Solution overview brochure

Deliver on customer experience

HPE IoT Platform

Hewlett Packard Enterprise

IoT evolution

Today it is almost impossible to read a publication of any kind about the tech industry without some reference to the Internet of Things (IoT). IoT is a natural evolution of machine-to-machine (M2M) technology and is the interconnection of intelligent devices and management platforms that collectively enable the "smart world" around us. From wellness and health monitoring to smart utility meters, integrated logistics, and self-driving drones, this world is fast becoming a hyper-automated one.

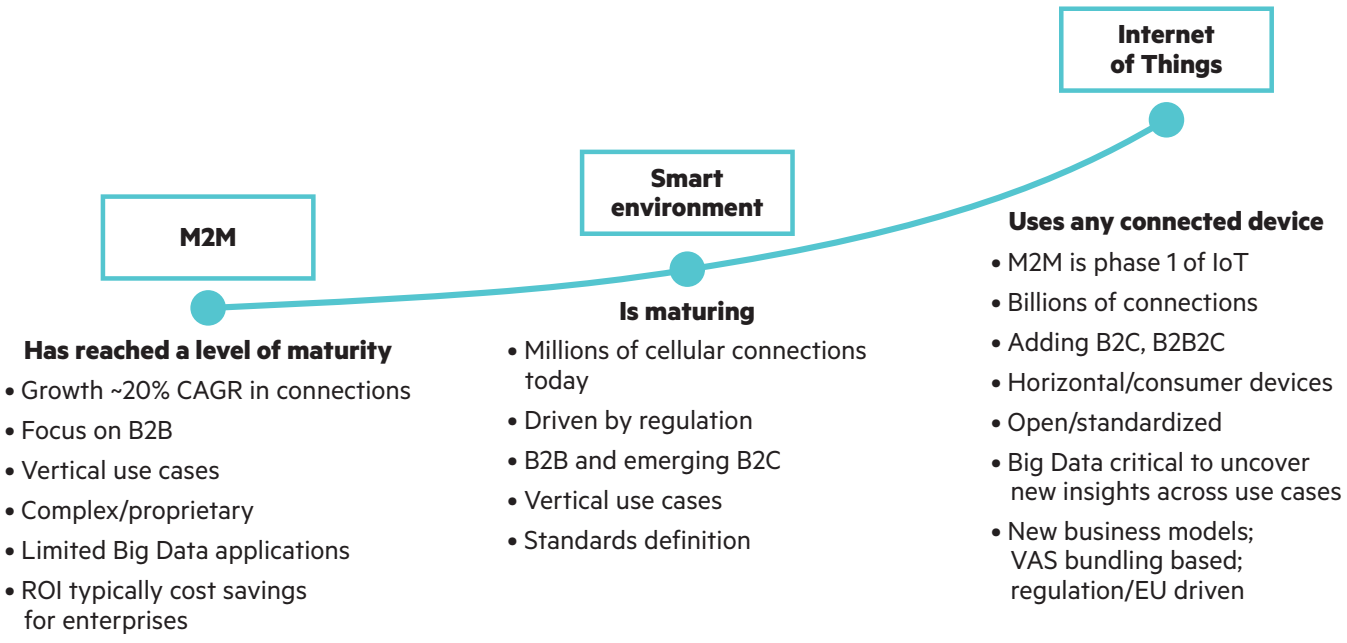

Figure 1: M2M to IoT evolution

The market for IoT devices and applications, and the new business processes they enable, is enormous. Gartner estimates a 35.2 percent compound annual growth rate (CAGR) of nonconsumer IoT devices from 2013 to 2020, reaching an installed base of 25 billion units in 2020.[1] IDC estimates that the installed base of IoT is approximately 9.1 billion devices in 2014, growing to 28.1 billion devices by 2020 with a $7 trillion market value.[2] Goldman Sachs forecasts that about $2 trillion of that (IDC's estimated $7 trillion market value) will relate directly to "industrials," which includes building automation, manufacturing, and resources.[3]

In some instances, IoT may relate purely to devices connected via an enterprise's own network such as a Wi-Fi mesh across one or more factories. However, in the vast majority of cases, an enterprise's IoT network extends to devices connected in many disparate areas, requiring connectivity over a number of connectivity options. For example, an aircraft in flight may provide feedback sensor information via satellite communication, whereas the same aircraft may use an airport's Wi-Fi access while at the departure gate. Equally, where devices cannot be connected to any power source, a low-powered, low-throughput connectivity option, such as Sigfox or LoRa, is needed.

