2016 SPECIAL REPORT

STATE OF THE INTERNET OF THINGS

Produced by:

SAPinsider DataInformed

Sponsored by:

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Contents

Keep Calm and Carry On with the Internet of Things

Thomas H. Davenport

You may have seen endless variations of the "Keep Calm and Carry On" message on t-shirts and posters — but I doubt you have seen the venerable British wartime theme applied to the Internet of Things (IoT). This burgeoning technology, comprised of an uncountable number of sensors and devices feeding businesses with neverending data, is an area in which calmness and perseverance are a must. IoT will certainly provide value — the question is whether organizations will be patient enough for it to deliver.

The reason patience is necessary with IoT is the incredibly large scope of the technology and the fragmentation of its current state. The number of sensors, data formats, and possible uses of the data is massive — as is, of course, the volume of data produced. We haven't yet seen a lot of sophisticated analytics on IoT data, largely because the world first has to undertake a major data-integration initiative. And that's true for every particular IoT domain that I know of.

IoT Drives Automotive Change

Take, for example, the IoT focus area with some of the highest potential value: automotive. Even given the existing human-driven model of automotive transportation, the potential benefits of IoT are substantial, including traffic improvement, maintenance alerts, new insurance business models, and so forth. And to have any chance of realizing truly safe autonomous vehicles, we'll need IoT on steroids: All those positioning and image sensors in a vehicle will have to communicate with other vehicles and with external weather and traffic systems.

Cars already have between 100 and 200 sensors on average. Right now, the sensors don't communicate with each other very well; there are almost as many data formats as there are sensors and no way to pull all the data together. OBD-II, a US federal standard for onboard diagnostics, captures only a small subset of the available sensor data in a car. New sensor development is taking place at a much faster rate than data-standard development — OBD-II, for example, was implemented 20 years ago, and since that time sensor capabilities have grown exponentially.

Integration Issues

Other broad sensor domains — such as airplanes, homes, offices, and manufacturing plants — face the same data challenges found in cars. In airplanes, for example, there are data bus standards, but companies that manufacture complete airframes compete with suppliers like engine manufacturers for ownership and use of engine data. In the home, there are as many different data standards as most houses have rooms. The same profusion of IoT data and interoperability standards prevails in manufacturing.

There are, of course, software companies that seek to handle all this integration for you, but at present there are so many competitors that it is not yet known which IoT platform contender will ultimately win.

Plan with Patience

If you are planning to integrate and use data across an entire car, home, or even human body, plan to be very patient. It could take years to integrate and make sense of all the different data and, even if you succeed, you may choose the wrong standard or platform.

Instead, carefully consider your ambitions and IoT applications. If you want to do something with IoT in cars, stick to the data that's in the OBD-II standards, which mostly involve engines, emissions, and vehicle speed. If you want to do something with healthcare, employ the data on behaviors that are measured by activity trackers. If you are working with IoT in homes, limit your ambitions to lighting, thermostats, or refrigerators. That way, you'll be able to accomplish something in a reasonable period of time and experience some wins that will help guide you when you broaden your IoT efforts into other areas.

Don't Wait — Start with Some IoT Analytics Now

While it's smart to exercise some caution in your solution adoption, it doesn't make sense to wait until all the relevant data is available before proceeding with some analytics. Yes, it would be great if your dashboard or predictive model could address every sensor-measured phenomenon in a vehicle or home, but that would take too long to come to fruition. So make sure that whatever sensor data you have access to, you try to turn it into something useful right now.

I am guessing that the integration of IoT data is going to take another 20 years or so. If I'm right, it doesn't make sense to wait until all the integration and application work is done before proceeding. While it's important to keep calm among the frenzy of IoT activity, you need to start betting on your IoT path now, and there are plenty of useful things to accomplish on the smaller scale I have described. Just make sure your bets are focused on tangible, achievable returns. ■

Thomas H. Davenport, the author of several best-selling management books on analytics and big data, is the President's Distinguished Professor of Information Technology and Management at Babson College, a Fellow of the MIT Initiative on the Digital Economy, co-founder of the International Institute for Analytics, and an independent senior adviser to Deloitte Analytics. He also is a member of the Data Informed Board of Advisers.

