VDC Research
Insights for the Connected World

2014 | M2M Embedded Software & Tools

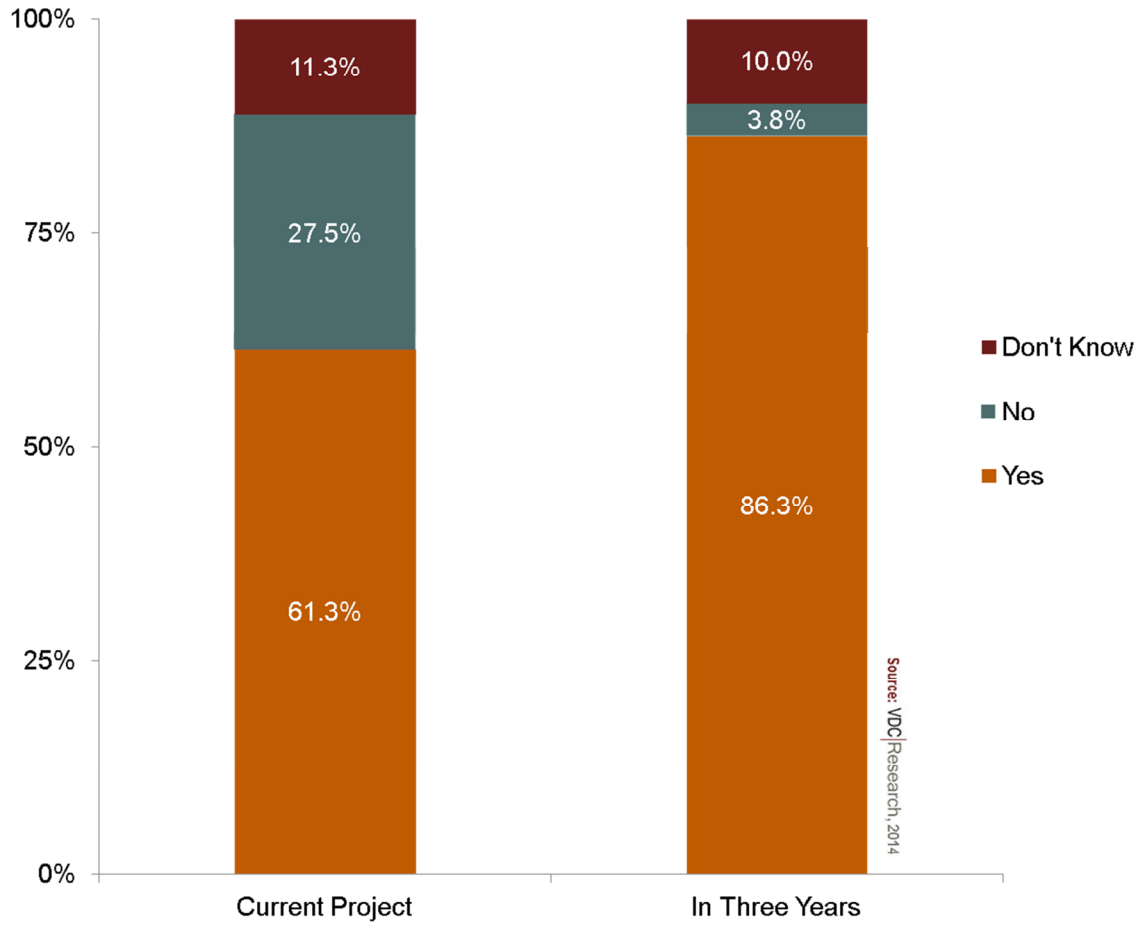
Enabling Innovation in Industrial IoT Systems

By Chris Rommel, Executive Vice President

Introduction

The Internet of Things is rapidly reshaping engineering organizations' product roadmaps and go-to-market strategies. Much of its value proposition is centered on the premise of enabling devices to more readily communicate with backend infrastructure to provide the system, and thus the end user, with context-rich situational awareness and functionality. Provided with faster and more intelligent decisions, enterprises can more readily adapt to changing business climates and deliver their customers more customized and valuable experiences with their technology. To generate the needed improvements in response time, organizations often must invest to increase the level of intelligence at each layer of the network topology – from the datacenter to the gateway to the edge.

