



Powerfleet for Vehicles Proof of Concept Guide

Exclusively created for



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1. Problem Statement

With so many assets on the road, it can be difficult to manage your rental fleet. Normal wear and tear, theft, and billing inefficiencies can be a challenge to run a profitable operation. Preventative maintenance can be difficult to track and may rely on customer feedback when there is an issue. Tracking systems are not always offered by the OEM and can be very costly. Fuel and mileage billing can be an imperfect science that relies on an agent to visually inspect the dashboard. All these factors and more make it a challenge to operate a cost-effective and efficient Rental Fleet.

Powerfleet lets you dive deeper into your car rental operations, gaining deep insights to help you streamline processes and drive constant operational improvement. Specifically built to automate car rental and return processes, RentalFleet provides real-time visibility to see the big picture.

- Increase fuel revenues and reduce fuel costs
- Library of OBD-II code interfaces
- Optimize car return and processing speed
- Quickly determine ready to rent cars
- Easily install in any make or model
- Download future software upgrades wirelessly
- Gain real-time insight

2. Solution Overview

Powerfleet's Class 2 – 5 rental and private fleet vehicle status and tracking solution offers:

1. The Keyless Vehicle Gateway (KVG) plug-and-play OBDII connected device.
2. Make, Model and Year specific vehicle certification providing hyper accurate fuel & odometer.
3. LTE Cellular data distributed communication to a secure central SaaS application (RentalFleet)
4. End-to-End data security using enhanced AES256 encryption.
5. Enhanced CoAP UDP transport layer for high delivery reliability and low data consumption
6. Secure RESTful API vehicle telemetry uplink and control downlink data exchange

The fully integrated and field proven HW/FW/SW solution allows rental and private fleet operators to confidently and seamlessly monitor vehicle status and usage to bill for fuel recovery, identify usage trends, track location, identify theft or misuse and integrate with other systems to realize the highest return on assets with minimal manual intervention.

The KVG is a 3.00" x 2.00" x 1.50" main enclosure with a 10.0" OBD cable and connector assembly. The OBD connector includes Green and Red LEDs and a sliding latch to ensure connection to the vehicle OBDII port. The KVG includes a main processor, LTE/3G cellular modem, GPS module, BLE4.1 module, ISM transmitter and vehicle power protection circuitry (see Figure 1).



Figure 1 KVG Assembly

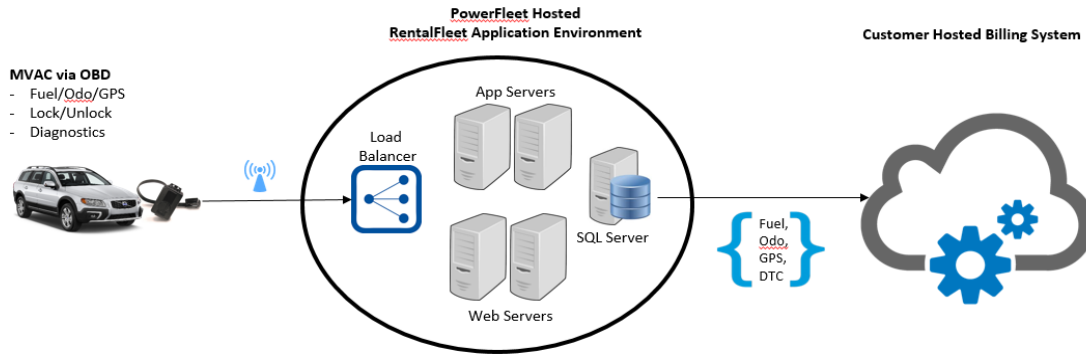


Figure 2 KVG, RentalFleet and 3rd Party System Overview

Vehicle status data includes but is not limited to:

1. Fuel Level to +/- 0.3 Gallon Accuracy
2. Odometer to +/- 0.6 Mile Accuracy
3. GPS Position Location Less Than Three Meter 90% Circular Error Probability (CEP)
4. Vehicle Battery State (Normal, Warning, Critical)
5. Vehicle Battery Voltage to 1/10th of a Volt Accuracy
6. Diagnostic Trouble Code (DTC) and General Description Set and Clear Reporting

The KVG HW/FW device and the entire system has successfully passed several rounds of extensive penetration testing and reviews to guarantee state of the art security and prevent bad actors from compromising the integrity of the whole fleet even if one or more devices are completely compromised.

3. Proof of Concept Scope

The intent of this Proof of Concept (PoC) is to demonstrate the end-to-end core functionalities of the KVG HW/FW platform quickly and efficiently and RentalFleet SaaS system on a few select vehicle makes and models.

The suggested PoC includes two phases with API Support(if applicable): Setup/Verification and Evaluation.

1. Setup (1 week)
 - a. System Overview
 - b. KVG delivery
 - c. Certified vehicle Make, Model, Year (MMY) discussion.
 - d. API Review and RentalFleet platform review

2. Evaluation (3 weeks)
 - a. Independent Testing – 3 weeks on demand support
 - b. Issues and questions and answers – throughout evaluation phase
 - c. Results Review
 - d. Decision to Proceed

3. API Support (if applicable)
 - a. API development support
 - b. Integration Testing
 - c. Agreement on data exchange authentication (if any)

4. SIXT and Powerfleet Teams

1. Powerfleet Team
 - a. Solutions Lead – Justin Schneider (Manager, Solutions Consulting)
 - b. Sales Lead – Glenn Martin (Sales Director)
 - c. Product Manager – Eric Frey (Director, Global Product Management)
 - d. SW Development Lead for API – Dennis Senior (Senior SW Engineer)
 - e. Business Lead – Josh Betz (SVP of Sales)

2. SIXT Team
 - a. Business Lead –
 - b. Technical Lead –

5. Evaluation Metrics

Evaluation should be mainly focused on the telemetry data reported and posted to the Restful API endpoint.