[1] Forecast: Internet of Things, Endpoints and Associated Services, Worldwide, Gartner, 20 October 2014

[2] Worldwide and Regional Internet of Things (IoT) 2014–2020 Forecast: A Virtuous Circle of Proven Value and Demand, IDC, http://www.idc.com/downloads/idc_market_in_a_minute_iot_infographic.pdf

[3] The Internet of Things: Making sense of the next mega-trend, 3 September 2014, Goldman Sachs, http://www.goldmansachs.com/our-thinking/outlook/internet-of-things/iot-report.pdf

The evolutionary trajectory—from limited-capability M2M services to the super-capable IoT ecosystem—has opened up new dimensions and opportunities for traditional communications infrastructure providers and industry-specific innovators. Those that exploit the potential of this technology—to introduce new services and business models—can deliver unprecedented levels of experience for existing services and, in many cases, transform their internal operations to match the needs of a hyper-connected world. Although the prospect of IoT is enticing, it's essential not to neglect the practical applications of the technology before moving along to analyzing the data that has been collected.

IoT has the potential to facilitate beneficial decision-making that no one device could spur on its own. However, that treasure trove of information coming online for the first time is rendered completely useless, unless the devices generating this information can be managed and the information considered accurate and trustworthy. And it can be analyzed, then monetized into new revenue streams, cost savings, or improvements in user experience. Without all of that, the true value will not be maximized. With this wealth of useful information available from IoT devices; organizations and those in the media need to be careful not to get so absorbed in the "what" of IoT that they completely gloss over the "how."

Next-generation IoT solutions

Given the requirement for connectivity, many see IoT as a natural in the communications service providers' (CSPs) domain, such as mobile network operators, although connectivity is a readily available commodity and therefore of low value. In addition, some IoT use cases are introducing different requirements on connectivity—economic (lower ARPU) and technical (low-power consumption; limited traffic, mobility, or bandwidth), which means a new type of connectivity option is required to maximize efficiency and return on investment (ROI) of such use cases, for example, low throughput network connectivity.

However, value creation is no longer based on connecting devices and having them available, rather on collecting their data, validating it, possibly enriching it with analytics, and mixing with other sources. And then exposing it to the applications that enable enterprises to derive business value from these services.

While there are already many M2M solutions in use across the market, these are often "silo" solutions, able to manage a limited level of interaction between the connected devices and central systems. An example would be simply collecting usage data from a utilities meter or for a fleet management solution. These solutions are also often limited in terms of scale being specific to a device type, vertical protocol, and business processes. In addition, they were designed and dimensioned prior to the explosion in connected devices and available functionality that has given rise to the Internet of Things.

In a fragmented ecosystem, close collaboration among participants is required to conceive and deliver a service that connects all components of the data monetization; key participants being:

- **Smart device** and sensor manufacturers
- **Systems integrators** for M2M/IoT services and industry-specific applications
- **Managed ICT infrastructure** providers
- **Management platforms** providers for device management, service management, charging
- **Data processing** layers operators to acquire data, then verify, consolidate, and support with analytics
- **API management platform** providers to expose status and data to applications with partner relationship management (PRM), Market Place, and Application Studio

With the silo approach, integration must be redone for each and every use case. IoT operators are saddled with multiple M2M silos and associated operational costs, while being unable to scale or integrate these standalone solutions or evolve them to address other use cases or industries. As a result, these silos become an inhibitor for growth, as the majority of the value lies in streamlining a complete value chain to monetize the data all the way from sensors to applications. This creates added value and related margins to achieve the desired business cases and therefore fuel investment in IoT-related projects. And it requires the maximum flexibility, scalability, cost efficiency, and versatility that a next generation IoT platform can offer.

HPE IoT Platform overview

For CSPs and enterprises to become IoT operators—and maximize IoT's value, there's a need for a horizontal platform. Such a platform must be able to easily onboard new use cases being defined by an application and a device type from any industry, and manage a whole ecosystem from the time the application is on-boarded until it's removed. In addition, the platform must also support scalability and lifecycle when the devices become distributed by millions over periods that could exceed 10 years.

