support

SMS, UDP Packet Data, TCP, CalAmp Telematics Cloud API

Satellite Location (GNSS)

Constellation Support	GPS, GLONASS, SBAS Engine (WAAS, EGNOS, MSAS, GAGAN)
Channels	55 Channel
Tracking Sensitivity	-167 dBm
Acquisition Sensitivity	-157 dBm (hot start) -148 dBm (cold start)
Location Accuracy	~2.0m CEP Open Sky (GPS SBAS 24 hours static)
Location Update Rate	Up to 4 Hz
AGPS Location assistance capable	

Comprehensive I/O

OBD-II Interface	J1850 PWM, J1850 VPW, ISO-9141-2, ISO-14230 (KWP 2000), SW-CAN, ISO-15765 CAN
Serial Port	2-wire TTL Serial Interface
Bluetooth	Bluetooth Low Energy (BLE)
Status LEDs	3 (OBD, GPS, cellular)
Integrated Buzzer	Programmable audible alert
Accelerometer	Built in, triple-axis (driver behavior, impact detection, motion sensing, tilt detection)

Certifications

Industry Certifications	FCC, IC, CE, PTCRB, RoHS

Device Management

PULS™	Monitor, manage, upgrade firmware, configure and troubleshoot devices remotely

Embedded Intelligence Engine

PEG™	Update device functionality or develop new on the edge applications
Geo-Fences	32 built-in
Buffered Messages	2000

Electrical

Operating Voltage	12/24 VDC Vehicle Systems 9-30 VDC (start-up, operating) 7-32 VDC (momentary)
Power Consumption	Typical 2mA @ 12 V (deep sleep) Typical 40mA @ 12 V (active tracking w/ GPS and cell enabled)

Battery Pack

Battery Capacity	180 mAH
Battery Technology	Lithium-Ion
Charging Temperature	0° to +45° C

Environmental

Temperature	-30° to +60° C (connected to primary power) -20° to +60° C (operating on battery) -20° to +25° C ≤ 6 months (long term storage with battery)
Humidity	95% RH @ 50° C non-condensing
Shock and Vibration	U.S. Military Standards 202G, 810F; SAEJ1455
ESD	IEC 61000-4-2 (4KV Test)

Physical/Design

Dimensions	1.8 x 2.6 x 1.1" (46 x 67 x 28 mm)
Weight	1.75 oz (50 g)

OBD Data Extraction

Detection	Automatic detection of vehicle interface services
Extraction	Transmission of standard OBD-II codes, plus manufacturer specific codes which are made available by the embedded OBD firmware stack
Scripts	Download of vehicle specific diagnostic scripts dependent on vehicle model variant

Connectors/SIM Access

GPS Antenna	Internal
Cellular Antenna	Internal
SIM Access	Internal (2FF SIM)

CALIFORNIA PROPOSITION 65

WARNING: This product can expose you to chemicals including Carbon black and Nickel, which are known to the State of California to cause cancer, and including Bisphenol A and 1,3-Butadiene, which are known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov

TTU-2830™ Technical Specifications

Cellular/Network

North American Variant I	
LTE Cat 1	1900 (B2)/AWS 1700 (B4)/850 (B5)/700 (B12) MHz
HSPA/UMTS	850 (V)/1900 (II) MHz
North American Variant II	
LTE Cat 1	AWS 1700 (B4)/700 (B13) MHz
Global Variant I	
HSPA/UMTS	800 (VI)/850 (V)/900 (VIII)/1800 (III)/1900 (II) MHz
GSM/GPRS	850/900/1800/1900 MHz
Global Variant II	
GSM/GPRS	850/900/1800/1900 MHz

Data Support

SMS, UDP Packet Data, TCP, CalAmp Telematics Cloud API

Satellite Location (GNSS)

Constellation Support	Hybrid GPS, GLONASS, SBAS Engine (WAAS, EGNOS, MSAS)
Channels	55 Channel
Tracking Sensitivity	-167 dBm
Acquisition Sensitivity	-156 dBm (hot start) -148 dBm (cold start)
Location Accuracy	~2.0m CEP Open Sky (SBAS 24 hours static)
Location Update Rate	Up to 4 Hz
Anti-jamming	
AGPS Location assistance capable	

