

ENABLING CONNECTED HEALTHCARE

IoT devices and data will make healthcare provisioning more efficient, effective and tailored to individual patient needs. A flexible, secure IoT management platform is the essential enabler.

According to McKinsey and Co., IoT will have a potential economic impact of up to \$1.6 trillion in the human health and wellness sector globally by 2025. Most of this value will be generated by using IoT-enabled devices to monitor and treat illness. In addition, the Boston Consulting Group expects direct spending on healthcare-related IoT to reach \$16.1 billion by 2020 – a three-fold increase on the 2015 figure. But the implementation of IoT within healthcare organizations creates numerous challenges for their IT departments: from maximizing the value of existing investments, to protecting patient privacy, ensuring data security and maximizing system reliability.

For example, nurses and doctors equipped with IoT-enabled devices can be updated in real-time on patients' vital signs, with automated alerts that enable them to react more quickly when a potential problem is identified. A similar system can be used to keep family members informed on the progress of surgery and to provide regular updates on their post-operative condition. Patients can take advantage of IoT-enabled blood-pressure monitors or other equipment to treat themselves at home, saving them and their medical professionals time and money compared with regular hospital appointments or home visits.

The use of advanced analytics applied to data generated by IoT networks in hospitals can also deliver big advantages for healthcare providers. For example, the use of predictive

analytics at one Texas hospital has allowed managers to reduce 30-day readmission rates for heart failure patients by nearly half, based on a calculated risk score that allows physicians to target cardiac patients most in need of intensive follow-up care.

Moreover, the starting point for introducing IoT is not an easy one. The technology infrastructure within a hospital or clinic is typically large, diverse and complex. Workloads are high, and compliance with patient privacy regulations is a top priority. Within this context, the introduction of thousands of new data points and devices could quickly overwhelm available resources. One response to this scenario is to delay or even reject the expansion of IoT into the healthcare environment. However, in the long term, the potential benefits are simply too significant to ignore.

Realizing these benefits is dependent on having the right infrastructure in place to effectively and efficiently manage the rapidly rising volume of data generated by an increasing number of diverse devices.

VMware Pulse IoT Control Center, allows healthcare providers to manage, monitor and secure their entire IoT infrastructure through a single pane of glass to enhance patient satisfaction, improve treatment success, and lower error rates and per patient treatment costs.

LOWERING COSTS DUE TO INVENTORY LOSS

Industry statistics show that within many hospitals and clinics, up to 30% of medical devices get lost every year. The definition of a 'device' is necessarily broad. It encompasses, for example, relatively large and low cost items such as wheelchairs and trolleys that are never returned to the correct ward or nursing station after use. But it also includes expensive surgical kits that can cost five figure sums, which slip down the back of cupboards in store rooms and surgical theatres, are presumed lost, and then replaced. In the worst cases, the total value of these losses can amount to tens of thousands of euros over the course of one weekend within a single hospital.

These shocking figures make it easy to see how IoT device tracking could make a dramatic contribution to improving the financial performance of healthcare organizations. Firstly, attaching a chip or RFID tag to every item of inventory would make it much more difficult for hospital



assets to simply disappear off the inventory radar. And secondly, when stocks of particular items run low, an integrated IoT implementation would enable the automation of inventory management and ordering, so that 'empty shelf' incidences become much less common. However, the enablement of this more efficient scenario requires an infrastructure that allows effective execution, while maintaining watertight security and the separation of sensitive patient data.

VMware Pulse IoT Control Center offers an IoT infrastructure management platform for securely managing all the data required to improve device, equipment and inventory management as described above.

RIGHT INFORMATION, RIGHT PERSON, RIGHT TIME

The movement of people around a hospital is just one of the variables that makes the day-to-day operations of healthcare facilities so complex – but it's also one that can mean the difference between life and death. For example, patients can get lost, suffer illness or injury while not being monitored, or leave wards and buildings without permission. Moreover, with multiple demands on their time, healthcare professionals may also not be exactly where they are most needed at any given moment. Therefore, any opportunity to track the location and condition of patients and professionals more efficiently, and potentially increase the speed of response to emergencies, demands to be taken seriously.

Through connected, wearable devices, IoT offers the opportunity to, for example, track patient whereabouts and well-being more closely. It can also allow for the physical condition and/or performance of surgeons (human or robotic) to be monitored in real-time during operations. This would enable the transfer of critical



information that could positively influence the results of the procedure and/or identify potential problems before they endanger patient health.

VMware's Pulse IoT Control Center enables integrated, over-the-air management of all the gateways required to build this infrastructure. Using a sophisticated and flexible rules engine, it can enable healthcare organizations to precisely and comprehensively define and track what, where and when 'things' are updated or changed and by whom. This can help ensure patients and professionals are in the right place at the right time, with access to all the equipment, medicines and information they need for optimal patient health.

