

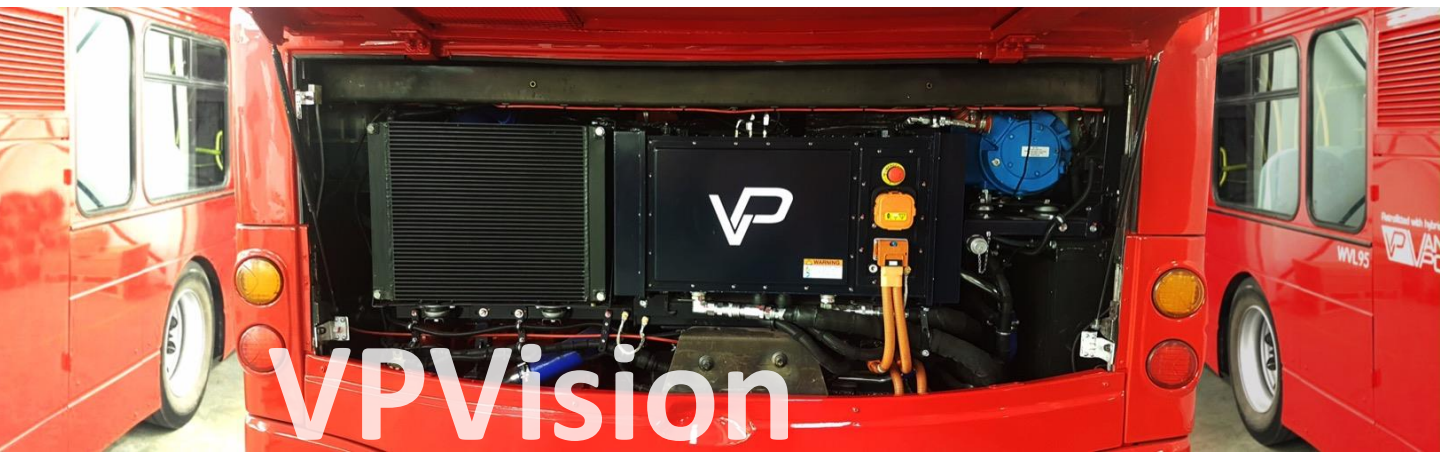


Heavy Duty Vehicle Telemetry

Next generation telemetry solution for vehicles, systems and components.



Connected and Electrified Powertrains



Next-Gen Telemetry Solution

VPVision is a low cost next-generation telemetry platform that has streamlined and delivered new capabilities in heavy duty vehicle operation and maintenance, as well as providing strategic benefits to OEMs, tier 1 and 2 organisations.

Vantage Power has 7 years of designing, building and fielding hybrid and electric powertrains, and VPPVision has been built off the back of this extensive real-world experience. In-depth knowledge of driveline components and lithium-ion batteries has resulted in the most comprehensive integration, generating better insights and new advanced capabilities.

Reduce the cost and improve the performance of your aftermarket service and support...plus:

Legislation – Using live real-world data, demonstrate emissions and other legislation compliance for every connected device.

Time-to-market – The risk of new tech deployments is reduced with 24-7 monitoring and alerts. Issues are diagnosed and resolved rapidly accelerating product maturity.

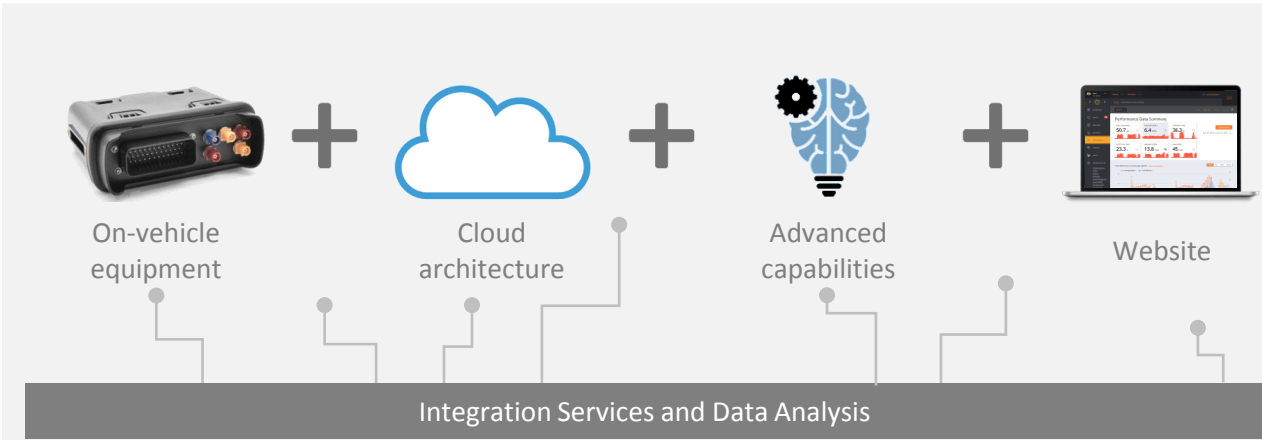
Value streams – Create new data-driven capabilities that can generate revenue and provide a competitive advantage.

