



Today's Digital Ecosystems

Take Mobile Hydraulic Systems to a New Level



ENGINEERING YOUR SUCCESS.

Not so long ago, only the largest OEMs could afford to develop complex proprietary control systems. But the recent introduction of versatile digital ecosystems connecting electronic control hardware and software to the Cloud is expected to be a game changer for mobile hydraulic machinery and equipment manufacturers. By empowering design engineers with real-time access to the most sophisticated data collection and monitoring capabilities, such systems are enabling OEMs to customize electro-hydraulic control parameters to meet highly specific application requirements.

This leveling of the playing field is catalyzing a new era of mobile machine and equipment design innovation, as OEMs across industries, tiers and geographies develop customized solutions that digitally integrate their customers' hydraulic and machine controls with the Internet of Things (IoT). This article will explore some of the major operational and safety advantages of integrated electro-hydraulic motion control platforms connecting mobile machinery and equipment to the IoT.



Setting the Context for Next-Generation Mobile IoT

Whether customers are managing a fleet of transport trucks, utility vehicles, refuse collection trucks, and material handlers, or complex construction, agricultural and mining machinery, the ability to conduct real-time monitoring of vehicle functions and operator performance enables:

- **Increased productivity through predictable maintenance and improved uptime**
- **Improved customer satisfaction and loyalty through proactive data-driven service engagement**
- **Improved equipment operator safety, including the ability to field-validate training certifications**
- **Optimized efficiency in energy and fuel usage**
- **The ability to continually track performance variables such as vehicle locations, engine speeds, torque, pressure levels, and aspects of operator behavior**
- **The ability to selectively share data across the distribution and supply channels by assigning multi-tiered user types and permissions**
- **Comprehensive reporting for analysis and improvement**



From an OEM perspective, real-time monitoring of mobile equipment conditions provides the additional advantage of expediting repair and maintenance operations and facilitating after-market component sales and support services.



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Clint has extensive experience in IoT and solution development. Prior to joining Parker, he worked for Motorola in a variety of roles, including vice president of services & solutions, and more recently at Gogo where he managed the startup and significant growth of the aviation IoT business unit. In addition, Clint holds a MBA from the Kellogg Graduate School of Management at Northwestern University.

Hector has extensive experience in IoT platforms and engineering solutions. Prior to joining Parker, Hector worked in multiple technical and business roles to help connect assets and develop remote monitoring solutions with GM's Onstar and Ryder Trucks. At Parker's Motion System Group, his primary focus is on Mobile Internet of Thing solutions. Hector received a M.S. in Project Management from Keller Graduate School of Management and Project Management Institute, he also holds a B.S. in Industrial and System Engineering from the University of Florida.

Mobile IoT in Action

Now imagine adding to these benefits the ability to custom-modify from a remote location onboard programs, software releases, alerts and notifications, as well as specific system parameters such as operating ranges. Today's Mobile IoT systems enable OEM and/or user-based control system designers and technicians to respond rapidly to ever-changing application requirements, providing high-tier, mid-tier and lower tier enterprises with a strong competitive advantage.

Today's Mobile IoT ecosystems securely monitor, access and adjust operational parameters via laptop, tablet or cell phone anywhere the internet is available, rapidly delivering functional adaptations and improvements to fleet managers, engineers, call center operators, technicians, and/or administrators across the channel as required.

Such systems make it easy for OEMs and their customers to collect and analyze data sets to identify usage trends and field-based problems with an eye towards continual design improvements enabling increased operational efficiency. Once global design adaptations have been identified, OEMs can deliver improvements to all customers rapidly and securely via the Cloud. Application-specific design changes can be shared similarly on an individual machine basis by OEMs or operator design teams.

Next generation Mobile IoT systems are highly user configurable, which means both control functions and

interfaces can be customized to match specific customer needs. Operational parameters and controls are easily adjusted to improve the efficiency of the equipment and of related business operations. Interface details such as colors and the types and designs of freestanding or display-based controls can be customized to match each customer's branding requirements.

For end users, the design flexibility of end-to-end integrated control of mobile machinery's complex electronics, emissions, engines, powertrains and other sub-systems is accelerating management's ability to quickly respond to operator, market and enterprise conditions, with the ultimate goal of optimizing the health and performance of their mobile equipment.



The Components of Mobile IoT

Anywhere mobile equipment is used, no matter how vast the regions in which that equipment is deployed, Mobile IoT systems offer an opportunity for higher levels of productivity improvement and cost efficiency. Across all markets, Mobile IoT systems are expediting the time to market of cost-saving operational improvements.

The hardware components of smart gateways are designed to withstand punishing industrial and outdoor environments.

When new-equipment installs are adopted, previously existing vehicles can typically be retrofitted to connect to the IoT.

At the heart of today's Mobile IoT solutions is a digital link connecting the hardware and software components of a customer's application to each other and to a highly configurable digital interface via the Cloud. Typically, connections are made using a CAN bus or J1939 for optimum system versatility. Customized third-party protocol applications are also possible. Data is securely transmitted via cellular, WiFi or satellite communications, with no recoding required. Although GPS, 3G and 4G connections are commonly standard, WiFi and Satcom options may also be available.



Electronic control systems are compatible with a wide range of intelligent components, including hydraulic pumps, accumulators, cylinders, filters, tubing, fittings, power units and valves. On the interface side, today's digitized integrated control solutions are compatible with joysticks and operator displays, as well as a variety of on-board digital cameras, electronics and sensors.

Data is aggregated into customizable reports that identify trends and anomalies, enabling operation engineers and technicians to adjust system functionality with the ultimate goal of improving productivity and the efficiency of business operations.



Ease of Use

For design engineers and technicians, an intuitive, easily configurable digital interface is of paramount concern. Today's Mobile IoT solutions can be rendered on any browser anywhere in the world and have been designed for ease of use.

Typically, Mobile IoT solutions use flexible and intuitive interfaces for simple configurability.

Designers can literally build-out individualized monitoring systems and dashboards on a customer and asset level, rather than settling for standard IoT telemetries, providing a more robust and relevant data set for competitive market advantage. Designers can view display pages, adjust parameters, view logs, and test user interfaces to facilitate review of functional performance in real-time.

“Advanced functions can be implemented in minutes using the intuitive graphical interface. No advanced programming skills are required to take application improvements from concept to implementation.”

Insights Catalyze Innovation

Perhaps the most significant benefit of remote configurability and internet-based data access is the downstream effect on innovation. Enterprise software connecting machines to the Cloud is accelerating the collection and analysis of data leading to new insights that not only improve the competitiveness of individual market players, but raise the performance bar on entire industries.

Imagine mining sites where near-instant access to troubleshooting data triggers alerts and shutdowns, saving lives. Imagine how the improved

flexibility and responsiveness afforded by remote control might enable engineers to experiment with micro-repositionings of a single sensor to ensure the fastest possible identification of wear factors for continual improvements in uptime. Imagine the on-going analysis of millions of operator performance profiles enabling OEMs to go to market with next-generation ergonomic improvements for greater in-the-cab efficiency and reduced operator injury.

The complex mechanical, electronic, and hydraulic systems used by mobile equipment and

machinery, when supported by digital ecosystems, are expected to usher in a new era of mobile solution innovation. For the first time, mobile equipment OEMs and their customers have immediate access to large and robust collections of data which, upon analysis, can be quickly acted upon to improve functional efficiencies, operator wellness and productivity. Today's motion control enterprises are leading the way towards a new era of safer, cleaner, more efficient and more reliable mobile equipment performance.

