The Platform of Platforms in the Internet of Things

IDC OPINION

In recent years, the Internet of Things (IoT) platform has become a focal point in any discussions regarding an IoT investment. As this market continues to mature in 2016, IDC expects to see a "platform of platforms" emerge. This is necessitated by the fact that there are a myriad of platforms in the market today – all endeavoring to be a center of gravity for IoT implementations. These IoT platforms are offered by a range of players, from niche vendors and industrial players to software vendors and, in some cases, equipment makers. The challenge, however, is that many of these platforms focus on one aspect of a holistic platform, whether device connectivity, connectivity, application management, or even analytics. What is needed is a *center point* that acts as the platform of platforms to integrate these disparate solutions as well as provide additional capability.

IBM, through its Watson IoT portfolio, is looking to be that platform of platforms. Its goal is to act as the epicenter for platform providers, other IoT market participants, and organizations themselves. By leveraging IBM's Watson IoT Platform, organizations not only benefit from a holistic IoT platform portfolio but also have access to the cloud, information management and data services (i.e., weather, social), and security capabilities on which IBM has established its reputation. Watson IoT, in particular, offers the learning and intelligence to enable the digital disruption of the physical world, transform business, and enhance the human experience.

IN THIS WHITE PAPER

This white paper examines the Internet of Things with a lens on the IoT platform and why it is needed to bring together the connected endpoints with the enterprise applications, security, and analytics. The key elements of the IoT platform are discussed and positioned within the overall context of the IoT market. In essence, the IoT platform is critical to provide connectivity, manage risk, and provide information management and analytics.

This white paper offers perspective on the opportunities and challenges to enterprises as they look to invest in an IoT platform. It also provides an overview of IBM's Watson IoT Platform, which is a robust solution set that brings the key elements of the platform into one offering and positions it as laying the foundation for being a true platform of platforms.

SITUATION OVERVIEW

The IoT Opportunity

The Internet of Things will be a key driver for the digital transformation that enterprises are about to undergo in the next several years. Digital transformation is the approach by which enterprises will drive changes in their business models and ecosystems by leveraging digital competencies. IDC sees transformation happening across five different areas:

- Leadership transformation
- Omni-experience transformation
- Information transformation
- Operating model transformation
- Workforce transformation

The Internet of Things will be a critical piece of this transformation because it not only allows new business models to emerge but also will enable changes in work processes, productivity improvements, cost containment, and enhanced customer experiences, to name a few.

IDC defines the IoT as a network of networks of uniquely identifiable endpoints (or "things") that communicate without human interaction using IP connectivity. The ecosystem that supports the IoT includes a complex mix of technologies not limited to modules/devices, connectivity, IoT platforms, storage, servers, security, analytics software, and IT services. IDC expects that by 2020, spending on the IoT will be $1.7 trillion.

It is important to note that the IoT is more than just Fitbits and connected consumer electronics. IDC expects that more than 80% of spend on the IoT in 2020 will be on B2B applications and use cases. In IDC's 2015 *Global IoT Decision Maker Survey,* the majority of respondents stated that business applications will be an important area of growth in the IoT. With the plethora of industrial applications, enterprise applications, and government applications emerging from across the ecosystem, the real opportunity will be in the organizational value that is generated.

The Holistic IoT Platform

Most recently, the IoT platform has received a significant amount of attention because it is implicitly tied to providing business value in that it links the IoT endpoints to the applications and analytics needed to generate business outcomes. It is essentially the linchpin in a holistic IoT solution because it enables the data generated at the endpoints to be processed and meaningfully used by end users.

IDC believes there are five key elements to the IoT platform. This is not to say that all platform solutions in the market include all five elements. Today, many IoT platforms include two or three elements, with only a few vendors truly addressing the full spectrum of platform capabilities. The five elements are discussed in the sections that follow.

