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DRIVING SOCIETY FORWARD

Power and transport keep the world moving. With the right infrastructure platform, IoT can enable greater speed and efficiency for both these crucial sectors – and much more besides.

Industry analysts are predicting rapid growth in IoT spending in the energy and logistics sectors – a fourfold increase from 2015 to 2020 according to the Boston Consulting Group. This growth is being driven by: the increasing digitalization and complexity of the infrastructures concerned; the need to simultaneously drive down costs; and the requirements of increasingly stringent environmental regulations. The increased threat of cybercrime and terrorism also makes protection against attacks increasingly critical. The remote locations of many energy generation sites, oil and gas extraction facilities only amplifies the challenge. On the one hand they are expensive and dangerous to monitor, maintain and control manually. On the other, relying on automated systems could increase risk if the right safeguards are not in place.

Nevertheless, the opportunities of IoT for energy, oil and gas companies are also considerable. For example, in the energy sector, power generation will become increasingly dependent on the complex interaction and integration of different technologies, such as natural gas and wind power installations, or deploying floating solar panels on hydropower reservoirs. The ability to manage and monitor the complex interactions between generation methods through a stream of sensor-derived real-time data, will help ensure consistent supply regardless of weather conditions, and will enable downtime to be minimized through proactive maintenance.

Transport, particularly in terms of logistics, but also in relation to the digitalization of private vehicles is another sector in which IoT is likely to have a dramatic impact on efficiency. As lorries, vans and cars essentially become ‘devices on wheels’, the opportunities to make them run at maximum efficiency at all times will increase significantly – particularly if they are driverless. Software can regulate the way a vehicle operates far more accurately than a human, and can make adjustments in real-time based on information fed to it via IoT sensors in other vehicles, roads, parking spaces, weather stations and so on. As a result, the most energy efficient route can always be taken, accidents can be avoided, and dangerous conditions can be managed more carefully. The benefits will be measured in lower power or fuel consumption, reduced pollution, faster journeys and fewer injuries or fatalities.

VMware is leveraging its extensive experience in managing and securing data centers and extending it into the world’s IoT infrastructure. The VMware Pulse IoT Center provides the secure, integrated one-console infrastructure management platform to support effective management of all the connected ‘things’ that will transform the efficiency of energy generation networks, and vehicle fleets. It is also the ideal platform to run the enhanced analytics that will help service providers and asset owners in these sectors continuously identify opportunities for further improvement.

POWERING THE SMART GRID

The world's energy infrastructure is undergoing a metamorphosis. The monolithic grid delivering predictable energy supply based on fossil fuels, is being replaced by a more fragmented infrastructure, parts of which deliver unpredictable and intermittent supply from renewable but weather-dependent sources. Within this context, demand and supply manageability assumes much greater importance. IoT can be a key enabler of that manageability, while also creating opportunities to unlock the value of the data that energy networks generate through more complete data sets and advanced analytics.

The potential applications of IoT for energy suppliers range from enhanced monitoring of generation facilities such as wind turbines, to proactive fault diagnosis and remote maintenance. Importantly, it can also help balance

demand and supply more efficiently by providing a more accurate picture of peaks and troughs in usage, empowering suppliers to manage generation and distribution more proactively. The benefits can be measured in, for example, lower maintenance costs, less energy wastage, greater profitability and easier regulatory compliance. However, it's important that these advantages are not compromised by the increased potential for cyber-attacks that IoT connectivity can create, without the right management tools.

VMware enables the secure, integrated management of all the device gateways required to power a more efficient energy generation and distribution infrastructure. In particular, it enables the real-time management required to maximize grid performance and minimize generation interruptions in a proactive way.

DRILLING DOWN FOR EFFICIENCY



The infrastructure required for energy, oil and gas production and distribution is highly complex, often in hard to reach places and vital to keep modern society running. In addition, the markets for the output of these industries can be volatile, and cost reduction is an ever-present topic. Add growing security threats into the mix, particularly when infrastructure elements such as drilling

rigs are not owned by the exploration firm, and the advantages of establishing automated asset monitoring, efficiency optimization and security management through IoT become obvious.

