Competitive Edge from Edge Intelligence

IoT Analytics Today and in 2020

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ABIresearch®

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May 2015

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INTRODUCTION

Across the enterprise sector, the business case for Internet of Things (IoT) deployments is increasingly based on big data and analytics. Mere connectivity already allows valuable enhancements to products and processes, such as remote monitoring and service, but the stage where IoT truly becomes transformative to businesses is when it crosses over with analytic tools and modeling.

By analyzing data from their previously data-opaque assets, today's connected enterprises can build their operations on hard evidence and statistical probabilities instead of soft opinions and gut feeling. However, between this vision and the current enterprise reality there are a number of unique problems that make the implementation of IoT analytics challenging.

In this whitepaper, ABI Research discusses how IoT analytics are currently being used in the market and what advances can be expected in the next five years. In particular, the paper explores the role of edge intelligence, in addition to cloud intelligence, as a key enabler for organizations that seek to utilize their IoT data.

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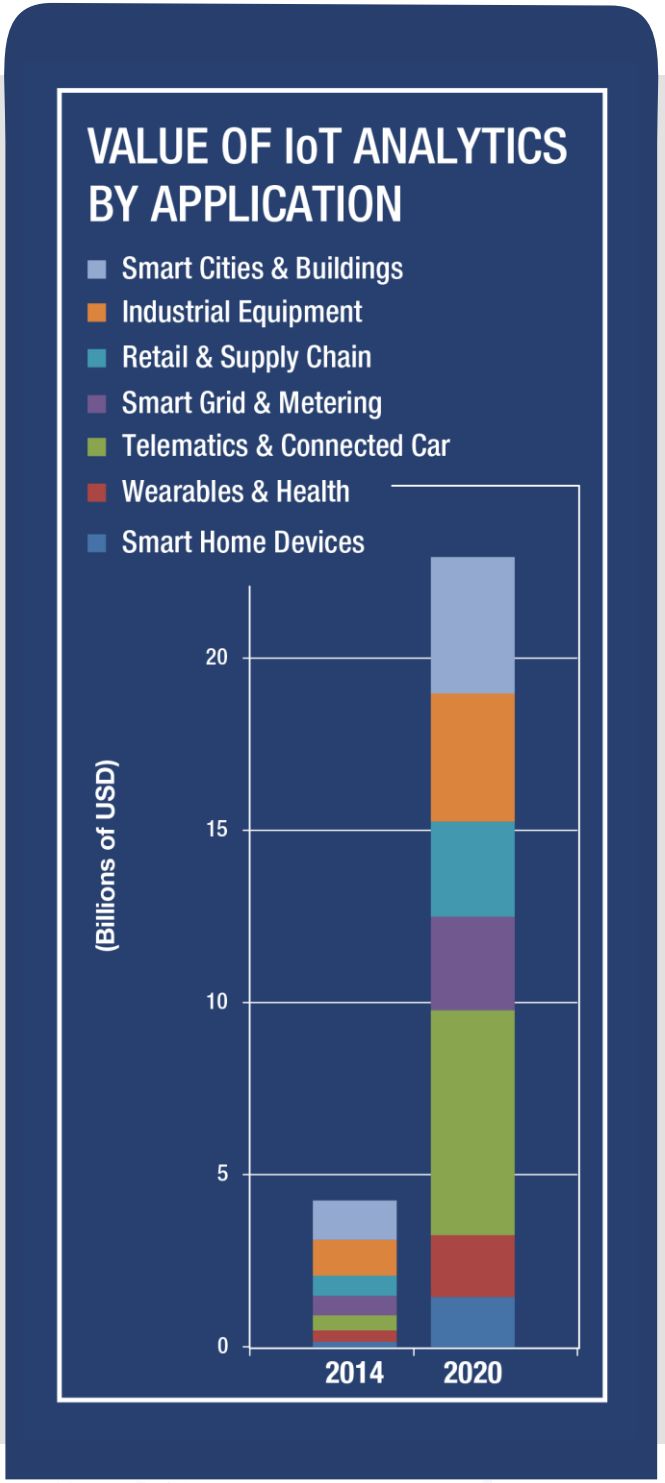
THE ROLE OF ANALYTICS IN ENTERPRISE IOT

As a concept, IoT analytics is about exposing and analyzing data from assets that can be best described as “physical-first” – that is, they do not generate digital data unless appropriately augmented or manipulated. From an analytics perspective, they are fundamentally different from the “digital-first” devices, such as smartphones, PCs, servers, and the applications running on them. The digital-first domain has digital data readily available and that data is also easier to centralize for analytics because the endpoints typically benefit from robust network connectivity as well as constant or frequent access to power supply.

Physical-first IoT devices and applications, meanwhile, are much more constrained on both fronts, so collecting the data from geographically dispersed endpoints can be technically daunting. Additionally, IoT data is typically generated as a continuous time series, so the associated volumes and velocity can be far higher than what is seen in the digital-first space, where the data tends to be event-based in nature. Finally, in IoT, the consequences of analysis are, in general, more far-reaching because the applications have a direct link to the physical world. Making a bad decision concerning, say, website traffic, can be costly but it is not nearly as costly as a bad decision concerning a passenger vehicle or a power plant.