Comprehensive I/O

Ignition Inputs	1 fixed bias
Digital Inputs	2 (high/low bias selectable 0-30 VDC)
Digital Outputs	3 (open collector relay 150mA)
Analog Inputs	1 external ADC input
Accelerometer	Built in, triple-axis (driver behavior, impact detection, motion sensing, tilt detection)
Serial Interface	1 TTL port
1-Wire® Interface	1 (driver ID/temperature sense)
Status LEDs	2 (GPS and cellular)

Certifications

Industry Certifications	FCC, IC, PTCRB, RoHS

Electrical

Operating Voltage	12/24 VDC Vehicle Systems 9-30 VDC (start-up, operating) 7-32 VDC (momentary)
Power Consumption	Typical 400uA @ 12V (deep sleep) Typical 15mA @ 12V (radio-active sleep) Typical 60mA @ 12V (active tracking w/GPS and cell enabled)

Battery Pack

Battery Capacity	Up to 5200 mAh
Battery Technology	Lithium-Ion
Charging Temperature	0° to +45° C

Environmental

Temperature	-30° to +60° C (connected to primary power) -20° to +60° C (operating on internal battery) -20° to +25° C (storage > 3 months)
Humidity	95% RH @ 50° C non-condensing
Shock and Vibration	U.S. Military Standards 202G, SAEJ1455
ESD	SAE J1113-13 (4 KV Limit)
Ingress Protection Rating	IP66

Physical/Design

Dimensions	4.5 x 3.2 x 1.6" (114 x 80 x 39mm)
Weight	8.11 oz. (230g)

Connectors/SIM Access

Power, I/O	12 wire captive harness
SIM Access	Internal (2FF SIM)

Device Management

PULS™	Monitor, manage, upgrade firmware, configure and troubleshoot devices remotely

Embedded Intelligence Engine

PEG™	Update device functionality or develop new on the edge applications

CALIFORNIA PROPOSITION 65

WARNING: This product can expose you to chemicals including Carbon black and Nickel, which are known to the State of California to cause cancer, and including Bisphenol A and 1,3-Butadiene, which are known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov

LMU-5531™ Technical Specifications

Cellular/Network

North American Variant I	
LTE Cat 3	1900 (B2)/AWS 1700 (B4)/850 (B5)/700 (B12) MHz
HSPA/UMTS	850 (V)/AWS 1700 (IV)/1900 (II) MHz
GSM/GPRS	850/900/1800/1900 MHz
North American Variant II	
LTE Cat 1	AWS 1700 (B4)/700 (B13) MHz
Global Variant	
HSPA/UMTS	800 (VI)/850 (V)/900 (VIII)/1900 (II)/2100 (I) MHz
GSM/GPRS	850/900/1800/1900 MHz

Data Support

TCP/IP, UDP/IP, DHCP, HTTP, IP Router, PPP, HTTP web server, Telnet DHCP server, DDNS, DDNS Client, NAT, NMEA, TAIP, TSIP, TFTP, IP port forwarding, CalAmp Telematics Cloud API

Satellite Location (GNSS)

Constellation Support	Hybrid GPS, GLONASS, SBAS Engine (WAAS, EGNOS, MSAS)
Channels	56 Channel
Tracking Sensitivity	-162 dBm
Acquisition Sensitivity	-156 dBm (hot start) -148 dBm (cold start)
Location Accuracy	~2.0m CEP Open Sky (GPS SBAS 24 hours static)
Location Update Rate	Up to 4 Hz
AGPS Location assistance capable	

Comprehensive I/O

Digital Inputs	7 (high/low selectable 0-30 VDC)
Digital Outputs	5 relay driver outputs (200mA) 2 low current LED outputs (20mA)
Analog Inputs	5 general purpose A/D (0-30 VDC)
Accelerometer	Built in, triple-axis (driver behavior, impact detection, motion sensing, tilt detection)
1-Wire® Interface	2 (driver ID, temperature sense)
Status LEDs	4 (Pwr, COMM, GPS, Wi-Fi, BT)
Serial Interface	1 DB-9 (RS232/RS485), 1 5-Pin TTL level switch power