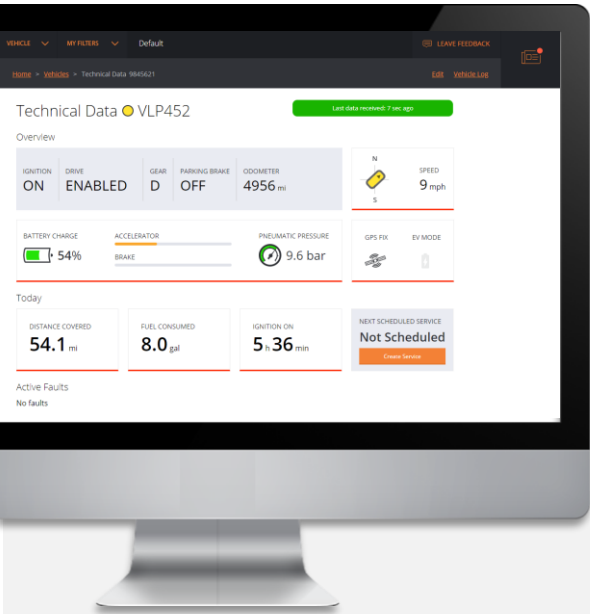
Innovation – Continually monitor and optimise your product performance, understand failure modes, make improvements and immediately understand the impact.

Risk management – A data-driven approach is required to correctly manage the transition to electrification. Ensure warranty stock, service interventions and mitigation plans are based on current accurate insights .



Main Components:



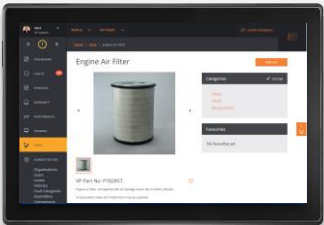


Website

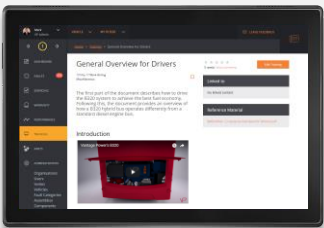
The main user interface is the website which can be used as standard or customised to specific requirements. It's browser based and compatible with PC, tablet and smart phone with no additional software. Data is translated and presented as meaningful information which can be augmented by users who can add greater context.

Live data typically has an age of 2 – 5 seconds and historical data can be accessed many years later if required. Admin controls ensure user access is tailored to specific features and devices, so the right information gets to the right people.

Features



Fault Management: Fault alerts are live and include the fault code and description. Selected channels leading up to and after the fault are displayed so device status can be understood. Prior occurrences of the fault and the fault category can be quickly identified. This enables faults to be diagnosed, understood and resolved rapidly and remotely.



