White Paper

How to Choose an IT Platform to Empower Your Internet of Things

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Contents

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Are You Ready for the Internet of Things?

When we watch science-fiction films, the biggest difference between science fiction and today's world is often the presence of futuristic gadgets. Yet a lot of the high tech devices in films from past decades are now commonplace. We use location trackers to find things anywhere in the warehouse or anywhere in the world. We communicate via smart wristwatches. Our vehicles measure themselves and make more decisions for us. We rely on self-monitoring medical implements. We live and work in buildings that automatically adjust to our needs. Inventions that are not yet commercially available are likely being developed in some R&D lab. As the world turns digital, this Internet of Things (IoT) will analyse ubiquitous sources of data and react intelligently in real time.

But how can all these smart things bring about profound change for businesses and society, and therefore create value beyond their novelty factor? Increasingly devices will measure and monitor themselves and their environments, but this will only lead to a meaningful response if the data can be captured, analysed to trigger an appropriate response. To help close this loop, new technology platforms are emerging. An IoT platform serves as the operating system for the whole environment: people, processes and yes, things. This paper will explore this concept and recommendations, and will be followed by deeper discussions of specific solution areas.

How IoT Takes Shape in the Real World Today

The development of the Internet of Things accompanies other macro-trends like big data, cloud and mobile solutions, but goes beyond that. Broadly speaking, two kinds of IoT are emerging:

- **Consumer IoT -** Perhaps more conspicuously visible to the average person, this category includes relatively new commercially available products such as the Apple Watch, Fitbit and self-parking cars. The goals for consumer IoT are often to increase awareness of activities and provide more convenience for the user. Value is created in the perception of the consumer, and realised in new revenues or higher margins for the manufacturer of innovative and differentiated products. Other times, the value is in building deeper profiles of the consumers themselves – information which can be used internally or sold on to others.
- **Industrial IoT** - While more specialised in nature, industrial monitoring and control systems have been around for decades, yet are now becoming far more sophisticated. This grouping includes diverse use cases like streamlined warehouse logistics, reliable machinery operation, capacity-managed public transportation and reactive energy grids. The goals are often efficiency, cost savings, increasing quality and mitigating operating issues. Value comes from enabling the business to better understand its own activities and continuously improve. Whole new services and products can be invented to take advantage of the new information. Increasingly, industrial use cases also involve information sharing with partners in a supply chain for mutual benefit.

So while the usefulness of consumer IoT is easier to see in everyday life, industrial IoT may be able to drive more radical efficiency gains. In both arenas, modern enterprises need to embrace IoT data to augment their personal experience in making decisions and reacting to changing conditions.

Business Outcomes Enabled by IoT

The vast majority of surveyed organisations (92%) are moving to IoT adoption by increasing usage of sensor data, as shown in Figure 1.[1] It's a broad market, but some specific business goals can be achieved with IoT-enabled technology. First, organisations can gain more operational efficiency by creating less waste and introducing less risk into their decisions. For example, a city could run trains only when needed based on detailed ridership data. Second, organisations can get more leverage out of existing physical assets – appreciating, rather than depreciating, their value. Another example here could be optimised truck routing and proactive service schedules, minimising fuel costs and idle time spent waiting for loading or for emergency roadside repairs.

[1] ESG Research Report, *2015 Data Storage Market Trends*, October 2015.