Exhibit 1: Industrial Automation System's Use of IoT/M2M
(percent of respondents)



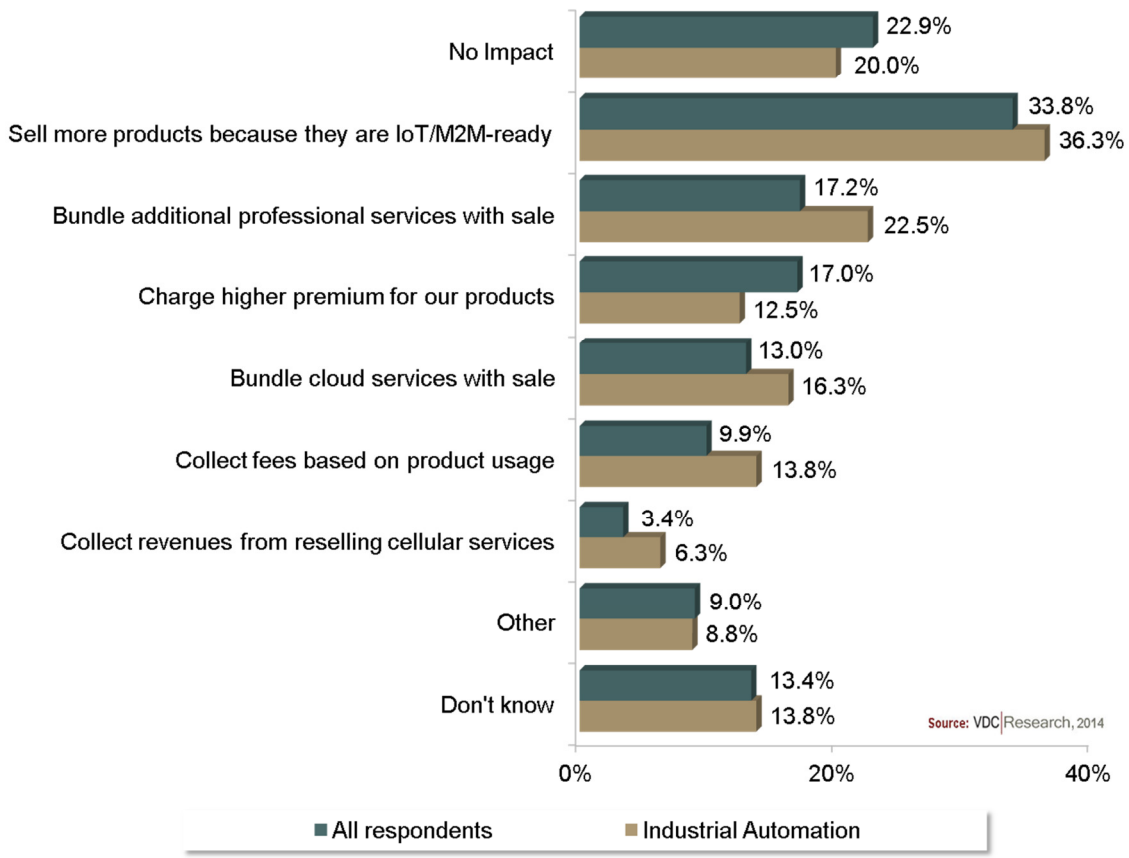
Across the tech ecosystem, the magnitude and maturity of IoT adoption vary considerably. The industrial automation (IA) market was one of the first sectors to establish connected, system-of-systems deployments and explore the potential for sales and operational benefits. However, customer expectations for more intelligent automation and enhanced real-time system insight are now placing that industry on a new IoT growth curve, with 86% of surveyed engineers at IA OEMs (e.g. ABB, Omron, Siemens, etc.) expecting their systems under development to leverage IoT within three years. So while IoT adoption in the broader embedded market may still be ramping, upstream, IoT-enabling capabilities are being woven into the infrastructure of tomorrow's manufacturing plants.

Although the connected factory may not be a new concept, the traditional processes used within many manufacturing organizations to enable bespoke, customized connections do not scale efficiently. Engineering organizations must identify new strategies and technologies, such as Java 8, that can help minimize time and labor committed to non-differentiating tasks and maximize the resources they can devote to innovation. This white paper summarizes key takeaways from Tridium and Oracle's webcast and draws from VDC's research and experience covering the embedded and industrial automation marketplaces for more than 20 years.