Certifications

Industry Certifications	FCC, CE, IC, PTCRB, RoHS

Device Management

PULS™	Monitor, manage, upgrade firmware, configure and troubleshoot devices remotely

Embedded Intelligence Engine

PEG™	Update device functionality or develop new on the edge applications

CALIFORNIA PROPOSITION 65

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Electrical

Operating Voltage	12/24 VDC Vehicle Systems 9-30 VDC (start-up, operating) 8-32 VDC (momentary)
Power Consumption	<2mA @ 12V (deep sleep) 160mA @ 12V (idle on network) 270mA @ 12V (active tracking)

Battery Pack

Battery Capacity	Up to 1000 mAh
Battery Technology	Lithium-Ion
Charging Temperature	0° to +45° C

Environmental

Temperature	-30° to +70° C (connected to primary power) -40° to +85° C (storage)
Humidity	95% RH @ 50° C non-condensing
Shock and Vibration	U.S. Military Standards 202G, 810F, SAE J1455
ESD	SAE J1113 (4 KV Limit)

Physical/Design

Dimensions	5.8 x 4.0 x 1.2" (146 x 102 x 40 mm)
Weight	8.0 oz. (227g)

Connectors/SIM Access

Power, Ignition, ADC	4-Pin Connector
I/O	22-Pin Connector
GPS Antenna	External
SIM Access	External
Ethernet	2x 10/100 Base-T RJ45
USB	On-the-go (mini), Host Type A

Interface Standards

Bluetooth	4.0 Dual-Mode Classic, BLE
Wi-Fi	802.11 b/g/n Supports access point and/or client operations Supports internal/external antenna

Product Options

All necessary antennas (GPS, cellular, combined GPS/cellular)
Serial adapter cable RS-232 8-wire (PPP, AT commands, NMEA GPS output)
Internal/External/Optional jPOD™ truck ECU interface
Connectorized I/O wiring harnesses

TTU-730™ Technical Specifications

Cellular/Network

North American Variant I	
LTE Cat 1	1900 (B2)/AWS 1700 (B4)/850 (B5)/700 (B17) MHz
HSPA/UMTS	850 (V)/1900 (II) MHz
North American Variant II	
LTE Cat 1	AWS 1700 (B4)/700 (B13) MHz

Data Support

SMS, UDP Packet Data

Satellite Location (GNSS)

Constellation Support	GPS, GLONASS, SBAS Engine (WAAS, EGNOS, MSAS, GAGAN)
Channels	55 Channel
Tracking Sensitivity	-167 dBm
Acquisition Sensitivity	-157 dBm (hot start) -148 dBm (cold start)
Location Accuracy	~2.0m CEP Open Sky (SBAS 24 hours static)
Location Update Rate	1 Hz
AGPS Location assistance capable	

Certifications

Industry Certifications	FCC, IC, PTCRB, RoHS

Device Management

PULS™	Monitor, manage, upgrade firmware, configure and troubleshoot devices remotely

Embedded Intelligence Engine

PEG™	Behavioral scripting (8-bit support)
Accelerometer	Built-in, triple-axis (motion sensing, tilt detection)
Geo-fences	10 built-in
Buffered Messages	2000

Electrical

Operating Voltage	3.6V internal battery
Power Consumption	Typical 30uA @ 3.6V (hibernate) Typical 50uA @ 3.6V (deep sleep) Typical 50mA @ 3.6V (active GPS tracking only) Typical 80mA @ 3.6V (cellular idle only)

Battery Pack

Battery Capacity	Up to 57 Ah
Battery Voltage	3.6V
Battery Technology	Lithium Primary

Environmental

Temperature	-30° to +65° C (operating and storage)
Humidity	95% RH @ 50° C non-condensing
Shock and Vibration	U.S. Military Standards 202G, 810F, SAE J1455
ESD	IEC 61000-4-2 (4KV test)
Ingress Protection Rating	IP67