Device Management

- This element includes platform features and functionality that are designed to provision, update, and ensure the ongoing ability of the endpoint to receive and send data.
- The subelements of device management include activation certification, configuration, device monitoring, diagnostics, enablement, and provisioning/OTA software updates.
- The goal of device management is to ensure these functions are able to be fulfilled and maintained cost effectively at the edge of the network.

Connectivity Management

- This element includes platform features and functionality that enable IoT service providers to manage security, access, and some billing activities for connected endpoints. Features often include the support for multiple connectivity protocols and varying levels of security services. Increasingly common is the inclusion of functionality that helps manage mobile operator services on a single global SIM. Mobile operators have long brought more traditionally defined network management features as part of or alongside connectivity management platforms. These features are OSS/BSS capabilities, including home location register (HLR), a repository of subscriber information such as account status, user preferences, services subscribed to (e.g., data), user location or address, and authentication, authorization, and accounting (AAA) related to data services.
- The subelements of connectivity management include SIM management/gateway management, store and forward, monitoring and alarms, diagnostics, and reporting.
- The goal of connectivity management is to help ensure the speed to market of connected endpoints globally as well as the secure connectivity to these "things."

Application Management

- This element includes extensible functionality made available typically via cloud-based APIs that enable the development of horizontal and/or vertical applications that leverage data generated by the connected endpoints in the IoT solution. Application provisioning and application-level security services are key parts of application management platforms.
- The subelements of application management include APIs, application provisioning, and application security services.
- The goal of application management is to reduce the cost and complexity that developers and/or end users can suffer when developing applications that need to collect, manage, and begin the interpretation of data generated by a wide range of connected endpoints.

Dashboard and Reporting

- This element includes tools that enable the IoT solution provider and/or end user to create automated, repeatable, and management-oriented summaries of IoT data. The tools enable the normalization of data in the cloud and allow the dashboard creator to integrate data from the IoT solution in a report with data from the enterprise cloud or other enterprise systems.
- The subelements of dashboard and reporting include visualization tools, normalization of data in the cloud, and integration of data from/with enterprise systems or data in public clouds.
- The goal of dashboard and reporting tools and services is to facilitate easy digestion of IoT solution data results for ease and speed of management decision making.

Analytics

- This element includes basic compute functionality that reveals insightful, actionable, and some elementary predictive data. Analytics capabilities in the IoT platform are not of the big data, sophisticated variety. Additional compute capabilities are required to generate large-scale, meaningful interpretation of the data. Services often provide fundamental contextualization of IoT solution data, for example, in social, historical, and real-time contexts.
- The subelements of analytics include basic contextualization of IoT solution data in social, historical, and real-time contexts and basic compute functionality. Information management and storage of information are components that can be included in some platforms that have analytics functionality. Having the ability to plug in available data sources (i.e., weather, social) will also provide a better picture of the information captured.

- The goal of analytics within the IoT platform is to raise the relevancy of data interpretations, reducing the amount of time that end users spend piecing together data outputs. However, without access to deeper cognitive analytics functionality, the information captured and managed will not provide the deeper insight that will drive digital disruption of the physical world, business processes, and real-time decision making.

FUTURE OUTLOOK

As organizations look to deploy an increasing number of IoT solutions, they must seek vendor partners that can support the growing needs of these deployments. IDC has identified the following capabilities that organizations will require of their IoT platform partners. It will be critical for organizations to work with vendors that have the expertise to manage these longer-term requirements and have these capabilities built into their solution:

- **Vertical industry expertise.** There will be an increasing need for platforms to address the needs of specific applications, which in most cases will be associated with an industry use case – whether healthcare, transportation, manufacturing, or retail, to name a few. However, it is also beneficial if the fundamental capabilities of the platform are not vertical specific but are capable of being customized to meet the organization's specific requirements.

- **Security focus.** With security a top-of-mind issue for all organizations, IoT platforms need to have solutions that ensure security is baked into the offering. Organizations will increasingly insist that business risk is mitigated with their IoT deployments.