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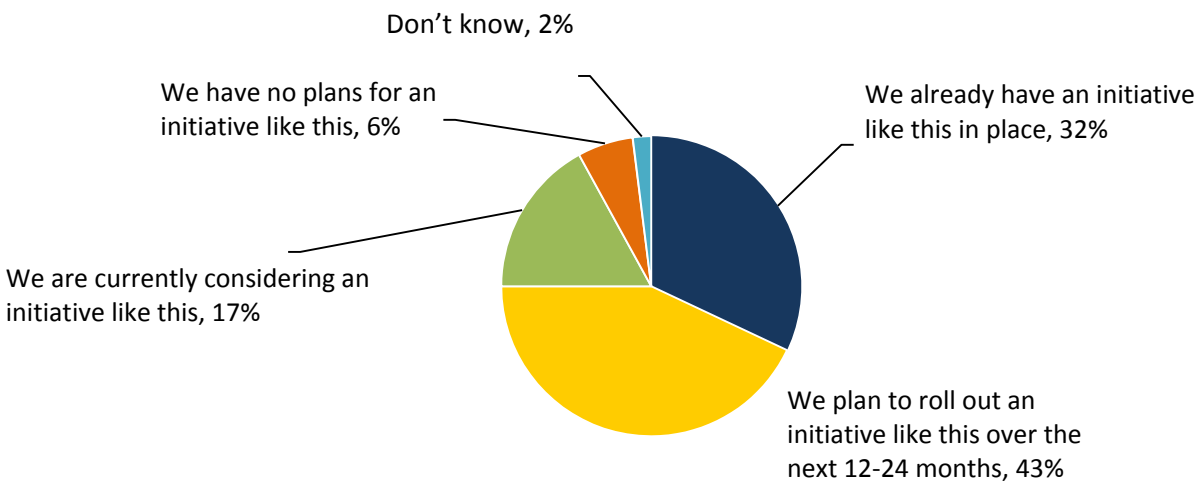
IoT offers immediate intelligence on how operations are running and provides greater insights over time. And finally, organisations can take advantage of more market opportunities when they can innovate on products and services. IoT can enable new ways of adding incremental value and exploring entirely new markets.

Right now, many organisations are identifying ways in which they can monetise IoT and implementing new projects to do so. This survey data shows how prevalent IoT initiatives are already (32%), how many are in active development (43%) and how many are being explored (17%).

Figure 1. Plans for Initiatives Involving Increased Usage of Sensors to Collect Data for BI/Analytics

What plans – if any – does your organisation have for an initiative involving the increased usage of sensors to collect data for business intelligence and analytics purposes? (Percent of respondents, N=373)



Source: Enterprise Strategy Group, 2015.

To Achieve IoT Greatness You Need to Adapt

Technology concepts like IoT require major shifts inside a business. Change has to happen in three broad categories for IoT success:

- **People.** Your teams will have to think creatively about how they can achieve specific goals, and then refine to generate practical and feasible applications. People don't always like change, but they'll have to embrace IoT, because, whether they are conscious of it or not, IoT will increasingly feed into the applications they use daily. Human and organisational behaviour is critical to realising the value of new approaches, and it's particularly important in shifting an organisation to demonstrate clearly what will change, how it affects people and what they stand to gain from IoT applications.
- **Process.** Beyond thinking differently, acting differently will become necessary. Enterprises should explore where more and faster insights can lead to new responses, and then figure out what can be automated. It'll be crucial to standardise and institutionalise the ways that various business stakeholders carry out their activities. The new behaviours stemming from new IoT processes will have to be built into job definitions and operational guides to gain the IoT efficiencies.
- **Things**. The "T" of IoT is clearly important, but too often, it's the only area of focus when examining IoT in business. The Things are only the means to an end as objects that can capture data measuring physical conditions or sometimes as actuators to affect the system. The rest of the systems need to be instrumented to leverage the data: communicating it to the right place for action – whether the cloud, data centre, or edge – and then using analytics to understand what the data is saying and craft a response to fix or optimise.