IoT Enabling Business Model Changes

The most widely recognized goal associated with the Internet of Things is the ability to enhance customer engagement and retention and create new revenue streams through connected services. IoT-enabled service offerings such as remote monitoring and control, predictive maintenance, and usage-based business models are already being adopted in relatively high frequencies within the industrial automation market. However, IoT enablement and functionality integration are quickly evolving from differentiating features to competitive imperatives. OEMs are under increasing pressure to embrace IoT simply to keep pace with the evolution of competitors' portfolios. This trend is even more acute within the IA marketplace, where 36% of respondents indicated that they intend for IoT to help them sell more products, albeit less often with a related premium, as compared to the overall embedded market.

Exhibit 2: Ways in which IoT/M2M Currently Impacting Organization's Business Model
(percent of respondents)



Operational Efficiencies Offer More Immediate IoT Returns

Although IoT offers OEMs the opportunity to monetize new services and content, many of the largest near-term benefits can be derived from enabling operational efficiencies – especially within the IA segment. In this domain, connectivity and analytics can provide mechanisms to improve production optimization and throughput, increase quality through defect reduction, and save additional cost by managing energy consumption, as through lighting and power. For example, Tridium, an industrial automation application deployment solution vendor (whose Niagara Framework is deployed in more than 400,000 systems worldwide), reported that some of its largest customer successes have been based on enabling previously untapped operational efficiencies. Boeing, using Tridium's Niagara IoT platform for energy consumption management, reduced its on-peak lighting expense by 20% and its weekend costs by 50%.

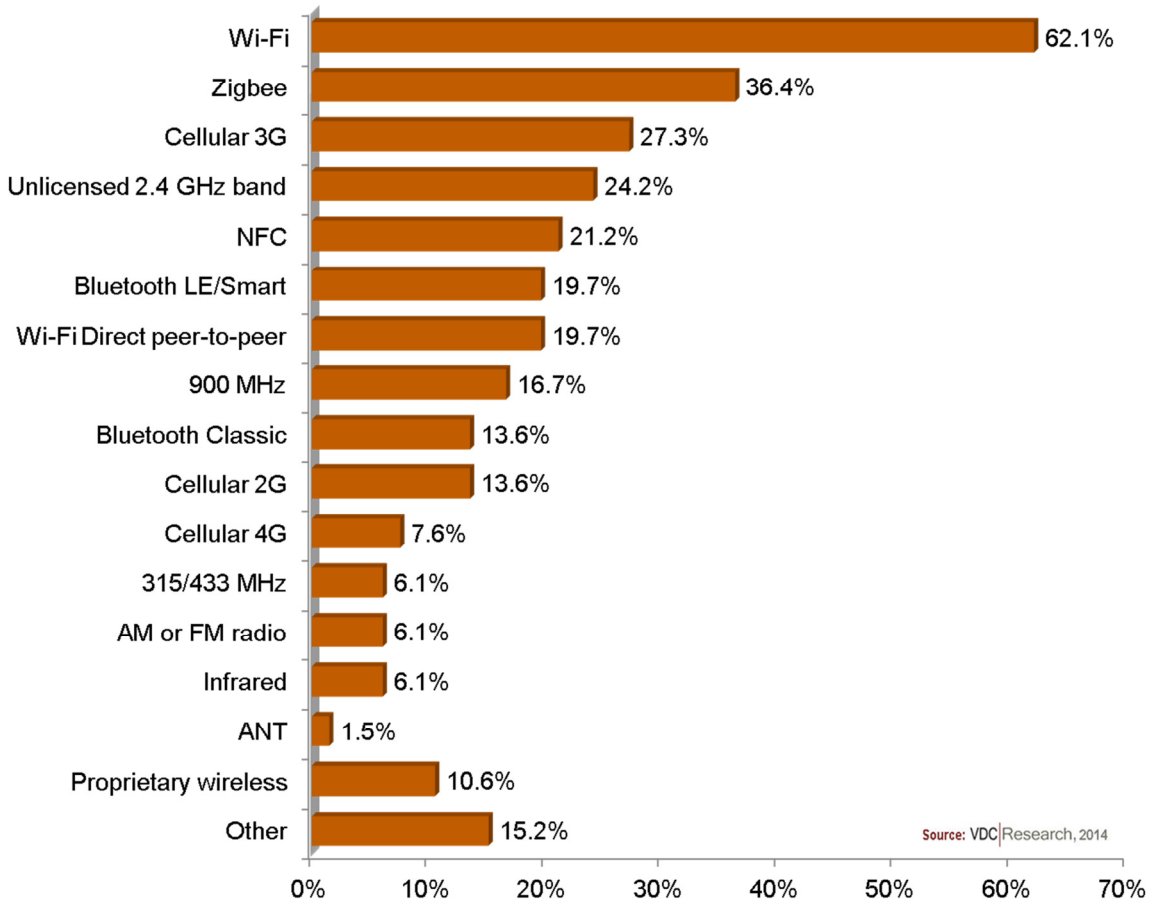
The cost of uptime within most manufacturing settings and thus the potential ROI associated with more intelligent automation are significant. The uncertainty of end user acceptance of new IoT services and business models pales when compared to the quantifiable impact associated with possible operational savings. The tangibility of such potential new efficiencies is both why IA was an early IoT adopter and why the sector is poised for further connectivity-fueled growth going forward.