Taking Analytics to the Edge

How OEMs Can Analyze IoT Data at the Network Edge for Faster Insights

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Hewlett Packard Enterprise

The Internet of Things (IoT) is unquestionably one of the most vibrant growth areas for original equipment manufacturers (OEMs). IoT opportunities abound in virtually every industry — manufacturing, energy, telecommunications, transportation — as next-generation intelligent systems automate industrial control processes and optimize workflows, improving productivity, decision making, and business results. But the vast scale of IoT poses complex architectural challenges for OEM system designers.

OEM solution architects are faced with unprecedented scalability, interoperability, and performance challenges. Numerous IoT endpoints — including sensors, smartphones, and tablets — generate massive volumes of data that must be efficiently gathered and processed. Businesses must also consider space and power requirements when selecting IoT solutions, as both can be limited in the field. Innovation with IoT can even go beyond typical business benefits, and have a real impact on topics such as the environment and quality of life, adding complexity to how data is processed and analyzed. To get the most out of their IoT efforts, OEMs should look to a distributed IoT system architecture that pushes data processing and control functions to the edge of the network for ultimate scalability and resilience.

Analytics at the Edge

Over the decades, Hewlett Packard Enterprise (HPE) has developed many IT and embedded electronic assets to assist organizations in achieving their business goals. With the Edgeline Systems family, HPE is bringing its competencies to IoT. HPE's Edgeline Systems process streaming data as close to the sensor as possible, enabling a real-time turnaround of insights before the data is stored for additional analytics.

As the need to eliminate data bottlenecks and achieve massive scalability grew, HPE launched Edgeline EL12 and EL20 IoT gateways that execute data processing and control functions at the edge of the network. Now HPE has extended the Edgeline Systems family with the introduction of converged IoT systems that capture and analyze big data at the network edge.

Ideal for Remote Sites

The new Edgeline EL1000 and EL4000 systems deliver high-density compute and storage functionality at the edge of the network for ultimate performance and resilience. Ideal for energy, telecommunications, transportation, and industrial applications, the EL1000 and EL4000 are specifically designed for deployment in unattended, remote sites where space and power are at a premium. They are small in size and use fewer components, providing greater reliability and energy efficiency.

The Edgeline technology allows you to run complex computing software and applications that can provide appropriate business insight, instead of taking it all the way back to the data center. This capability gives you extra insight into industry plans and can help you with predictive maintenance.

Beyond Business Benefits

The benefits of IoT go beyond the bottom line. Enabled by IoT, intelligent systems are already improving the environment and quality of life for many people, while solving critical scalability, interoperability, and performance challenges. IoT can help companies in developing countries increase crop yield using drones and visual analytics, as well as reduce greenhouse gas emissions and raw material consumption. Another example is in healthcare, where an HPE OEM has even developed in-home monitoring solutions that use IoT technology to improve the well-being of senior citizens.

Across all industries, HPE has the skills, infrastructure, and technology to help OEMs at any point on their IoT journey. To learn more, visit **www.hpe.com/solutions/OEM**.

IoT Technology Enables Better Efficiency and Customer Experience

How the Internet of Things Is Changing the Transport Industry

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Tracking cargo, packages, or transportation assets such as railcars, trucks, or containers is not a new concept in the logistics world. Software systems have been able to trace the flow of goods and assets through the supply chain since the early 2000s. What is new, however, is the speed and accuracy of modern tracking technologies enabled by the Internet of Things (IoT). Depending on the software and devices leveraged, assets can now send out their position much more frequently, and packages can be traced more efficiently.