Hewlett Packard Enterprise (HPE) Communication & Media Solutions (CMS) developed the HPE Internet of Things Platform specifically to address long-term IoT requirements. At the heart, this platform adapts HPE CMS's own carrier-grade Telco software—widely used in the communications industry—by adding specific intellectual property to deal with unique IoT requirements. And also leveraging market-leading HPE offerings such as cloud and Big Data and analytics applications, which include Virtual Private Cloud and Vertica.

The HPE IoT Platform enables connection and information exchange between heterogeneous IoT devices—standards and proprietary communication—and IoT applications. In doing so, it eliminates dependency on legacy silo solutions. And it dramatically simplifies integrating diverse devices with different device communication protocols. For example, the IoT Platform can be deployed to integrate with the HPE Aruba Networks WLAN solution to manage mobile devices and the data they produce within the range of that network and integrating devices connected by other Wi-Fi, fixed or mobile networks. These includes GPRS (2G and 3G), LTE 4G and "Low Throughput Networks", such as LoRa.

On top of this ubiquitous connectivity, the HPE IoT solution provides federation for device and service management, and data acquisition and exposure to applications. Using our platform, clients such as public utilities, home automation, insurance, healthcare, national regulators, municipalities, and numerous others can realize tremendous benefits from consolidating data that had been previously unobtainable.

With the HPE IoT Platform, you can truly build for and capture new value from the proliferation of connected devices and benefit from:

- **New revenue streams** when launching new service offerings for consumers, industries, and municipalities
- **Faster time-to-value** with accelerated deployment from HPE partners' devices and applications for selected vertical offerings
- **Lower total cost of ownership (TCO)** to introduce new services with limited investment; flexibility of HPE options, including cloud-based offerings; and mitigate risk

By embracing new HPE IoT capabilities, services, and solutions, IoT operators—CSPs and enterprises alike—can deliver a standardized end-to-end platform, and create new services in the respective industry of their B2B/B2C/B2B2C customers and derive new value from data.

HPE IoT Platform architecture

The HPE IoT Platform solution architecture is aligned with oneM2M industry standard and designed to be industry, vertical, and vendor agnostic. This supports access to different south-bound networks and technologies and various applications and processes from diverse application providers across multiple verticals on the north-bound side. In simple terms, the HPE IoT Platform enables multiple industry verticals and industry-specific use cases to be supported on the same horizontal platform.

