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Internet of Things (IoT) - Cloud Platform for Industrial and Manufacturing Sector: Devices, Applications, New Developments, Industry Structure and Global Markets

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Abstracts

The Internet of Things (IoT) is the concept of looking at an enterprise as one entity, encompassing broadly two technologies, for example, information technology (IT) and operational technology (OT). While the former (IT) is the common term for the entire spectrum of technologies for information processing, including software, hardware, communications technologies, and related services, operational technology (OT) is hardware and software that detects or causes a change through the direct monitoring and/or control of physical devices, processes and events in the enterprise. OT is also known by other terms, such as supervisory control and data acquisition systems (SCADA), distributed control systems (DCS), process control systems and process control networks. OT makes extensive use of machine-to-machine communications, sensors, actuators, programmable logic controllers (PLC), and other types of collection, aggregation and embedded systems.

Because of cloud computing, devices can send data via the Internet to the cloud in an IoT architecture. The cloud is creating a revolution in SCADA system architecture because it provides very high redundancy, virtually unlimited data storage, and worldwide data access – all at very low cost.

The IoT allows communication among very heterogeneous devices connected via a wide range of networks through the Internet infrastructure. IoT devices and resources are any kind of device connected to the Internet, from existing devices such as servers, laptops and personal computers, to emerging devices such as smart phones, smart meters, sensors, identification readers and other physical devices.

Cloud-based IoT architecture designed for manufacturing generally follows one of two

business models. The first is a stand-alone type which uses cloud infrastructure as the service platform, a single entity combining embedded cyber security comprised of facilities, servers, storage, network routers, management software, middleware, device interfaces, application interfaces, security systems, network operations center, network backbone access, and other features and devices. The second is a proprietary model in which companies adopt customized IoT architecture, and vendors for cloud infrastructure components are selected depending on the users' requirements. In both cases, application networks are either through cable, cellular, or satellite.

In the connected industrial enterprise, it is critical to be able identify every device that provides data. This is particularly true for distributed sensors. TCP/IP provides the identification, location and routing that are core components of IoT architecture. TCP/IP also can support virtually any media type, which is important for industrial implementations. Most applications already support TCP/IP. The Internet Engineering Task Force (IETF) developed IPv6, the latest revision of the Internet Protocol, to replace IPv4, which still carries over 90 percent of Internet traffic. IPv6 simplifies network management and addresses the larger problem with IPv4, which is the lack of available new addresses. IPv6 further promises the ability to support differing network types and offers improved security provisions.

Analytic solution experts are engaged to design and build in software to convert thousands of signals generated by sensors and other machine-generated data into a few real-time operational intelligent data packets in usable and meaningful formats. This enables the control operator to visualize the supply chain of the plant or factory, whether at one place or situated at different locations, to enable real-time visibility into operational performance at every level of the organization and across the enterprise as a whole.

The generated data is extremely voluminous, complex, and difficult to interpret. It is not possible to analyze all the data using traditional relational database management systems alone. A powerful mix of platforms and technologies must be deployed to analyze this data and derive meaningful insights from it.

STUDY GOAL AND OBJECTIVES

This report explores trends in 2014 in capabilities of mobile technologies and the mobile ecosystem that will be crucial for enabling industrial and manufacturing companies to work toward key goals:

increasing profitability through improved resource management;

improving environmental safety and emissions;

gaining insights into customer behaviors, preferences and trends;

gaining insights into equipment health for improved maintenance;

driving operational improvements and workforce efficiencies; and

creating new business opportunities with new revenue streams.

With millions of electronic devices deployed around manufacturing and industries like oil and gas and mining, the capacity of organizations to conduct more efficient operations by gathering and analyzing data is critical. The willingness of organizations to deploy networking products and applications to capture and analyze that data will depend on how efficiently these networking solutions can be deployed and maintained and the expected benefits to be derived in doing so. IoT on a cloud platform aims to develop and market machine-to-machine (M2M) networking solutions at price points that can provide customers with a demonstrable return on investment.

Another goal of this report is to provide a detailed and comprehensive multi-client study of spending on IoT cloud platforms in three targeted manufacturing core areas in North America, China, Europe, Japan and the rest of the world (ROW).

REASONS FOR DOING THE STUDY

In a truly connected world of smart systems, not only people but also electronic and electromechanical products and machines will produce mountains of valuable information, and this will occur all the time. The Internet's most profound potential lies in the integration of people, information systems and smart machines through an IoT cloud platform. For example, in a 200-turbine wind farm, each turbine has 50 sensors with over 100 data points collected every 40 milliseconds, producing over 6,000 data points every second. A single large oil refinery claims to produce more data in a day than all of the New York Stock Exchange and AMEX combined. Making sense of this data, and using it to drive decisions, is dependent on IoT applications.

Many vendors and service providers are evolving their products and solutions to

address emerging IoT opportunities and capture a share of this emerging market. Various technical components are necessary to implement IoT solutions, including:

- a fixed or wireless network infrastructure to connect devices and sensors to a central server and transmit information about the objects;
- sensors, radio-frequency identification (RFID) endpoint devices, and external hardware to collect data and monitor status;
- software and middleware applications and services to address the specific needs of vertical markets (e.g., supply chain management in manufacturing or logistics management in the transportation industry); and
- systems integration, engineering, and professional services organizations to seamlessly integrate disparate IoT solution components.

The data and status information captured from these IoT solutions enables businesses to improve their decision-making and operational processes through real-time analytics. Therefore, iRAP felt a need to do a detailed technology update and analysis of this specific study to targeted core areas of industry.