- **Integration with embedded operating systems and intelligent gateways.** With embedded IoT platforms residing within the chipset or intelligent gateways, there will be advanced capability for developers to access functionality not available in the middleware type of IoT platform.

- **Integration of cross-vertical data sources with the platform.** Many IoT solutions will need inputs and information from external sources; therefore, it is important for platforms to have the capability to access cross-vertical data sources.

- **Robust ecosystem of partners, starting with the OEMs.** Successful IoT platform providers will have a myriad of partners throughout the IoT ecosystem, but IDC believes that it will be essential to have relationships with several device and chipset OEMs. These OEMs can help guide the functionality needed in the platform offering and help provide a more holistic solution to organizations looking for a single provider.

- **Geographic scale.** Despite the fact that some deployments in country will be self-contained, other deployments will be part of a global supply chain. It will be necessary for organizations to work with vendors that can address their local and global needs – by understanding some of the nuances of connecting endpoints in specific geographies. For example, deployments in China are challenged by the country's lack of integration with a global cloud. In Germany, there are issues with transmitting data outside the country's borders as a result of privacy laws. From a healthcare or finance perspective, the regulations are very country specific. These examples highlight that a truly global IoT platform must understand the geopolitical implications of tracking moving things, in particular.

- **Vendor viability.** In the IoT platform market, well over 150 vendors offer some or all of the elements of a holistic solution. The challenge, however, is that many of these vendors are small, and IDC's expectation is that some will fail and others will be acquired by larger players. It's important to consider the longer-term viability and market presence of the vendor selected because those factors will impact the long-term success of the IoT deployment project.

IBM'S ROLE IN THE INTERNET OF THINGS

IBM continues to invest heavily in the Internet of Things and seeks to be that platform of platforms for the IoT market. In April 2015, IBM announced a $3 billion investment over the next four years to deliver IoT solutions and services to its customers – with the focus on efficiently helping create, build, and manage connected products and systems at the heart of the IoT. In December 2015, IBM announced Watson IoT as a means to couple the cognitive analytics that Watson offers with the IoT business opportunity. This further solidifies IBM's investment in the IoT market – even after making a significant move by acquiring The Weather Company in October 2015. This section highlights IBM's IoT portfolio – in particular, the IBM Watson IoT Platform. IBM is focused on being the provider of enterprise IoT by enabling businesses to transform their industry with new services, offerings, and sources of revenue. It believes that IoT is driving digital transformation into the physical world because of the advancements in embedded sensors, ubiquitous connectivity, cloud computing, product life-cycle management, and advanced analytics. The result of this transformation is that organizations are:

- **Improving operations and lowering costs** through predictive maintenance, by reducing business risk, or through factory automation, for example
- **Creating new products and business models** in automotive innovation, health and fitness tracking, or home/building automation, for example
- **Driving engagement and customer experience** in retail scenarios, connected event venues, or omni-experience applications supporting a particular brand, for example

With this in mind, IBM has come to market with an end-to-end offering that provides the tools, services – and in some cases – partners to enable IoT across industry transformation, applications and solutions, platforms, and devices and networks. The sections that follow highlight the pieces of IBM's holistic vision for the company's IoT portfolio.

Industry Transformation

As mentioned previously, it is important for successful IoT vendors to offer platforms that can be verticalized yet maintain common elements across all industries. IBM has taken this approach to heart by developing industry-specific applications. To date, IBM offers two specific solutions: "IoT for Electronics" and "IoT for Automotive." Other solutions will be added in 2016 and beyond. These offerings are industry use case focused and leverage IBM's IoT applications and the Watson IoT Platform as well as other supporting elements, including IBM's strength in security, analytics, and commerce, while being based on IBM Cloud infrastructure and services. The IBM IoT team is also building its leadership capabilities in industry transformation by working closely with IBM Research.