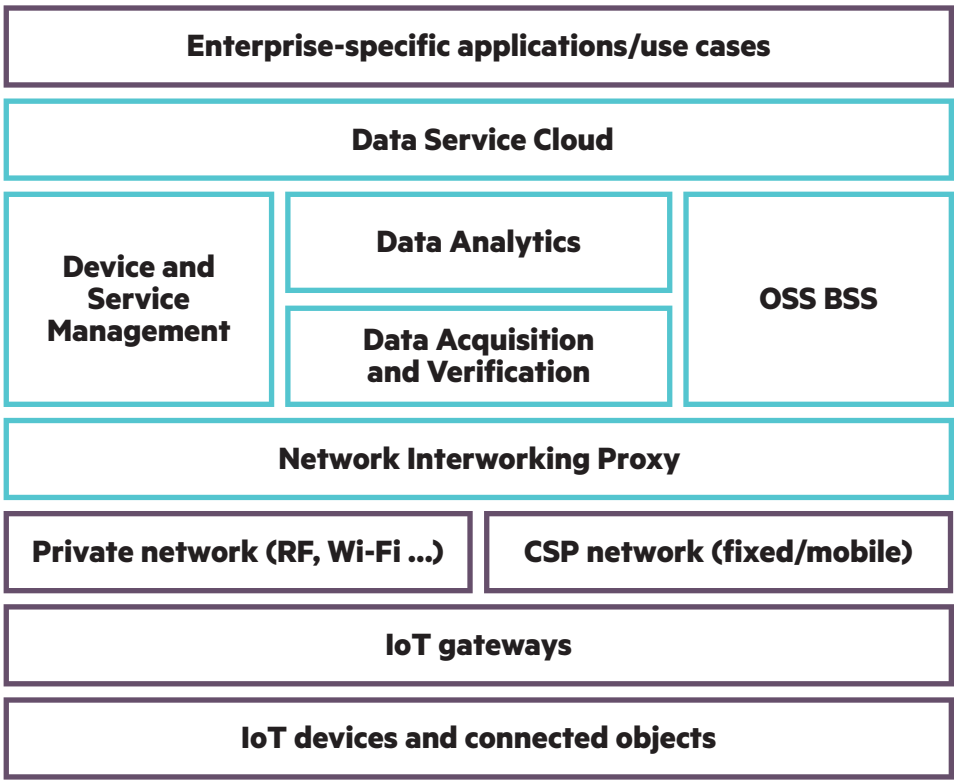

Figure 2: HPE IoT Platform Layered Architecture

Hewlett Packard Enterprise enables IoT operators to build and capture new value from the proliferation of connected devices. Given its carrier-grade Telco applications heritage, the solution is highly scalable and versatile. For example, platform components are already deployed to manage data from millions of electricity meters in Tokyo, and are being used by over 170 Telcos globally to manage data acquisition and verification from Telco networks and applications.

Alignment with the oneM2M standard and data model means there are already hundreds of uses cases covering more than a dozen key verticals. These are natively supported by the HPE IoT Platform when standards-based, largely adopted, or industry-vertical protocols are used by the connected devices to provide data. Where the protocol used by the device is not currently supported by the IoT platform, it can be seamlessly added. This is a benefit of Network Interworking Proxy (NIP) technology, which facilitates rapid development/deployment of new protocol connectors, dramatically improving the agility of the HPE IoT Platform against traditional platforms.

The HPE IoT Platform provides agnostic support for smart ecosystems, which can be deployed on premises and also in any cloud environment for a comprehensive as-a-Service model.

HPE equips IoT operators with end-to-end device remote management including device discovery, configuration, and software management. The HPE IoT Platform ensures control points on data, so you can remotely manage millions of IoT devices for smart applications on the same multi-tenant platform.

Additionally, it is device vendor independent and connectivity agnostic. The solution operates at a low TCO with high scalability and flexibility when combining the built-in data model with oneM2M standards. It also has security built directly into the platform's foundation, enabling end-to-end protection throughout the data lifecycle.

The HPE IoT Platform is fundamentally built to be data centric—as data and its monetization is the essence of the IoT business model—and is engineered to support millions of connections with heterogonous devices. It is modular and can be deployed as such, where only the required core modules can be purchased as licenses or as a Service, with an option to add advanced modules as required.

The HPE IoT Platform comprises the following key modules:

Device and Service Management (DSM)
The DSM module is the nerve center of the HPE IoT Platform, which manages the end-to-end lifecycle of the IoT service and associated gateways/devices and sensors. It provides a web-based GUI for all the stakeholders to interact with the IoT platform. The hierarchical customer account modeling, coupled with the Role-Based Access Control (RBAC) mechanism, enables various mutually beneficial service models such as B2B, B2C, and B2B2C models.

With the DSM module, you can manage IoT applications—configuration, tariff plan subscription, device association, and others—and IoT gateways and devices, including provisioning, configuration, and monitoring; and troubleshoot IoT devices.

Network Interworking Proxy (NIP)
The NIP component, in the HPE IoT Platform, provides a connected devices framework for managing and communicating with disparate IoT gateways/devices, and communicating over different types of underlying networks.

With NIP, you get interoperability and information exchange between the heterogeneous systems deployed in the field and the uniform OneM2M-compliant resource model supported by the IoT platform. It is based on a Distributed Message Queue architecture and designed to deal with the three Vs—volume, variety, and velocity—typically associated with handling IoT data.

NIP is supported by the Protocol Factory for rapid development of the device controllers/proxies for onboarding of new IoT protocols onto the platform. And it has built-in device controllers/proxies for leading IoT vendor devices and other key IoT connectivity protocols such as MQTT, LWM2M, DLMS/COSEM, HTTP REST, and others.