According to a recent study by ABI Research, the value of analytics in the enterprise IoT totaled US$4.2 billion in 2014, in terms of vendor revenues. The figure covers the applications deployed in B2B and B2B2C settings, excluding the pure B2C segments with no enterprise loop beyond the product purchase. The market value is forecasted to increase to US$23 billion by the end of the decade, reflecting the growing investment in IoT analytics. On one hand, the growth is being driven by the expansion of the IoT market beyond its first wave of asset-intensive verticals. On the other hand, it is also a result of enterprises doing more complex things with their data.



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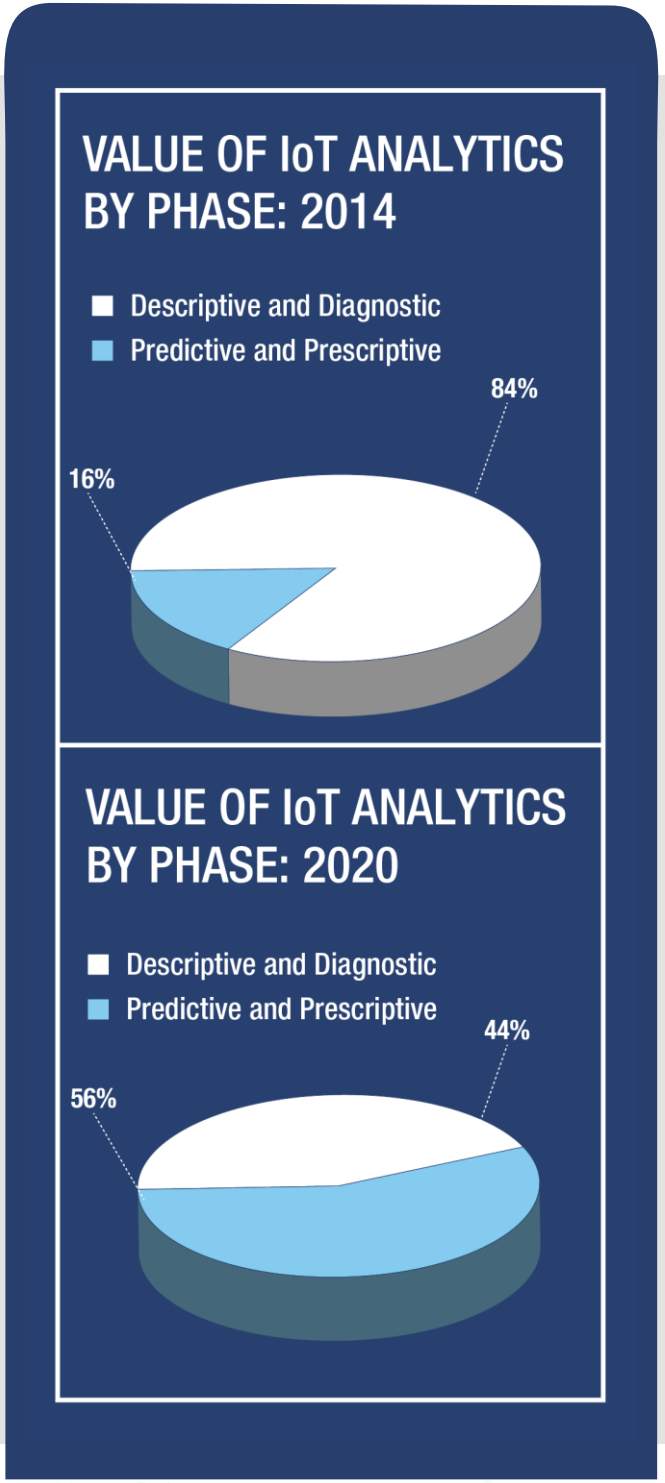
BEYOND DESCRIPTIVE ANALYTICS

The most prominent development in analytics and big data, as a whole, concerns how end users are actually employing their data. The trends can be best understood by looking at what are known as the three phases of analytics: descriptive, predictive, and prescriptive. Within the first phase one can also identify a more incremental "1.5" phase of diagnostic analytics. These four steps in the analytic journey aim to answer different questions based on the data:

- **Descriptive Analytics**: "What has happened?"
- **Diagnostic Analytics**: "Why did it happen?"
- **Predictive Analytics**: "What is likely to happen next?"
- **Prescriptive Analytics**: "How it can be encouraged or prevented?"

The phases have a hierarchical relationship between each other in that the descriptive and diagnostic types of analytics need to be mastered before advancing to the predictive one, which in turn can ultimately lead to prescriptive analytics. This final phase involves complex and real-time "what-if" models to extend the predictive function of analytics, as well as actionable recommendations, and potentially automated decision making. If compared to digital-first verticals, such as financial services or online media, the adoption of analytics in IoT-centric areas is lagging perhaps 3 to 5 years behind when it comes to this journey.