Physical/Design

Dimensions	9.90 x 2.35 x 2.45" (251 x 60 x 62 mm)
Weight	23.2 oz. (658 g)

Connectors/SIM Access

GPS Antenna	Internal
Cellular Antenna	Internal
SIM Access	Internal (2FF SIM)

Product Options

CalAmp Telematics Cloud API

CALIFORNIA PROPOSITION 65

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TTU-2840XTreme™ Technical Specifications

Cellular/Network

North American Variant I	
LTE Cat 1	1900 (B2)/AWS 1700 (B4)/850 (B5)/700 (B12) MHz
HSPA/UMTS	850 (V)/1900 (II) MHz
North American Variant II	
LTE Cat 1	AWS 1700 (B4)/700 (B13) MHz

Data Support

SMS, UDP Packet Data, TCP, CalAmp Telematics Cloud API

Satellite Location (GNSS)

Constellation Support	Hybrid GPS, GLONASS, SBAS Engine (WAAS, EGNOS, MSAS)
Channels	55 Channel
Tracking Sensitivity	-167 dBm
Acquisition Sensitivity	-156 dBm (hot start) -148 dBm (cold start)
Location Accuracy	~2.0m CEP Open Sky (SBAS 24 hours static)
Location Update Rate	Up to 4 Hz
Anti-jamming	
AGPS Location assistance capable	

Comprehensive I/O

Ignition Inputs	1 fixed bias
Digital Inputs	2 (high/low bias selectable 0-30 VDC)
Digital Outputs	3 (open collector relay 150mA)
Analog Inputs	1 external ADC input
Accelerometer	Built in, triple-axis (driver behavior, impact detection, motion sensing, tilt detection)
Serial Interface	1 TTL port
1-Wire® Interface	1 (driver ID/temperature sense)
Status LEDs	2 (GPS and cellular)

Certifications

Industry Certifications	FCC, IC, PTCRB, RoHS

Device Management

PULS™	Monitor, manage, upgrade firmware, configure and troubleshoot devices remotely

Embedded Intelligence Engine

PEG™	Update device functionality or develop new on the edge applications

Electrical

Operating Voltage	12/24 VDC Vehicle Systems 9-32 VDC (start-up, operating) 7-32 VDC (momentary)
Power Consumption	Typical 400uA @ 12V (deep sleep) Typical 15mA @ 12V (radio-active sleep) Typical 60mA @ 12V (active tracking w/GPS and cell enabled)

Battery Pack

Battery Capacity	Up to 5300 mAh
Battery Technology	Lithium-Ion
Charging Temperature	-15° to +55° C (extended temperature range)

Environmental

Temperature	-30° to +60° C (connected to primary power) -20° to +60° C (operating on internal battery) -20° to +35° C (storage > 3 months)
Humidity	95% RH @ 50° C non-condensing
Shock and Vibration	U.S. Military Standards 202G, SAEJ1455
ESD	SAE J1113-13 (4 KV Limit)
Ingress Protection Rating	IP67

Physical/Design

Dimensions	5.4 x 3.1 x 2.0" (137 x 80 x 52mm)
Weight	12.06 oz. (342g)

Connectors/SIM Access

Power, I/O	12 wire connector with detachable harness
SIM Access	Internal (2FF SIM)

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Cal/Amp®

Custom Garmin Driver Interface

- Garmin FMI Integrated
- Touchscreen
- Customized Canned Two-Way Messaging
- Driver Login
- Turn by Turn Navigation

General

Physical dimensions	5.5"W x 3.3"H x .7"D (14.0 x 8.4 x 1.8 cm)
Display size	4.4"W x 2.5"H (11.1 x 6.3 cm); 5.0" diag (12.7 cm)
Display resolution	480 x 272 pixels
Display type	WQVGA color TFT with white backlight, glass capacitive touch
Dual-orientation display	✓
Weight	6.1 oz (173.7 g)
Battery	rechargeable lithium-ion
Battery life	up to 1 hour