Data Acquisition and Verification (DAV)
DAV supports secure bi-directional data communication between IoT applications and IoT gateways/devices deployed in the field. The DAV component uses the underlying NIP to interact and acquire IoT data and maintain it in a resource-oriented uniform data model aligned with oneM2M. This data model is completely agnostic to the device or application, so it is completely flexible and extensible. IoT applications in turn can discover, access, and consume these resources on the north-bound side using secure oneM2M-compliant HTTP REST interface.

The DAV component is also responsible for transformation, validation, and processing of the IoT data:

- Transforming data through multiple steps that extend from aggregation, data unit transformation, and application specific protocol transformation as defined by the rules
- Validating and verifying data elements, handling of missing ones through re-acquisition or extrapolation as defined in the rules for the given data element
- Data processing and triggering of actions based on the type of message such as alarm processing and complex-event processing

The DAV component is responsible for ensuring security of the platform covering:

- Registration of IoT devices, unique identification of them, and ensuring data communication only with trusted devices
- Management of device security keys for secure/encrypted communication
- Access Control Policies manage and enforce the many to many communications between applications and devices

The DAV component uses a combination of data stores based on relational and columnar databases for storing IoT data, ensuring enhanced performance even for distinct different types of operations such as transactional operations and analytics/batch processing-related operations. The columnar database, used in conjunction with distributed file system-based storage, provides for extended longevity of the data stored at an optimal cost. This combination of hot and cold data storage enables analytics to be supported over a longer period of IoT data collected from the devices.

Hewlett Packard Enterprise is evolving its platform to reach an unrivaled stack of IoT functionality by adding:

Data Analytics
The Data Analytics module leverages HPE Vertica technology for discovery of meaning patterns in data collected from devices in conjunction with other application-specific externally imported data. This component provides a creation, execution, and visualization environment for all types of analytics including batch and real-time—based on Complex Event Processing—for creating data insights that can be used for business analysis and/or monetized by sharing insights with partners.

IoT Data Analytics covers various types of analytical modeling such as descriptive—KPIs, social media, and geo-fencing, predictive/propensity determination, and prescriptive/recommendations.

Operations and Business Support Systems (OSS/BSS)
The BSS/OSS module provides a consolidated end-to-end view of devices, gateways, and network information. This module helps IoT operators automate and prioritize key operational tasks, reduce downtime through faster resolution of infrastructure issues, improve service quality, and optimize human and financial resources needed for daily operations.

The module uses field proven applications from HPE's own OSS portfolio such as Telecommunication Management Information Platform, Unified Correlation Analyzer, and Order Management.

The BSS/OSS module drives operational efficiency and service reliability in multiple ways:

- Correlation: Identifying problems quickly through automated problem correlation and root-cause analysis across multiple infrastructure domains, and determines impact on services
- Automation: Automating major steps in the problem-resolution process, reducing service outage time

The OSS Console supports business critical service operations and processes. It provides real time data and metrics allowing reacting to business change as it happens, detecting service failures and protecting vital revenue streams.

Data Service Cloud (DSC)
The DSC module enables advanced monetization models, especially fine-tuned for IoT and cloud-based offerings. DSC supports mashup for new content creation providing additional insight by combining embedded IoT data with internal and external data from other systems. This additional insight can provide value to other stakeholders outside the immediate IoT ecosystem, enabling monetization of such information.

Application Studio in DSC enables rapid development of IoT applications through reusable components and modules, reducing the cost and time-to-market for IoT applications. The DSC, a partner-oriented layer, securely manages the stakeholder lifecycle in B2B and B2B2C models.

Data monetization equals success

The end game with IoT is to securely monetize the vast treasure troves of Internet of Things-generated data to deliver value to enterprise applications, whether by enabling new revenue streams, reducing costs, or improving customer experience. The complex and fragmented eco-system that exists within IoT requires a platform federating the various components of the end-to-end solution, from device through to application—to sit on top of ubiquitous securely managed connectivity, enable identification, development, and roll out industry-specific use cases that deliver this value.

With the HPE IoT Platform architecture, you get an industry, vertical, and client-agnostic solution with maximum scalability, modularity, and versatility. This enables you to manage your IoT solutions and deliver value through monetizing the vast amount of data generated by connected devices and making it available to enterprise-specific applications and use cases.

Learn more at
hpe.com/CSP/IoT

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