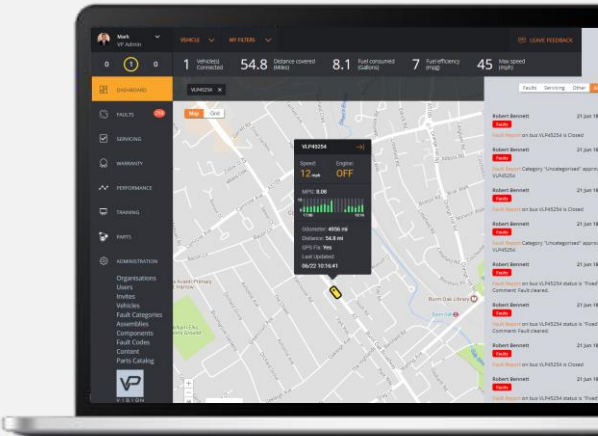
Performance: Selected data can be presented graphically, and users can view and compare key performance indicators such as on-time or distance, fuel efficiency and emissions, or download raw data for post-processing.

Servicing: A dynamic data-driven servicing routine can be created where servicing tasks can be triggered based on utilisation, performance or other criteria.

Live data: A live technical page presents low-latency data enabling a detailed device status and driver/external inputs to be monitored. This has proven to be invaluable when troubleshooting faults providing remote driver assistance.

Warranties, manuals, online shop & configuration: The data-driven capabilities are supplemented with information including warranty durations, published content such as datasheets, manuals and videos, an online shop and build configuration.

Connecting these features in one website means tasks become more data-driven, automated and based on current information. This offers efficiency improvements and cost reductions to OEM's and vehicle operators.



Dashboard: View individual devices or entire fleets, their location, live data, fault status, utilisation and performance metrics.





CORE ARCHITECTURE - A LAUNCH PLATFORM FOR INNOVATION

Re-usable, flexible, scalable, powerful, cutting-edge and massively capable.

Features and Benefits

- Utilises the latest tech from the world's largest cloud computing service.
- Rapid worldwide low-latency deployments at minimal cost.
- No back-end infrastructure is required.
- End-to-end encryption and authentication ensures excellent security.
- Scales automatically to take on billions of new connections.
- Bi-directional communication enables features such as geo-fencing.
- Unparalleled flexibility and stability tried and tested on thousands of different applications.
- Provides a mechanism to create artificial intelligence.
- Capable architecture is an enabler for smart cities, fault prognostics and other software driven advances.

At the heart of VPVision sits the architecture which connects devices to the cloud. Created as a common platform it can be applied to new applications rapidly, at low cost and at breath-taking scale.

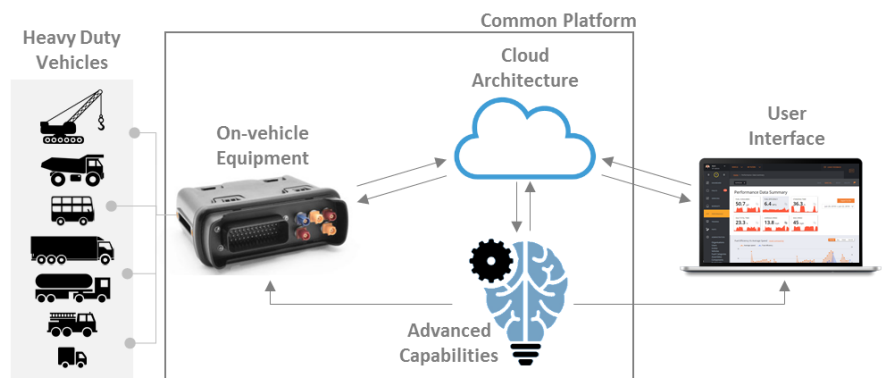
Increasingly, organisations are recognising the value of data - but obtaining it reliably, affordably and at scale has always been an inhibitor. VPVision overcomes these obstacles by using Amazon Web Services (AWS), the world's largest cloud computing provider, to create a common platform that extends from the cloud to the connected device.

Since collecting real-world data from millions of devices is made easy, what do you do with it?

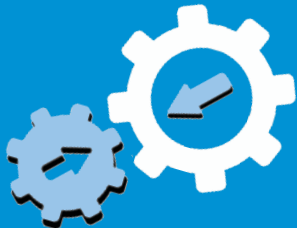
VPVision isn't just about presenting data, it creates an environment for fast complex learning. Analysis is conducted on huge datasets over a fleet of devices. This has enabled users to determine how parts in-service are getting damaged or why performance is deteriorating. New insights can be obtained by viewing the website, using analysis tools and with artificial intelligence.