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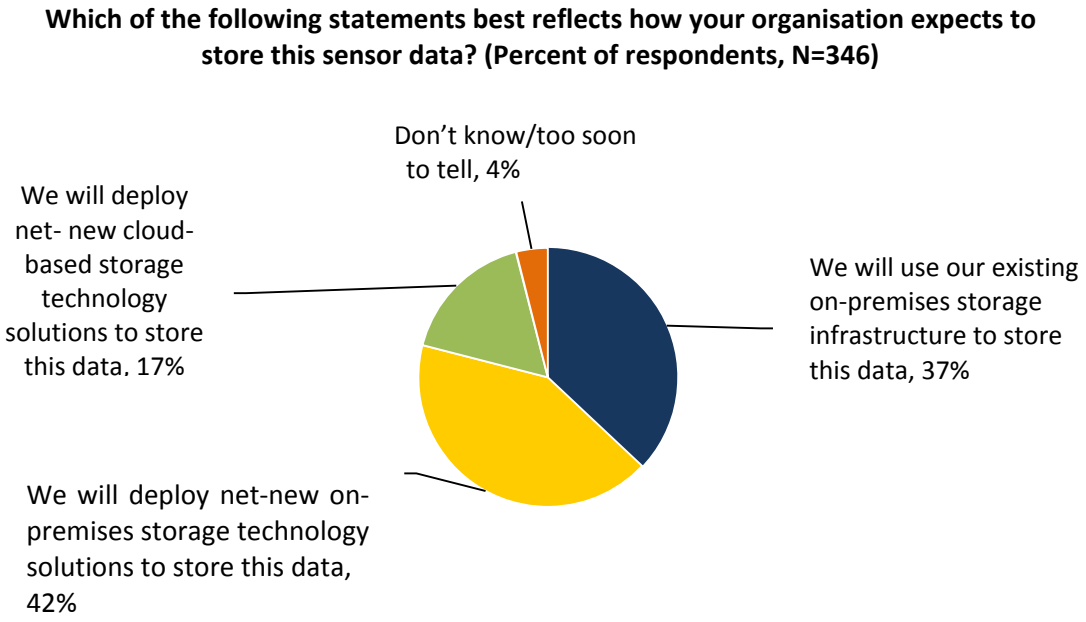
The "People" and "Process" components are often led by executive sponsors and strategy consultants, planning change management and business transformation initiatives. IT infrastructure and operations teams will most often take the lead in the "Things" category. It will be up to those IT teams to invent, adapt and then implement the physical and logical architecture that will make IoT actually work for the business.

ESG research shows how users are already considering IoT implications for the IT infrastructure. One telling example of an adjustment is how sensor data will be stored (see Figure 2). Forty-two percent of respondents will be deploying new storage in their data centres, and 17% will be adding cloud storage. Only 37% will make do with existing storage on site. Similar questions around the impacts of IoT will touch all layers of the IT stack, including also servers, networks, security, databases and more.

Figure 2. Organisations' Expected Method of Storing Sensor Data



Source: Enterprise Strategy Group, 2015.

Helpful Considerations Around Establishing an IoT Platform

With all of these major shifts, you'll need to formulate a holistic strategy for an IoT initiative to be successful. There are several essential technical requirements to take into account. First, the platform should reduce the need for specialised skills. If IoT is too difficult to implement, the project will never get off the ground, and not everyone you meet is a PhD in robotics or data science (thankfully). Yet organisations will want to employ the staff and skills they already have in place. These teams will be called on to design, implement, run and support specific IoT initiatives. Alternately, finding products that are simpler and expertise from solutions providers will help greatly.

The IoT strategy should also reduce system complexity. If IoT is too hard to operate, it won't work well or at all. Many products in the market today are in fact only a small part of the overall solution – an essential part maybe, but not the whole. The design of a technology stack should be comprehensive to meet all requirements, yet not so complex as to be fragile, unwieldy, or unduly expensive in the real world. The elements of the overall stack need to interoperate cleanly.

And finally, an IoT approach should increase data collection and facilitate the use of analytics. This doesn't mean that all data is uniformly valuable or should be kept forever, but that a useful IoT platform will readily capture more data from more sources and employ analytics tools to give it meaning. While a lot of IoT may be considered "exhaust data" spewing out endlessly and soon disappearing into the ether, discovering value from tons of transient data is critical in the moment, and keeping enough around to identify even subtle long-term patterns may be even more crucial. Real-time and historical analytics will lead to prescriptive and predictive outcomes.