Trends in Tracking Technologies

The adoption of these new tracking technologies is not uniform, however. The actual cost of technologies, like radio-frequency identification (RFID) chips or transponders, has limited this adoption to a few use cases in the past, but the good news is that the cost is coming down significantly. And while customer experience has overall become much better, pitfalls remain: Most tracking capabilities only alert people when their packages reach certain ports or stops along their journey. This was the case for me when I moved from the US to Australia last year, and could only see updates on the container full of my belongings when it reached a handful of ports and was physically scanned. While technology has improved, the adoption of and innovation with these technologies has been slow in the logistics and transport industry.

But when you think of the speed and depth of information now available in much of the consumer world — think of the "Find my iPhone" app or the effect of using Waze in traffic — the pace of adoption is no longer good enough. Consumers and businesses alike will expect more out of the transportation and logistics industry as the apps people use in their everyday life prove the possibility of constant, real-time GPS tracking. So how are organizations leveraging IoT technology to provide accurate and advanced logistics monitoring?

Influence from the Consumer World

Examples of using IoT technology in the consumer world go beyond a handful of apps. Smart refrigerators now come with sensors to monitor their operating status and contents. Some models even come with cameras inside the cooling section: If you're grocery shopping and can't remember whether you already have eggs or milk, you can take a look at your refrigerator in real time.

Now think about this in the context of my relocation. Having sensors and cameras constantly check the status of the container would have given me a much better consumer experience — I would have had peace of mind that my belongings were safe and in progress on their journey. Technology enables companies in the transport industry to offer their customers more options for this type of monitoring functionality.

Strategic Planning with IoT

Another concept to consider is strategic planning in transport marketplaces. An endless number of empty miles are being driven for various reasons: Vehicles are being driven without a full supply of goods to move, or are idling while waiting for more goods to fill capacity, wasting time and resources. Connecting smart assets to a network of businesses that are looking for capacity will make it much easier in the future to identify ways to take advantage of further cost savings. This is a tremendous opportunity in the industry, and the winners and losers will be determined based on their ability to plan strategically.

Leverage Your IoT Data Throughout Its Life Cycle

Why IoT Requires a Three-Tier Architecture

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Kay Tailor
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3V Solutions

The Internet of Things (IoT) represents a major change for enterprises across a variety of industries and use cases, producing a huge effect on the way we live our lives in a highly connected world. Though some of the early growth in IoT can be attributed to a fascination with the devices involved — whether it's personal devices such as smartphones and intelligent thermostats or industrial sensors on machines and equipment — that fascination is not solely responsible for the industry-wide changes IoT is spurring. The growth is fueled by the recognition that IoT is an economic engine that provides strong incentives for driving investments in technology that fundamentally change how we conduct business and deliver services. And at the root of these dramatic changes is data.

A recent study[1] found that many organizations are already realizing the changes that IoT data can enable. Among IoT early adopters, 97% are using that data to solve a variety of problems, from improving customer experience and understanding customer behavior to boosting research and development (R&D) efforts and improving product reliability and performance.

But they're not stopping there: The same study revealed that 53% of organizations that have already deployed IoT solutions are looking to expand their investment in the next 24 months, suggesting that these businesses have seen the potential for even greater growth from IoT technology.

[1]IDC, sponsored by Red Hat, "Internet of Things: State of the Market" (September 2016; https://www.redhat.com/cms/managed-files/idc-iot-state-of-market-research-info-brief-201609-en.pdf).

A New Data Management Paradigm

The difference between being overwhelmed by the sheer volume of IoT data and leveraging it lies in how you prepare to manage the data throughout its life cycle — from the point of collection to the moment of applying it — and considering ingestion, processing, and analyzing along the way. IoT data, in fact, has its own management paradigm (see **Figure 1**).