Taking the oil and gas industry as an example, IoT offers the promise of complete visibility and control over assets, operations and the associated status, performance and risk indicators. The collection and analysis of data from sensor-enabled machinery and other 'things' can enable: maximization of oil extraction through drilling site identification and viability analysis; predictive maintenance for wells, pipelines, rigs, etc.; improved energy efficiency and climate control; and smart surveillance of pipelines and refineries. Realizing these applications requires an integrated, edge-to-cloud IoT management platform. However, the sensitivity of the data involved, and the potentially catastrophic consequences of a security breach, make a public cloud solution inappropriate.

VMware now has the one-box IoT management solution required for the integrated, secure management of energy, oil and gas data gateways, informed by its proven track record in enabling secure datacenter operations: VMware Pulse IoT Center. As such it enables energy, oil and gas companies to realize the benefits of truly connected infrastructures.

INDUSTRY SPECIFIC LOGISTICS

Oil industry vehicle fleets are essential to keep the economy and society running. However, there is a common challenge when it comes to transporting fuel to filling stations: stations run out of different fuel products at different times. This makes planning the optimal route for tank trucks with multiple compartments to deliver the right fuel from the right compartment to the right filling station within the right time window, extremely difficult. However, by analyzing data collected from tank trucks equipped with IoT sensors, algorithms can be generated to generate optimal delivery routes for these multi-compartment vehicles. This ensures consumers can always choose from the complete range of fuels available, and pump downtime can be minimized. As a result, oil companies can recover profits lost from underground fuel tanks that run dry, and customers that go to competitors' stations, due to long queues at the forecourt.

In contrast, the use of sensor-automated vehicles in the mining industry drives efficiency in other ways. Automated vehicles run by software rather than people can be operational for longer because there are no rest breaks or shift changes. They find their way around and between sites using GPS, avoid obstacles using radar and laser sensors, and always take the most fuel-efficient route. In addition, they can be programmed to accelerate,

brake and position themselves for loading in the most efficient way at all times. And because they are driverless, employee safety concerns are also minimized. Together, all these factors add up to significant savings for mining operators over time.

VMware Pulse IoT Center is the optimal platform for collecting and analyzing data from IoT-enabled vehicle fleets, allowing their owners and end customers to benefit from more efficient production and distribution processes that are programmed to use resources more efficiently.



FILLING UP FOR THE ELECTRIC VEHICLE FUTURE

There is little doubt that the future of road transport is electric. The only question is: how fast will that future arrive? One of the determining factors is the extent of the vehicle charging infrastructure. Many buyers will only feel

confident about purchasing an electric vehicle when they can be sure that charging stations are as ubiquitous as petrol stations are today. And therein lies the problem.

The lack of standardization between different technological elements within charging stations means building each one is a complex project in itself. A great deal of integration work is required between software solutions from multiple vendors, creating significant cost and slowing the rollout of the charging infrastructure. And with less infrastructure, fewer people feel ready to make their next vehicle an electric one.

Effectively, each charging station is a gateway to the power infrastructure supplying it. By providing an integrated, single-console way to manage all of these gateways as one, VMware Pulse IoT Center solves the complexity problem, simplifying and accelerating charging infrastructure rollout as a result.



IoT BUSINESS BRIEF SERIES

The VMware IoT Business Brief Series explains how VMware helps organizations across manufacturing, public service, healthcare and energy sectors build the secure infrastructure for they need to maximize the IoT opportunity:

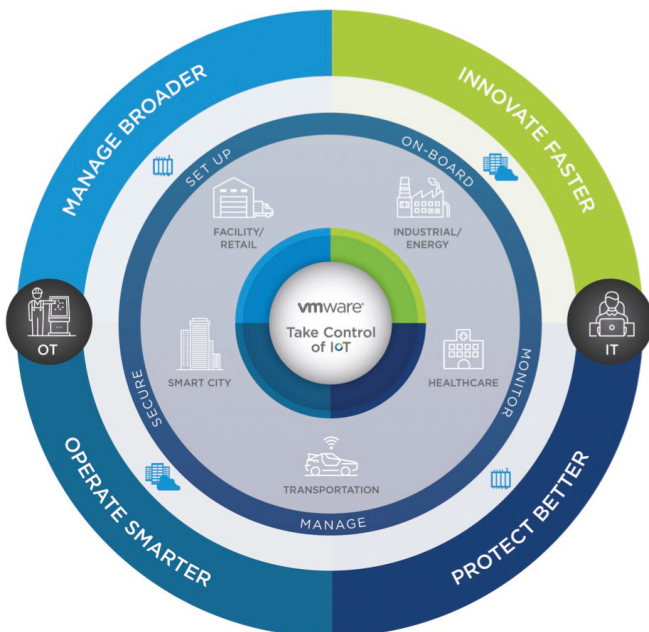
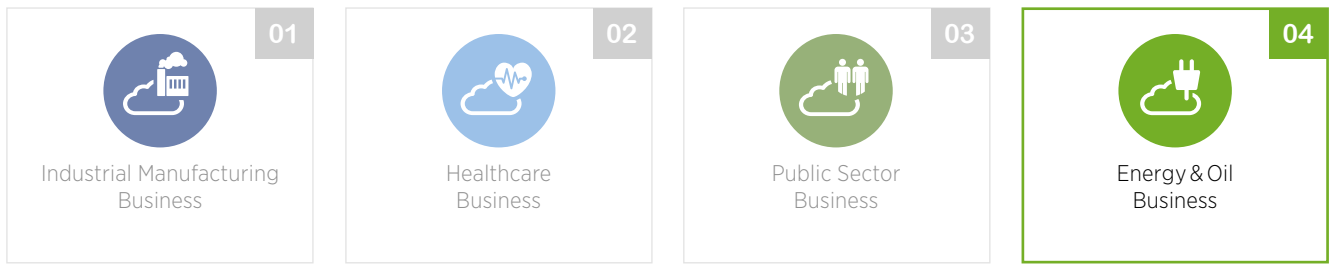
01 Industrial Manufacturing Business: How IoT will help close the gap between OT and IT in smart factories, and enable secure management of the connected value chain.

02 Healthcare Business: How the right IoT solution can enhance patient care and reduce the cost of lost equipment, without compromising on data privacy and security.

03 Public Sector Business: How smart cities that automate everything from parking space allocation to interactive

tourist information can be enabled through the right IoT management solution.

04 Energy & Oil Business: How integrated IoT gateway management delivers efficiency benefits across energy and fossil fuel infrastructures, as well as vehicle fleets, realizing financial and sustainability advantages for their owners and customers.



- **Simplify IoT complexity**
Manage across diverse set of things as easily as one
- **Improve reliability**
Provide accurate and real-time visibility of 'thing' health and act on anomalies as they arise
- **Accelerate ROI**
Streamline and accelerate how IoT gets deployed and scaled
- **Provide peace of mind**
Secure IoT infrastructure across things, edge, network, and applications

Your Contact



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Since 2017 Matthias Schorer leads the Business Development for IoT in EMEA. Before he was Head of Strategy Consulting and responsible for the VMware Accelerate Advisory Services Team in Central and Eastern Europe. He has extensive expertise in IT architecture, legacy system migration, cloud computing and virtualization across multiple industries, with a focus on the automotive sector and connected car innovations.

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Mimi Spier

VP Business Development, Marketing & GTM Strategy for IoT

Mimi leads since 2016 a team responsible for defining and launching the marketing, product and business strategy for IoT at VMware, and developing the strategic partners necessary to deliver the most complete solution to the market. Before, she was responsible for ISV Business Development and Marketing for VMware's Mobility solution and helped shape the growth and GTM strategy for VMware's \$1.5 billion acquisition of AirWatch.

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