An Evolving IoT Ecosystem

While IoT certainly presents a number of new revenue opportunities, OEMs must now also navigate a sea of new challenges and identify the new technologies and processes available to help them efficiently adapt to the changing market dynamics. For example, despite how fundamental a requirement connectivity has been for many industrial applications for years, there remains a litany of connectivity technologies and protocols – both physical and IP – available and deployed across existing infrastructure. This fragmentation dynamic is being further complicated as many organizations now look to transition new designs from hard-wired communication technologies such as Industrial Ethernet to the litany of wireless-based options.

Exhibit 3: Wireless Communications Technologies Used in Current IA Project

(percent of respondents)

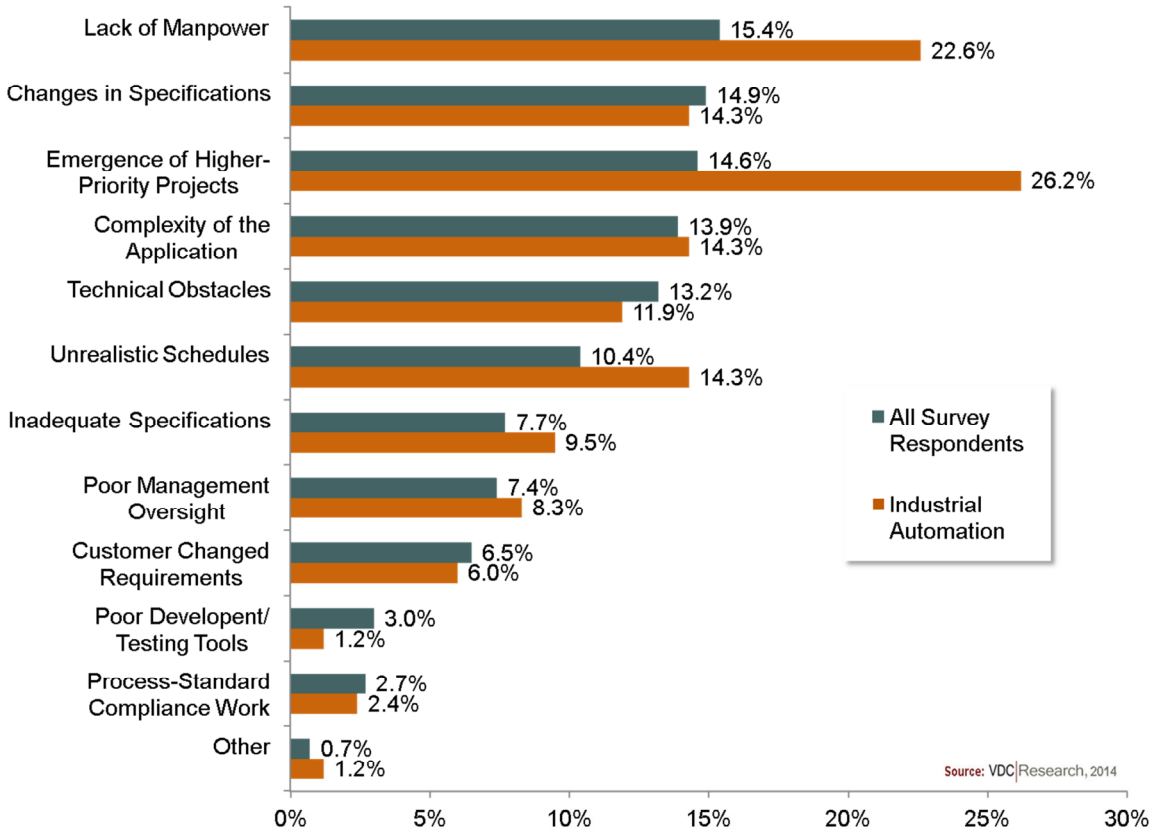


***Note**: Sums greater than 100% due to multiple responses*

In order to traverse the vast landscape of connectivity options and efficiently transition deployed networks into the Internet of Things, OEMs must evaluate technologies that can both integrate existing infrastructures and provide flexibility for future IoT systems. Furthermore, the growing number of connected industrial systems will generate an increasing amount of data that often require real-time, localized analyses to best realize potential operational benefits. As these computational requirements place an increasing burden on the edges of networks, we believe more organizations will deploy intelligent gateways. Gateways