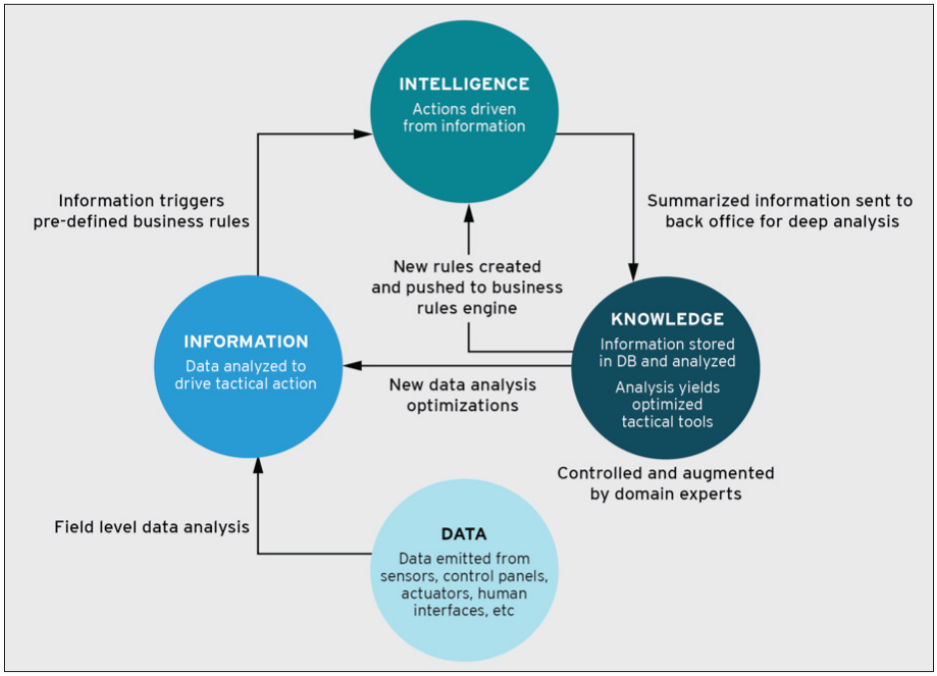

Figure 1 The life cycle of IoT data

Many IoT projects start with a two-tiered architecture that connects devices directly to the cloud where the data processing occurs. The IoT data flow, which allows for both consumption by the enterprise data infrastructure and immediate processing and consumption at the edge, is best supported by a three-tiered architecture.

The more complex, real-time data flow involved with IoT requires a middle tier, frequently positioned in proximity to the devices, where some level of data computing can occur. In the most complex scenarios, in which data must be immediately applied to controls, that middle tier is served by an intelligent gateway that hosts messaging, transformation, and analysis services as well as a business rules engine that determines the behavior of the managed devices.

Much of the technological adaptation needed to handle IoT data has to occur in the enterprise data center, whether that resides on premise or in the cloud. It requires a more robust infrastructure, including improvements to networking and storage, for ingesting

data coming in at different rates and formats and at high volume. And most importantly, it calls for a powerful data management and analytics platform, such as SAP HANA or SAP HANA Cloud Platform.

Putting the Paradigm into Action

Let's look at a retail implementation as an example of an IoT use case that requires an innovative, three-tiered approach to data management (see **Figure 2**). In this example, IoT data is used to deliver personalization within an omnichannel customer experience. This implementation, involving a combination of SAP and Red Hat technology, gathers data from various in-store collection points and uses it to trigger instant rules-based interactions with digital signage, customer mobile devices, kiosk interactions, and point-of-sale cross-sell or loyalty offers. At the same time, that in-store, real-time data is being integrated with operational systems at the enterprise level for deeper analysis that will drive long-term process improvements.