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What Is an IoT Platform Anyway?

An IoT strategy should include infrastructure and applications that metabolise machine and sensor data, and leverage it accordingly. At the moment, IoT platforms are often custom-built functional architecture. Enterprises that take the first step into this new market should look for interoperability between existing systems and a new IoT operating environment.

To be an IoT platform, the solution must include:

- **Connectivity.** This is obviously essential. Devices need to communicate, the information needs to be aggregated and processed, and the right data has to be sent to the right place at the right time. In addition, the user or administrator has to be aware of these connections and take action where needed. For example, geo-location from an on-board mobile device could alert a company's receiving department when a truck will make its delivery. Then RFID information from tags on boxes could communicate data back to the shipper, the manufacturer and the retail store to update inventories and accounting. From there, Wi-Fi-enabled processing equipment might put these recently arrived products directly into sales systems with information about their specific characteristics (SKU, freshness date, size, colour, etc.). In each of these examples, a different type of connectivity is needed – either mobile, Bluetooth, RFID and wireless or wired (IP).

  In an IoT world, connectivity is constant and enables data monitoring, monetisation and maintenance such as upgrades. Connectivity also needs to span low-energy local networks of sensors and actuators, edge-based gateways and wide-area networks, linking back to data centres and cloud services infrastructure.
  Latency may be a bigger consideration than bandwidth here, at least when instant response to changing conditions is required. Also, network disruption and disconnected operations should be mitigated, with edge systems able to function fully independently, at least for a short time.

- **Security, Privacy and Governance.** These reams of collected IoT data could easily contain sensitive information about people and operations, and can even cede control of critical systems. On one hand, more data is needed to get more insights, but on the other hand, more data can mean more exposure in the event of inappropriate access. Beyond protecting personal privacy and business secrets, as more systems become automated, the risk of attacks becomes both more likely and more impactful. Internal, external and even geo-political bad actors will look to exploit any vulnerabilities, and the rush to deliver functionality mustn't overlook safety.

  Devices themselves should be secured, as should operating systems, networks and every other exposed piece of technology along the way. The roles of users, administrators and managers should be individually defined with appropriate access and strong authentication embedded in the design. A multi-layered approach to security is essential, and it should have checks and balances to reinforce protection and, if necessary, diagnose any breaches.

- **Big Data Analytics.** The resulting deluge of IoT sensor data must be understood and made actionable in the moment and over the long term. These data points will include structured data, unstructured data and structured time series data, as well as a variety of analytical methods. Structured data might come from ERP systems and relational databases, such as supply chain and parts listings for automobile manufacturing. Exact specifications of each component are captured as transactional updates in tightly defined fields (part number, production lot, factory etc.). Later the data may be extracted and joined with looser, unstructured text data like service records notes from car dealerships. And a time element may come in also as the service dates for oil changes and other periodic maintenance occur. Each data type introduces more information, but combined together will yield the secret of when a part failure is happening, help diagnose the origin of the problem and suggest a preventative maintenance fix.

  Big data, in the context of the IoT, refers to analogue inputs being converted to digital data and analysed, and resulting in a response going back the other direction. Unlike some big data applications, the inputs should be at least semi-structured, but the sheer quantities and immediateness will raise other hurdles. Some analytics may need to be performed at the edge, some in the data centre, and some in a cloud environment, depending on the trade-off of speed versus depth.

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- **Compute**. In an IoT environment, computation needs to get done as quickly as the associated system of things requires. Some processes, like balancing the energy production loads and consumption on a power grid, will need instantaneous compute, at risk of causing blackouts and damaging expensive equipment in distribution substations. Other uses, like reporting the daily or monthly production totals of a particular assembly line, aren't as immediately time-sensitive. For data analytics, data movement, and data management, all IoT processing needs to be done at the optimal point across all sites – having the right amount of compute in the right place. Computation power clearly matters, but so do other factors like energy consumption, form factor and total cost of operation.