can both streamline the integration of heterogeneous edge devices as well as off-load significant work from those devices, reducing networking requirements and providing lower latency device management than could a direct device-to-datacenter connection.

Exhibit 4: Reasons for Delays in Project Schedule

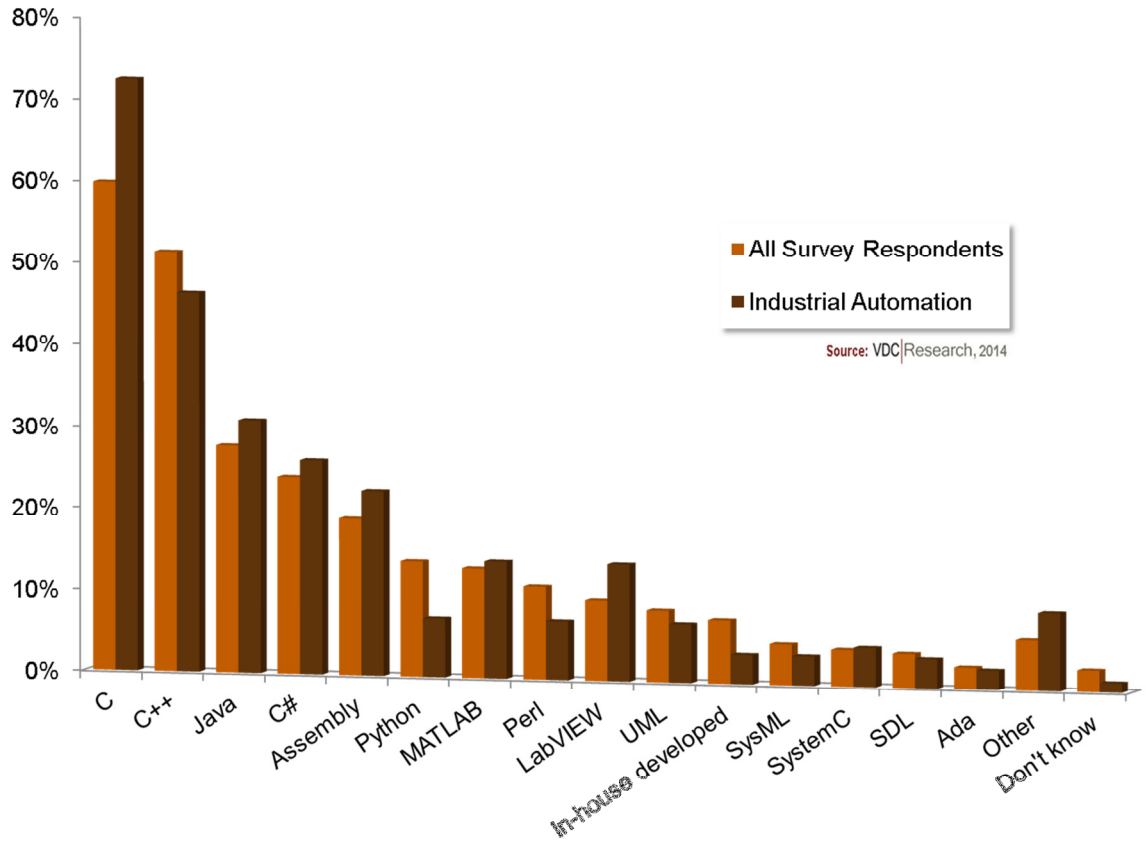
(percent of respondents)



Despite the new technical and business obstacles presented by the Internet of Things, some of the largest challenges facing engineering organizations within the industrial automation sector remain lack of manpower and application complexity. As a result, our research shows that engineering organizations are also adopting new software development technologies that both can ease IoT connectivity integration and help improve content reuse. For example, more than 30% of all surveyed IA developers reported using Java on their current projects, up from just 4.7% in 2010. As compared to the long-standing leading choice in the industry, C, Java provides middleware and libraries that engineers can leverage to speed development, allowing them to focus their time on more differentiating layers of the software and application stack. Our research also indicates that engineering organizations in the IA sector are implementing mixed-language systems in greater frequency than those within the embedded industry at large, assisting their transition to new object-oriented languages and allowing them to maximize their reuse of legacy software assets that may address hard real-time latency requirements in C or Assembly.