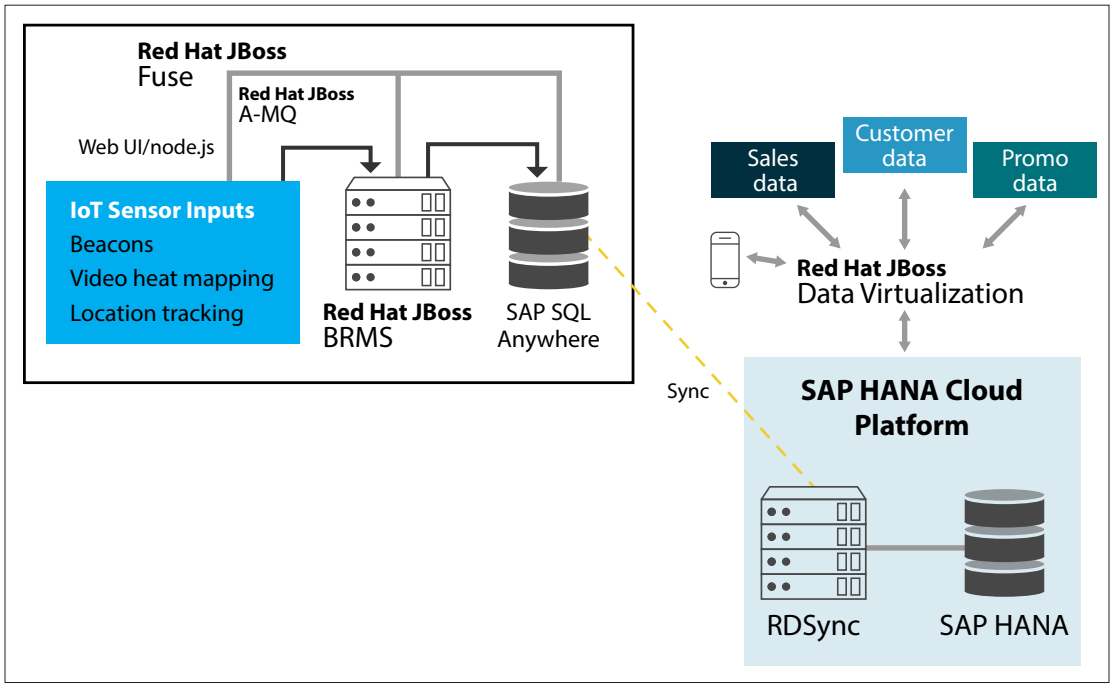

Figure 2 IoT architecture for a sample retail use case

In this example, data flows from devices to an in-store gateway running Red Hat Enterprise Linux and to the Red Hat JBoss BRMS business rules engine, where it is then acted on and captured by SAP SQL Anywhere. The SAP SQL Anywhere database synchronizes with SAP HANA Cloud Platform for further analysis and integration with other enterprise data sources presented through Red Hat JBoss Data Virtualization. Data is routed appropriately, and transformation services are provided by Red Hat JBoss Fuse. Meanwhile, retail applications can access that real-time data and use it to deliver customized information and service to customers.

As you can see from the previous example, building an infrastructure to handle IoT data can be an involved task. However, it can be well worth the effort, opening up a world of opportunity for your business. There are many use cases for IoT data spanning all industries — oil and gas, asset-heavy organizations, communications — that businesses are already driving toward. Building the right architecture will allow you to expand into other use cases as data needs and analysis increase to generate additional business value and benefits.

Partnering for the IoT Transformation

IoT implementations may appear complex at first, as few off-the-shelf solutions are available that don't require some level of customization. IoT implementations bring together technologies that have not had to interoperate before — for example, operational technology deployed in the physical world and information technology anchored in the digital world. The right implementation partner can be a valuable asset while navigating the IoT transformation journey, with insights and expertise that can help ensure your success. ■

3V Solutions, a partner of both Red Hat and SAP, is part of an ecosystem of partners that supports companies as they transform existing processes by harnessing machine data generated by connected devices. The combination of technology provided by Red Hat and SAP and the implementation services and expertise of a delivery partner such as 3V Solutions can help reduce the complexities of IoT projects and help organizations realize the benefits of this type of business transformation. Find out more about Red Hat and IoT at **www.redhat.com/iot**. And, for more information, visit **http://3vsolutions.com** or contact 3V Solutions at **info@3vsolutions.com**.

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