Maps & Memory

Preloaded street maps	✓
Includes map updates	✓
Data cards	microSD™ card (not included)

Camera Features

Backup camera compatible	yes (BC™ 30 or BC™ 40)

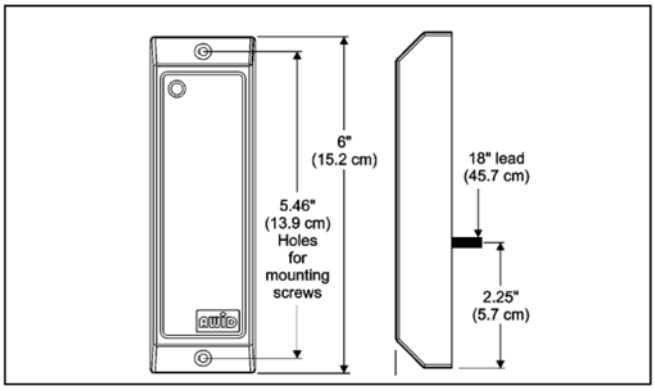
Navigation Features

Garmin Real Directions™ landmark guidance	✓
Millions of Foursquare® points of interest	✓
TripAdvisor® ratings for points of interest	✓
Route shaping through preferred cities/streets	✓
Voice-activated navigation (operate device with spoken commands)	✓
Includes traffic	✓
Lane assist with junction view (displays junction signs)	✓
Bluetooth® calling	✓
Speed limit indicator (displays speed limit for most major roads in the U.S. and Europe)	✓
Driver alerts for sharp curves, school zones, red light and speed camera warnings and more	✓

Specifications and model subject to change.

Cal/Amp®

Driver ID – Dash-Mounted RFID Reader



FEATURES

Compact size…
Fits on a mullion or door frame

Clean, slim design…
Matches good architecture at site

Ready for rough usage…
Rugged, strong construction

Ready for adverse weather…
One-part enclosure with potting

Easy mounting…
2 screws (supplied) for fastening

Special read range in a small unit…
Up to 8 inches with cards

Visual and audible indicators…
3-color LED and beeper inside reader

Controllable functions in reader…
LED, beeper, hold can be wired to panel

Specifications subject to change.

OPERATING CHARACTERISTICS

Reading Distance:
With cards – Up to 8 inches (varies with mounting method, voltage applied to reader, and credential type)

Excitation Frequency:
Transmit and Receive - 125 kHz

Antenna Output:
Omni-directional low-frequency RF field

Indicators (Control by Reader and Panel):
LED – 3 colors, red-amber-green
Beeper – piezo-electric, 4 kHz tone

Power Supply:
+5 volts to +12 volts DC, linear, regulated
Current rating: 120 mA at 5 V, 200 mA at 12 V

Communication Protocols:
Wiegand electrical interface
RS-232 serial interface

Code Formats:
Determined by AWID's credentials programmed with 26 bits to 50 bits

Cable (for Wiegand Interface):
4 to 7 conductors (not twisted pairs), stranded, 22 gauge, color-coded, overall 100% shielded, plastic jacket; up to 500 ft

PHYSICAL CHARACTERISTICS

Dimensions:
6.0 x 1.75 x 1.0 inches (15.24 x 4.45 x 2.54 cm)

Weight:
6 ounces (170 g)

Material:
ABS 1-part enclosure, dark gray color
Epoxy resin potting at rear surface

Cable (Integrated with Reader):
10 conductors, 22 gauge, 18 inches long.
Overall shielded, gray plastic jacket

Mounting:
Door frame, window mullion, wall, cabinet

ENVIRONMENT

Operating Temperature:
-31˚F to 150˚F (-35˚C to 65˚C)

Operating Humidity:
0% to 95% non-condensing

Protection from Environment:
Use Lexan housing when reader must be removed from view or protected from damage.

Avoiding Interference:
Optimize reader performance by spacing or shielding reader from neighboring readers, including reader on other side of wall at door.

CERTIFICATION

ISO-9001:2000; FCC Part 15; IC; UL listed