Exhibit 5: Languages Used to Develop Software on the Current Project

(percent of respondents)



Oracle's newest release of Java 8 also adds new features that address many other existing challenges for IoT and industrial system development and should fuel further adoption of the platform going forward. For example, despite the injection of more sophisticated software and hardware to align systems with the needs of the IoT, many embedded platforms remain resource constrained and require small, highly optimized software stacks. The addition of new compact profiles with Java 8 provides engineering organizations with the additional flexibility needed to customize a Java solution that has the features and footprint required for more resource-constrained devices. Furthermore, Java's virtual machine can be a benefit to these engineering organizations simply because it provides a layer of abstraction above the lower-level software and hardware. The fragmentation of the OS and processor landscapes in the IA market (as well as the rate of change within them) underscores value of any solution that can help OEMs future-proof their designs and protect themselves from being locked into a given set of platforms.

The evolution of the Java ecosystem for the embedded market is strengthening its value proposition for the industrial automation sector. For one, the alignment of the various Java platforms (Java SE Embedded, Java ME Embedded, etc.) can allow engineering organizations to reuse software application assets on a wide variety of devices, across multiple layers of their network. Tridium, for example, uses Java in every layer of its Niagara Framework system architecture – its solutions for clients, cloud supervisors, and remote workstations. One of the Niagara Framework's value propositions, that it is extensible and customizable for individual companies, is also a function of the solution's foundation being built on Java.

Conclusion

The impact of the Internet of Things is being felt across the tech ecosystem. All embedded industries – even those such as industrial automation that are burdened with an incredibly heterogeneous set of deployed device and technologies – are being affected. Within the IA sector, the lure of new service offerings and operational efficiency gains made many OEMs early IoT/M2M adopters and primed the manufacturing supply chain with a pipeline of IoT-enabling functionality. Many of the expected first-mover advantages borne through initial IoT experimentation are waning. As more companies compete and look to leverage the IoT within their portfolios, many engineering organizations are struggling to adapt their technology and business models fast enough to keep pace with the market's demands and expectations as interest in IoT-enabled solutions accelerates.

In many cases, however, the ubiquitous connectivity fueling the IoT and the business processes that it supports must be enabled by a new set of underlying technologies. One such solution, Java, is being adopted by an increasing percentage of industrial automation OEMs. As an object-oriented language that offers a vast middleware library, Java can allow engineering organizations to spend less time on non-differentiating code and focus on designing application-level innovation. Furthermore, the expansion of the IoT and the cross-system coordination that it requires will place a premium on any technology that can promote reuse and facilitate system integration. In this vein, Java's standardized libraries and virtual machine can help speed development and mitigate risk by providing a platform that facilitates reuse across the wide variety of systems' scale, processors and operating systems in place within the industrial automation ecosystem.

About this Report

VDC Research is the leading IoT-focused market intelligence firm that provides engineering leaders and technology suppliers with research-driven insights to help guide their product development and technology strategies. Based on a unique blend of quantitative and qualitative analysis that offer granularity and breadth of coverage, VDC is organized around five practice areas, each with its own focused area of coverage. Together, they enable a unique 360-degree perspective of the opportunities and challenges resulting from The Internet of Things and M2M. For more information contact us at info@vdcresearch.com and visit our website at www.vdcresearch.com.

VDC Research
Insights for the Connected World

679 worcester road, ste 2 | natick, ma 01760 | t 508 653 9000 | f 508 653 9836
www.vdcresearch.com | info@vdcresearch.com

VDC is the Leading Market Intelligence Advisory Firm for the Connected World

Our analysts help technology suppliers develop winning market strategies and help technology end users make critical technology adoption decisions. With unmatched domain expertise and rigorous primary research methodologies, VDC enables clients to find new opportunities for growth and make critical decisions with confidence.