ENHANCING THE USER EXPERIENCE

In the healthcare sector as in every other industry, the user experience is becoming increasingly important for establishing differentiation. IoT is part of a healthcare revolution that will transform the user (patient) experience by personalizing healthcare service delivery in completely new ways.

For example, connected wearable or in-body devices such as pulse trackers and pacemakers will make it possible to: send medication reminders; adjust device settings; or even automate the delivery of medicine directly through the skin or into the bloodstream. These capabilities not only increase convenience and treatment immediacy for patients, but also save time and money for healthcare providers by, for example, eliminating the need for some

patient visits, and reducing the likelihood of human error in self-medication scenarios.

IoT also offers the potential for integrating these services into smart home infrastructures and providing proactive patient protection. For example, a sensor-enabled floor covering can send out an alert to the emergency services when it detects a heavy impact that is likely to have been caused by a patient falling or collapsing.

VMware's end-to-end IoT solution enables the integrated gateway management required to enable an intelligent, tailored patient experience that can also save lives by delivering the right information to the right person or 'thing' at the right time.

REDUCING THE BIG DATA RISK



Data is arguably more sensitive in the healthcare sector than most others. There is also a complex mix of information in play, ranging from patient health records to proprietary research, device readings and test results. Moreover, the arrival of IoT in hospitals will inevitably lead to a significant increase in the volume of data being generated, stored and communicated.

Privacy issues and the potential commercial value of this data means that public cloud-based approaches to data management are inappropriate in most areas of healthcare. Data must be stored and managed securely onsite or within a tightly controlled private cloud environment. Even so, additional hard to control risks can still arise. For example,

technology vendors may not coordinate the registration of new devices on hospital networks with the site's IT department, or patients could try to take their treatment into their own hands by hacking devices to increase medication doses – in fact, this has already happened.

In the context of such a varied range of potential risks, it's vitally important for healthcare providers that they have a secure, integrated platform for managing, storing and analyzing all their data. VMware's Pulse IoT Control Center offers healthcare providers the flexibility they need to maximize and protect the value of their data along with secure data orchestration capabilities to deliver relevant data wherever it is needed.

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:

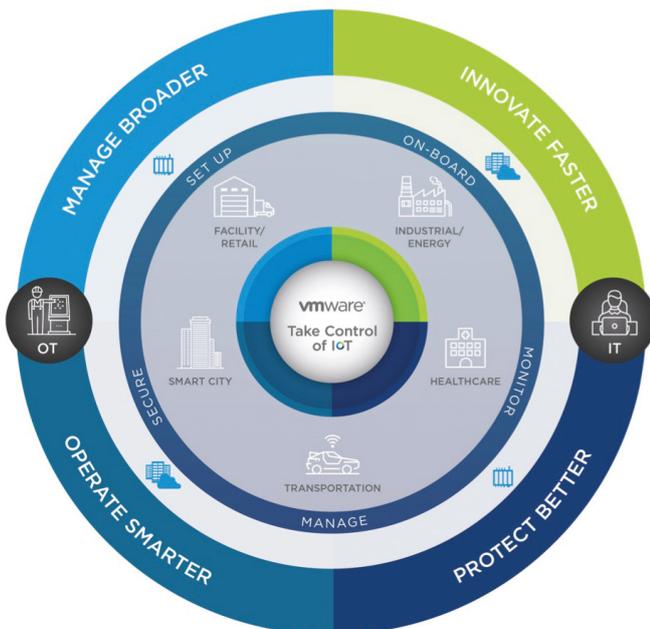
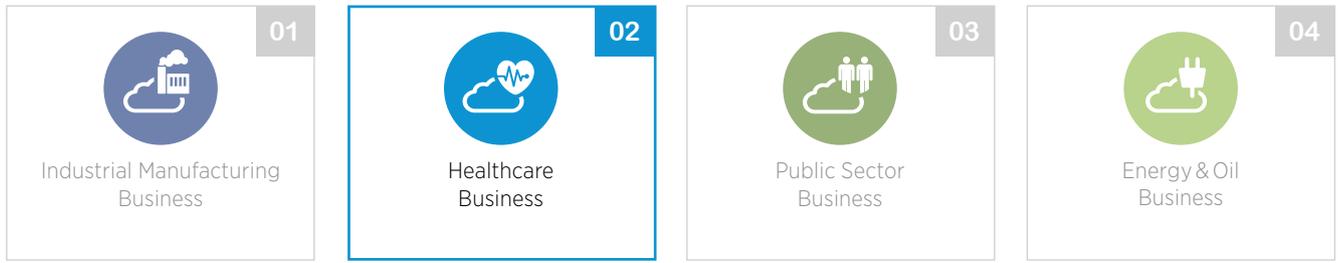
01 Industrial Manufacturing Business: How IoT will help close the gap between OT and IT in smart factories, and enable secure management of the connected value chain.

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 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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