Evaluation Metrics	Control Limits
Installation Guidelines and Timeliness	Guidelines: No wire cutting, or cable adapters required (OBDII connection only) Latency: <=5 minutes (cellular coverage required)
GPS Accuracy and Timeliness	Accuracy: <= 3 meters 90% CEP (under dash) Latency: <=2 minutes
Odometer Reporting Accuracy and Timeliness	Accuracy: <= 1km Latency: <=2 minutes
Fuel Reporting Accuracy and Timeliness	Accuracy: <= 0.3 gallons Latency: <=2 minutes
Vehicle State Change Reporting Timeliness	Engine On-to-Telemetry Reported: <10 seconds. Engine Off-to-Telemetry Reported: <10 seconds. Continued Engine On-Telemetry Reported: <10 seconds
Battery Drain with Prolonged Idle Periods	mA Current draw: <= 20 mA (healthy battery)
Standard DTC Set & Clear Reporting	DTC Set-to-Telemetry Reported: <10 seconds. DTC Cleared-to-Telemetry Reported: <10 seconds.

6. Success Criteria

The following items should be assessed during the evaluation period:

1. **Installation** – The KVG HW/FW platform connects directly into the vehicle OBD-II port and takes <=5 minutes to boot up and in-fleet on certified vehicles. Refer to the certified model list on the RentalFleet platform or MMY Certified Models Report. After successful in-fleet, the KVG and OBD cable are secured under the dash with cable ties.

The KVG contains Red and Green LEDs that indicate status during the bootup, in-fleet, and FOTA processes.

Cellular coverage is critical during installation as the KVG must connect to the RentalFleet back office to complete system configuration and in-fleeting.

Installation Recommended Test Cases	
<p>Select a vehicle from the certified models list and provide test vehicle VIN(s) to PowerFleet.</p> <p>Once Powerfleet confirms VIN has been added to the system, install the KVG on the test vehicle(s).</p> <p>NOTE: The KVG can be installed first before providing the VIN. A Red LED will indicate that it is not a recognized vehicle but once Powerfleet is notified of the MMY of the install, Powerfleet will assign the model to the VIN.</p>	<p>Check to see that KVG LED blinks slow Green initially and finally turns Solid Green at or before 5 minutes, indicating successful in-fleet.</p>
<p>Select a vehicle not on the certified list and install the KVG.</p>	<p>LED blinks slow Green initially during first 1-2 minutes and finally turns Solid Red after ~3 minutes, indicating non-certified vehicle.</p>

2. **Telemetry Data Reporting Interval** - The KVG reports every 2 minutes by default while the engine is on (adjustable) and every 4 to 6 hours while the engine is off. Each engine state transition generates a telemetry message.

Telemetry Data Reporting Interval Recommended Test Cases	
Turn engine on	System should report a telemetry record
Turn engine off	System should report a telemetry record
Drive vehicle for 10 minutes	System should report a telemetry record every 2 minutes (adjustable) while the engine is on
Leave vehicle idle for 24 hours	System should report a telemetry record every 4-6 hours while engine is off

3. **Fuel Level Reporting Accuracy** – The PowerFleet fuel characterization process ensures that fuel level reporting is accurate to within +/- 0.3 Gallons. Several fuel level reporting accuracy tests are recommended to ensure correct fuel reporting is realized during utilization and immediately following a fill up scenario.

The most accurate readings from the Powerfleet solution are found when these factors are involved:

- Time – Needed for taking sufficient samples.
 - We recommend at least 3 minutes between tests to allow for rolling average and sloshing algorithm to assist with the collection of data.
- Engine state transition – Turn the vehicle off after a short period of driving or a minimum of 3 minutes of engine-on activity.
 - This helps the fuel algorithm to detect “quick refuel” events that may not involve a large increase (i.e., 2-gallon increase)

Fuel Level Reporting Accuracy Recommended Test Cases	
Start with a full tank of gas.	Ensure full tank reported.
Drive vehicle ~80 miles (if mpg known, drive 3 x MPG miles). For example, if MPG is 25 miles, drive 75 miles and check to see that fuel reading reflects loss of 3 gallons of fuel in the new reading.	Ensure correct fuel is reported.
Fill tank up. New reading should take less than 2 minutes after engine on to reflect actual fuel level.	Check to see that fuel added matches fuel utilized in previous step and that the tank is now full.

4. **Odometer and GPS accuracy** – The odometer reading will be reported at each engine on event and while the engine is on and may take up to 2 minutes to report after initial KVG in-fleet. Odometer readings are reporting in tenths of miles and are accurate to at least .6 miles (~1 km).

GPS readings are sampled several times per second and are reflected at each data upload interval. The most accurate GPS location readings are achieved in area without overhead cover.

Odometer and GPS Accuracy Recommended Test Cases	
Turn engine on	Verify telemetry odometer matches dashboard odometer and telemetry latitude/longitude match actual location (use Google Maps on mobile device in vehicle).
Drive 10 miles, park vehicle in nearest parking lot.	Verify odometer increase is reported correctly and lat/long location matches mobile device location.

7. Weekly Pulse Call Agenda

All team members will meet weekly to review current progress and resolve any outstanding issues as they arise. See brief outlined agenda below:

- Review Current Progress
- Resolve Roadblock Issues
- Q&A Session