  Compute can be encapsulated in devices at the edge, in gateways and in data centres. Some demands will be persistent while some will be temporary, and resource allocation needs to be optimised for efficiency while being able to accommodate peak loads. In big data clusters, processing is often bundled tightly with memory and storage, and an appropriate balance needs to be found to meet the demands of the system.

- **Applications**. Whether fully automated or using a human interface, the IoT environment must have apps that actually use the gathered information and are very specific to the operations and activities for the appropriate role, function or industry. These can vary tremendously, but it's important that they are tailored to the environment and users. Here is where it is hardest to claim a universal platform approach and most important to tie into existing or emerging processes. For example, users may have applications that they won't change just to incorporate IoT inputs. Those people and apps will need to work together but sometimes the changes will have to be behind the scenes, leaving familiar interfaces for workers.

You may have many of these parts in place today, but pulling them all together may require outside expertise to connect and simplify your existing environment into an IoT strategy. Consulting services should be utilised to fill in knowledge gaps, simplify the overall solutions and to identify the topical areas of data collection.

While this paper explores the unifying theme of a platform, upcoming pieces will drive deeper into each requirement above.

How HPE IoT Solutions Meet IoT Requirements

Among all of the solution providers for IoT, HPE is certainly worth a closer look. HPE's IoT solutions cover four tiers of solution architecture, from the first tier of sensors and actuators, through tier two of data aggregation, tier three of edge IT such as analytics and the fourth tier of data centre and cloud. All components of the IoT can be mapped into these tiers, or stages. HPE's deep industry knowledge and experience and breadth of products work tightly together to provide an end-to-end IoT platform. HPE and its partners can complete the application part of IoT, whether by running it themselves or developing integration plans.

Perhaps even more importantly, HPE's partner ecosystem also plays a large part in making HPE's IoT offering so successful, with GE, SAP, and many others adding resources. In the IoT market, the shared delivery of services and shared technology are guiding development. HPE has enormous industry experience and expertise that will be valuable in shaping the proposed solution, and can call on specialised partners wherever necessary to manifest that solution. While everyone claims to have an ecosystem and can display many swapped logos, HPE has delivered in the real world, both as the system integrator lead for projects and as a contributing technology that is "OEMed" and integrated into others' services.

HPE's IoT platform takes advantage of a wide range of skills and technology to meet, and exceed, the requirements for a complete IoT solution. It starts with data centre hardware and cloud software, pulling in supporting technologies like connectivity and other management tools. Other functionality can embed and manage context and location information, and perform real-time, inline analytics. In addition, data gets streamed asynchronously into a data lake for analytics and processing. HPE's guiding principles of IoT push compute power and analytics ever closer toward the edge, without neglecting the core. This paper simply introduces the concepts, but subsequent pieces will explore the specific technologies that will come into play.

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The Bigger Truth

The Internet of Things is moving into the realm of reality, and IT leaders now have some real tools to implement. In this brand-new connected world, it'll be useful to ask some big questions about what the IoT can accomplish for a business, and how that should happen. For example, how future-proof are current architectures? IoT can bring plenty of disruption while in its infancy. Considering the actual processes, resources and capabilities needed to run an IoT platform is also important. Implementing IoT will likely also bring up questions of the cloud and current networks and whether they are suitable for the job.

The sheer volume and variety of data pumped out by devices and sensors can appear overwhelming, and IT teams should get the right platform in place to direct the deluge. Control is important in order to actuate and manage the Things of the IoT.

HPE's IoT approach provides an important means to an end, packaging connectivity, security and big data analytics – plus the rest of the necessary components – in a way that users can actually deploy. This is a big step in a new market, and early use cases promise customer and business insights and intelligence that wasn't possible even a few years ago. HPE's offering also provides a quick time to value and reduced integration risk, as it depends on a tried-and-true set of products and partners. Businesses looking to take the IoT leap would do well to engage with HP on their short list to assess, supply and implement IoT.

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