

Driving business value on-highway and off with IoT

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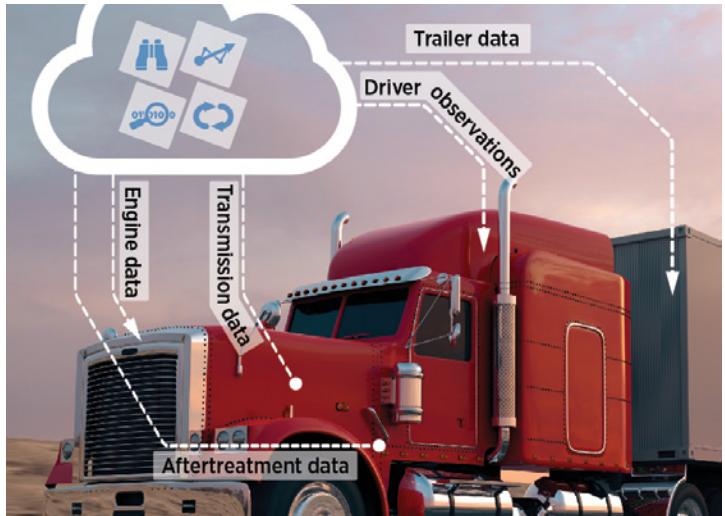


Whether on-highway, off-highway, above ground, or underground, vehicles operating in all these often harsh and remote environments share similar characteristics: they require ongoing maintenance and repairs. Reliability and uptime are critical for business operations, and equipment operator safety is paramount.

Heavy-duty trucks have been using telematics for many years to communicate a relatively narrow view of engine status. Manufacturers and fleet operators are now looking at the Internet of Things (IoT) to provide an expanded view of truck health. IoT can analyze truck engine data in conjunction with other data sources, like transmission or aftertreatment subsystems, to determine whether an error condition needs attention now or can wait until the end of the job. Information about the error and a detailed repair plan can be sent ahead to the service center so that repairs can be made quickly and accurately. Routine maintenance can be performed based on actual operating conditions rather than time- or mileage-based schedules. The improved accuracy of error condition reporting reduces instances of trucks going in for unnecessary service (false positives) or not getting needed service (false negatives). IoT also can help ensure regulatory compliance.

For example, **Peterbilt** has successfully implemented IoT to help flag, diagnose and repair failures, significantly reducing its Mean-Time-to-Repair (MTTR) metrics and improving first-time repair rates. The company combined existing telematics and remote diagnostic

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data from tens of thousands of trucks with workflow automation software and historical repair records, then applied adaptive diagnostics to analyze the resulting pool of information and generate detailed repair plans. Diagnostics and repair plans are continuously refined as the system learns more over time from the growing body of knowledge.

From on-highway to off-highway

In addition to maintenance and repair, off-highway vehicles often have unique operating conditions. Many are tied to a specified jobsite. Take for example when a contractor is hired for highway improvements. The contractor leases heavy equipment from a leasing company that has stringent requirements for use of the equipment. IoT can help make sure these rules are followed; for instance, by implementing geo-fencing to track vehicles that are required to stay within the jobsite or tracking duty cycles of operation for improved maintenance. Leasing companies get better insight into how and where their equipment is being used, and lease customers are more likely to lease from companies that have the most reliable, well-maintained equipment.

In underground mining, one of the most remote and harsh environments, safety is critical and machine data directly impacts productivity. Connectivity is typically either nonexistent or severely constrained. Here, IoT can help by processing and analyzing data directly on the equipment and implementing logic that can take action even when equipment is disconnected from the outside world.

A perfect example is when unsafe operating conditions are detected and the equipment shuts itself down before the operator is injured. Onboard processing can also analyze the flood of data being

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produced by machines and only forward data that is relevant for further analysis or reporting.

Getting the most value from IoT

IoT can usher in measurable business value for vehicle owners and operators in multiple ways:

- Predictive failure can increase asset uptime and reduce emergency repair costs by examining the vast amounts of real-time data engines produce in conjunction with surrounding and historical data. By looking at the entire vehicle—and even across whole fleets of vehicles—in context, pending failures can be predicted much more accurately.
- Adaptive diagnostics builds on the insight gained from predictive analysis to create detailed repair plans and procedures that shorten repair times and improve the rate of first-time fixes. Vehicles get back in service faster and service centers become more productive and efficient.
- Condition-based maintenance looks at actual usage in context with operating conditions and determines the ideal maintenance plan for each vehicle. It reduces costs associated with too-frequent servicing and extends vehicle longevity for better return on capital investment.