Once a new understanding is obtained it can be automated and deployed at scale. The analysis, which might offer reliability or performance benefits, can be executed in the cloud which provides a good location to trial, test and mature software at low risk. Alternatively, new code can be deployed and executed locally on the device, offering low latency and a lower cost solution.

The platform enables incredible insights to be obtained and capable software to be developed to capitalise on this. This process to learn, develop, trial, deploy at scale and continually improve, stimulates innovation and creates new data-driven capabilities throughout a product's lifecycle.



Integration Service and Data Analysis



Integration: Sensor to
Screen



Insights: Fault analysis &
Performance analysis

The VPVision platform has been conceived on the principle that most connected devices will be different, data will be different and customer needs for each application will be different.

The on-vehicle equipment can be configured to translate input signals in to a common format. This maximises code re-use and allows for rapid and remote integration.



When deploying VPVision, customers have the option of using a standard setup or tailoring to their specific requirements. Creating requirements for connected devices is no easy task and Vantage Power engineers can analyse needs and optimise a new application for cost and capability.

The on-vehicle hardware and software required for a VPVision integration is supplied. If an application requires authority over device behaviour (ie geo-fencing), VP’s expertise in safety critical control software ensures this can be achieved.



A standard implementation of VPVision will immediately enable a customer to start conducting analysis and obtaining new insights.

Performance Analysis: Real-world data is presented live 24/7 providing foresight and alerts in case device performance falls out of compliance with contractual requirements or legislation. If more insight is needed, performance can be reviewed in detail over many years to identify and understand trends or step changes.

As more is learnt about in-service products, VPVision provides an easy process to introduce new automated performance measures. These can be used to ensure devices continue to operate as expected or can show where changes can be made that will improve performance further.

Fault Analysis: Fault codes are streamed live so users are instantly alerted and can see the location, fault description, whether it’s a repeat issue and how it was resolved last time. The value of selected channels 5 minute pre and post failure are displayed meaning a greater understanding of what was happening at the time can be obtained.

Fault categories are created for reoccurring faults and detail how they are diagnosed and fixed, ensuring consistency of approach. If more information is needed, log data can be analysed using data analysis tools. This has been used to perform remote fault diagnosis and reduce on-site visits, identify warranty infractions and liability, trend failure categories to prioritise issues and ultimately achieve greater availability and reduce costs.

Advanced Capabilities

BIG DATA ANALYTICS AND MACHINE LEARNING



VPVision has established a mechanism to utilise the latest software driven technology capabilities such as artificial intelligence, big data and edge computing. The ease with which these can be accessed and employed to deliver value is a major differentiator. These can be used to provide advanced analysis, automated decision making and introduce new features.

The opportunity to apply these capabilities to benefit different stages of a product development lifecycle, to enhance business processes and to offer new services in the aftermarket are vast. They are the enabling technologies required as we transition toward smart cities, where vehicles communicate with their environment, to self-optimisation where performance can be improved based on routine or prevailing conditions, and prognostics where faults are anticipated in advance.



A.I, edge computing and big data analytics are new services that can be leveraged by VPPVision today to deliver real value and keep you at the forefront of technology for years to come.

HOW HAVE THESE BEEN USED?

The three examples below demonstrate how different technologies within VPPVision have been utilised and the benefits obtained. These same capabilities can be accessed by anyone that uses the VPPVision platform.

Machine Learning: Lithium-Ion batteries can experience cell deterioration that's difficult to detect. If left unchecked, a single cell can pull down the performance of an entire battery. Machine learning algorithms have been trained to automatically identify small fluctuations in data trends over time to identify these issues in advance, before they become a serious problem.

Edge Computing: The cloud presents an excellent environment to create advanced analysis capabilities which, once mature, are better executed on vehicle offering lower latency, less data transmission and cost savings. Cloud based analysis was used to develop an algorithm that can predict pressure spikes in air compressors, this analysis has been pushed to operate on vehicle where it can take preventative action to avoid repeat events.

Big Data Analytics: The fuel efficiency for vehicles operating a specific route needed to be improved. Multiple vehicles, years of data and trillions of data points were analysed to identify improvements areas, new vehicle control software was created and using the same historical data the impact was simulated, quantified and optimised before being deployed to the vehicle.