Applications and Solutions

In IBM's perspective, applications are the link between an organization's transformation and the IoT platform. Applications are the linchpin to bringing connected devices to life. These applications allow for technology-driven innovation, industry-driven innovation, and device innovation. IBM has focused many of its efforts on asset and facility management (including inventory optimization, facility space utilization, and worker health and safety) as well as asset performance (predictive maintenance, operations optimization, and condition-based maintenance).

Other areas in which IBM is taking a leadership position are continuous engineering (with its full end-to-end systems development and requirements management capabilities) and connected product development (with its services designed to help manufacturers create smart connected products for the Internet of Things).

Platform (IBM Watson IoT Platform)

Many IT and industry-focused vendors claim to have an IoT platform, but few have achieved a holistic, end-to-end platform incorporating all five elements as defined in IDC's taxonomy. IBM addresses each of the IoT platform elements with its Watson IoT solution. IBM's platform will be the common ground from which managed cloud-hosted offerings (using the IBM SoftLayer infrastructure) can be offered. The key elements include access to analytics tools, an application development environment in Bluemix, and the inclusion of security elements to ensure protection of corporate data in addition to the integration with ARM's mbed IoT Device Platform. IBM differentiates itself because of its strength in analytics and hybrid cloud capabilities.

- **IBM Watson IoT Platform Connect.** This element provides communications from device to cloud over multiple protocols and for many device types from IBM's range of device and silicon partners.
- **IBM Watson IoT Platform Information Management.** This provides data integration capabilities from other third-party data sources and platforms in addition to storage for IoT device data.
- **IBM Watson IoT Analytics.** This aspect of the offering incorporates IBM's analytics portfolio leveraging Watson APIs and brings these capabilities to the IoT Platform. Some of the key elements including Real-Time Insights that Watson APIs enable are natural language processing, machine learning, video/image/audio analytics, and text analytics.
- **IBM Watson IoT Risk Management.** This element focuses on addressing the increasing security demands of IoT and developing solutions that address business problems such as anomaly detection in large IoT landscapes.

Devices and Networks

IBM is committed to helping connect devices to the IBM IoT Foundation. IBM recognizes that it needs partners to make this a reality, but it aims to drive ecosystemwide interoperability and security in this layer of the market. It is working with hardware integrators (e.g., Flextronics, Avnet) to drive value to connected endpoints leveraging IBM Cloud services. For telcos and electronics companies (e.g., ARM, AT&T, Intel, Jasper, Sprint, Texas Instruments), IBM is providing developers with the ability to connect to the IoT Foundation and develop applications and functionality not only directly for devices that auto-connect but also using its self-service developerWorks Recipes site. Customers that are using the IBM Watson IoT Platform today include Continental, Cummins, Gibson, SilverHook, and Whirlpool.

CONCLUSION

Organizations in the midst of, or planning for, an IoT deployment understand the complexity of finding a solution that is holistic yet customizable to their own unique requirements. At the same time, IoT platform providers are looking for a way to scale, expand, and provide additional capabilities such as analytics and security. IDC believes that having a solid IoT platform is the linchpin in connecting endpoints and capturing data so that the data can be turned into meaningful and transformative business information. It is also critical to work with a vendor that invests in strong partnerships across the ecosystem — and that has the capability to deliver an IoT platform of platforms — as it will have the breadth, depth, and industry partners to provide that truly holistic solution, thus enabling the business outcomes that organizations aspire to with their IoT investment.

About IDC

International Data Corporation (IDC) is the premier global provider of market intelligence, advisory services, and events for the information technology, telecommunications and consumer technology markets. IDC helps IT professionals, business executives, and the investment community make fact-based decisions on technology purchases and business strategy. More than 1,100 IDC analysts provide global, regional, and local expertise on technology and industry opportunities and trends in over 110 countries worldwide. For 50 years, IDC has provided strategic insights to help our clients achieve their key business objectives. IDC is a subsidiary of IDG, the world's leading technology media, research, and events company.

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