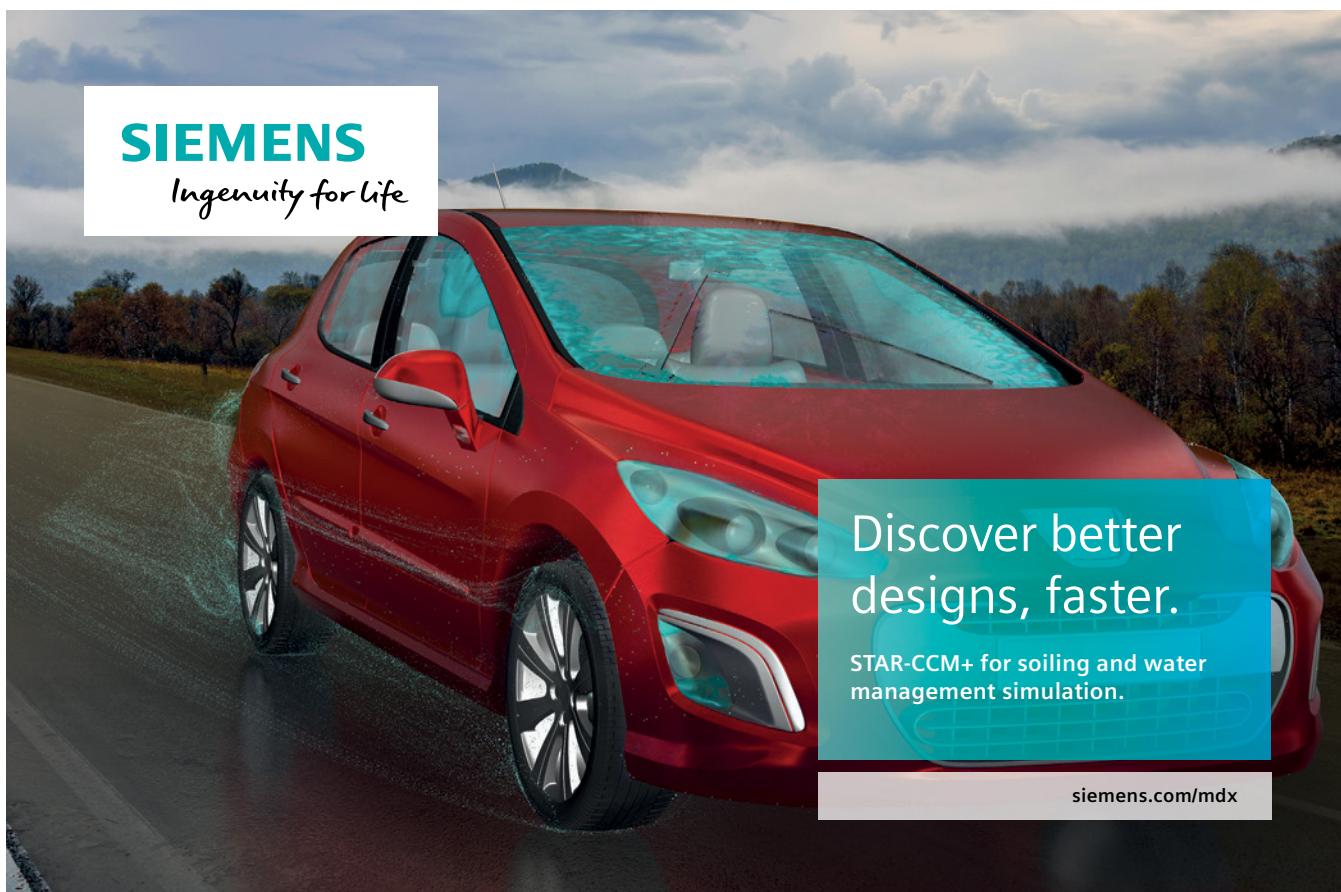
Getting started with IoT

Given the obvious benefits, it seems like a no-brainer to adopt IoT, but getting started can be daunting. Experience has shown that approaching an IoT strategy in stages is the most effective. If you already have a

telematics system in place, you have a good foundation on which to build a holistic IoT solution. By adding contextual and historical data then applying sophisticated analytics that support business rules, you will gain much greater insight into the entire vehicle.

Further expanding that across entire populations of vehicles provides even greater insight into cumulative fleet health and asset optimization. Applying automation to the resulting information allows complex actions to be taken throughout the business, from the field to service centers. And in situations where vehicles are located in remote or bandwidth-constrained environments, adding processing capabilities directly onto the equipment can enable even more benefits such as being able to shut down faulty equipment to protect operator safety or perform local analysis of data to determine what's worth forwarding.

Companies like Peterbilt are already seeing tangible business benefits from IoT by building on existing telematics and diagnostics systems. By identifying your desired business outcomes and taking a staged approach to adopting IoT, your organization can gain a much broader view of its vehicles that can drive more effective business processes. ■



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