CONTRIBUTIONS OF THE STUDY

This study provides the most complete accounting of the growth of cloud platforms for the IoT. It targets three core areas of industry, namely, digital manufacturing, optimization of asset utilization, and supply chain optimization in manufacturing (in the oil and gas and mining industries).

Firms expect to achieve a wide variety of benefits from deploying IoT solutions. Overall, at least 70% of enterprises identify supply chain visibility and loss prevention as key benefits. Providing visibility into supply chain events and processes enables enterprises to make smarter business decisions, improves customer service, reduces operating costs, and releases working capital by reducing investment in safety stock. There are also geographic differences in the benefits of implementing IoT solutions. Top benefits for surveyed North American enterprises include loss prevention, cost efficiencies and supply chain visibility. In comparison, the top benefits identified by Asia-Pacific enterprises include improved customer service, improved safety and supply chain efficiencies.

The survey data shows that while firms have high expectations of supply chain visibility, they see the benefits more in terms of customer experience and delivery accuracy than in terms simply of cost efficiencies. This reflects the reality of driving complex multi-partner global value chains to deliver predictable and high-quality experiences for customers

The iRAP reports provides IoT cloud platform spending by manufacturing sectors in North America, China, Europe, Japan and the rest of the world. The report examines spending in 2014 on five core components of IoT cloud architecture – hardware, software, telecommunication, services and analytic solutions. The report shows market data for 2013 and estimates for 2019 and analyzes growth pattern in targeted core areas.

The study also provides extensive quantification of the many important facets of market developments in the emerging markets of IoT cloud platform complied sensors, actuators, application hardware, communication providers, semiconductor components, microcontrollers, data centers, data analyst software and application software.

iRAP's technical/economic study covers technology and industry overviews, new developments, business and technology issues, current and emerging applications, and an extensive market analysis. Current size and future growth of the global markets are estimated for 2014 and 2019.

FORMAT AND SCOPE

The report targets IoT cloud architecture in manufacturing and the oil and gas and mining industries, exploring three core areas – smart factory/ smart manufacturing, optimization of assets utilization, and the optimization of supply chains.

Cloud-based IoT architecture designed for manufacturing generally follows either a stand-alone or a proprietary model. The first uses cloud infrastructure as a service platform in a single entity combining all of the key elements. In the second model, companies adopt customized IoT architecture, selecting components and vendors based on specific requirements. In either case, the network is constructed through cable, cellular, or satellite.

The report examines dollar spending in 2014 on five core technology components of IoT cloud architecture – hardware, software, telecommunication, services and analytic

solutions. The report includes forecasts for 2019 and analyses growth patterns in targeted core areas.

TO WHOM THE STUDY CATERS

The study will benefit existing and new manufacturers of IoT cloud platform-related products, service providers and solution providers and users. This study also provides a technical overview of products and providers, including recent technology developments and existing barriers. Therefore, audiences for this study include marketing executives, business unit managers and other decision makers working in the areas of IoT cloud platform products, service providers and solution providers, users, as well as those companies peripheral to these businesses.

REPORT SUMMARY

The Internet of Things (the IoT) for any enterprise requires integration of products and services of information (IT) and operational technology (OT) companies. IT covers the entire spectrum of technologies for information processing and includes embedded technologies that generate data for enterprise use. OT covers connected assets. Companies using IoT technology are going through an evolution, questioning the shift toward more 'modern' Internet and big data technologies.

IoT technology creates the unique opportunity to collect real-time data from things (sensors, devices, and equipment) and combine that information with data and intelligence from business systems and people. Business processes become smart and connected and operational performance can be improved within individual functional organizations – including engineering, manufacturing, supply chain, quality, support and service – or across the enterprise as a whole. Such comprehensive visibility introduces real-time optimization capabilities for orders, materials, equipment status, costs and product quality. A personalized view of this information can be delivered via role-based applications to anyone, anywhere, at any time, allowing employees, customers and suppliers to make educated, split-second decisions with confidence.

The use of the cloud to connect assets brings many advantages, such as on-demand computing resources and storage. But the cloud also brings connectivity and security issues. Big data stores such as Hadoop® and Cassandra can save time series machine data at much lower cost per terabyte (TB) than traditional data historians. Real-time analytics and messaging protocols used in very high speed financial algorithmic trading (for example, 25,000 transactions per second) can be leveraged in real-time industrial

situations. Thus, information based on new low-cost sensors, along with improved ways of accessing and using data, provide increased context and value from industrial data that can enable productivity and revenue gains.

Cloud-based IoT architecture for manufacturing access to analytics that transform sensor and other machine-generated data into real-time operational intelligence. IoT brings the visibility, flexibility, interoperability and intelligence required to unlock the full potential of manufacturing investments, leading to significant operational performance improvements.

Cloud-based IoT architecture leverages three of the most compelling current technology trends to unlock the potential of the IoT – big data analytics and cloud computing, as well as the Internet of Things.

According to a recently published iRAP report ‘Internet of Things (IoT) - Cloud Platform for Industrial and Manufacturing Sector’, global spending on IoT cloud platforms specific to these targeted areas of industry was valued at $80 billion in 2014, and is projected to increase to $358 billion by 2019 with a CAGR of 35%. The iRAP report further focuses on usage and spending on implementation of IoT cloud platforms in three specific identified core areas – digital manufacturing as per industry 4.0 standard; asset efficiency and optimum utilization; and optimization of the supply chain of components. The report examines dollar spending in 2014 on five core technology components of IoT cloud architecture – hardware, software, telecommunication, services and analytic solutions.

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