In ABI Research's forecasts, the first two "basic" phases accounted for 86% of the IoT analytics market in 2014, while the third and fourth phases, which could be collectively described as "advanced" analytics, represented the remaining 14%. However, over the coming years there will be considerable progress in the sophistication of the deployed use cases and consequently, in 2020, 56% of the market is expected to be associated with advanced analytics. The anticipated evolution is linked closely to the changing nature of IoT architectures.



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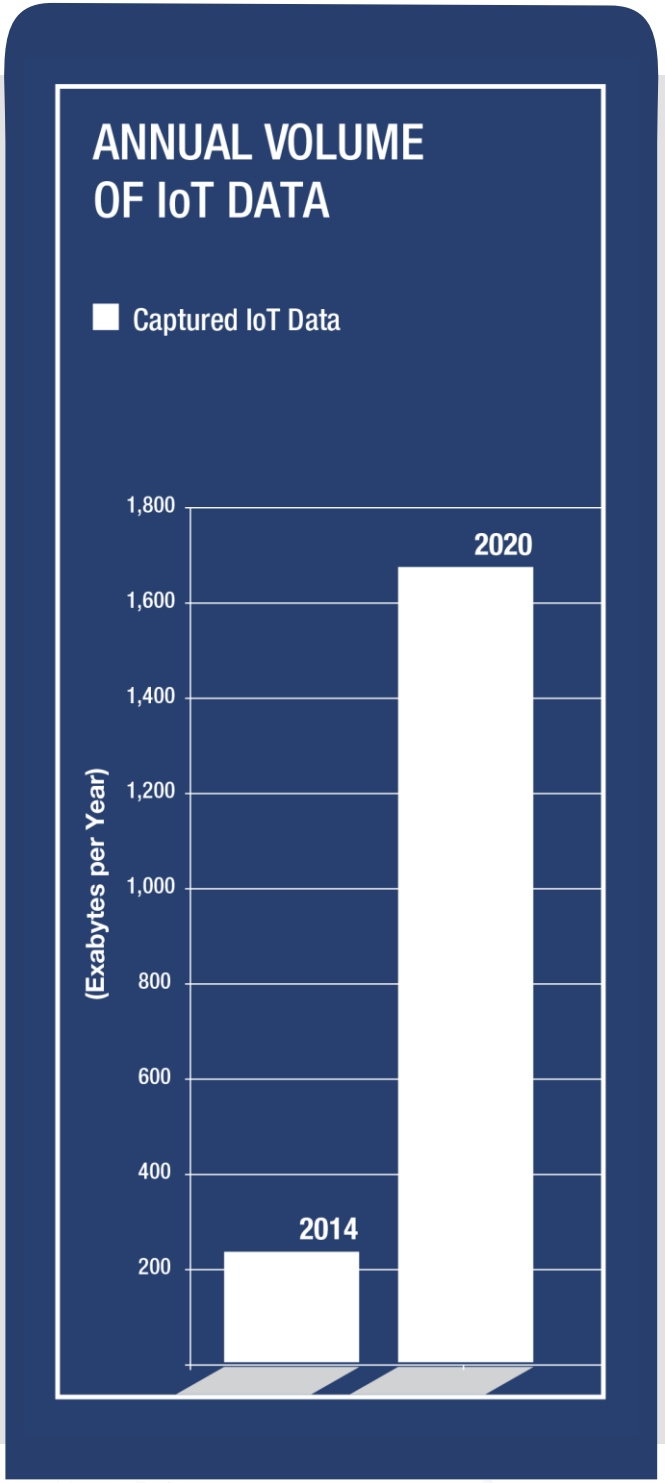
THREE LEVELS OF IOT ARCHITECTURE

Intelligence in IoT systems can be deployed on three different levels. The first, and deepest, level involves the endpoint that is capable of processing the data it gathers. The second level covers the so-called gateway devices that aggregate traffic from, and serve commands to, the endpoint devices, which reside under them in the architecture. Collectively, the endpoints and the gateways form the network's "edge". The third and highest level concerns the cloud and other backend infrastructure, to which the edge devices transmit data over a backhaul connection.

Edge analytics are currently seeing traction primarily in industrial environments, such as manufacturing, extractives, and utilities, where intelligence has always predominantly taken place in on-site control systems. In such settings, applying "analytics" to operational data is a largely gradual step from what the involved enterprises have in some form been doing for the past 15 to 20 years, and often even longer. The key difference is that innovation in gateway devices is enabling more sophisticated algorithms and cost-efficient storage of granular data at the edge, as well as more secure connections to the cloud level.

First and foremost, the adoption of a more capable edge is dictated by the sheer volume of data involved. Over the course of 2014, ABI Research estimates that IoT-connected devices *captured* 233 exabytes of data. This data mass represents only a tiny fraction of what was actually *generated* within the endpoints – passing through their sensing units without further processing or storage – but it is nonetheless so vast that less than 10% of it is being *transmitted* to the cloud today. In 2020, the annually captured total is forecasted to exceed 1,600 exabytes, or an equivalent of 1.6 zettabytes. ABI Research argues that the only realistic way to keep up with such volume, without compromising on the ROI, is to run a larger share of the analytic workloads locally.



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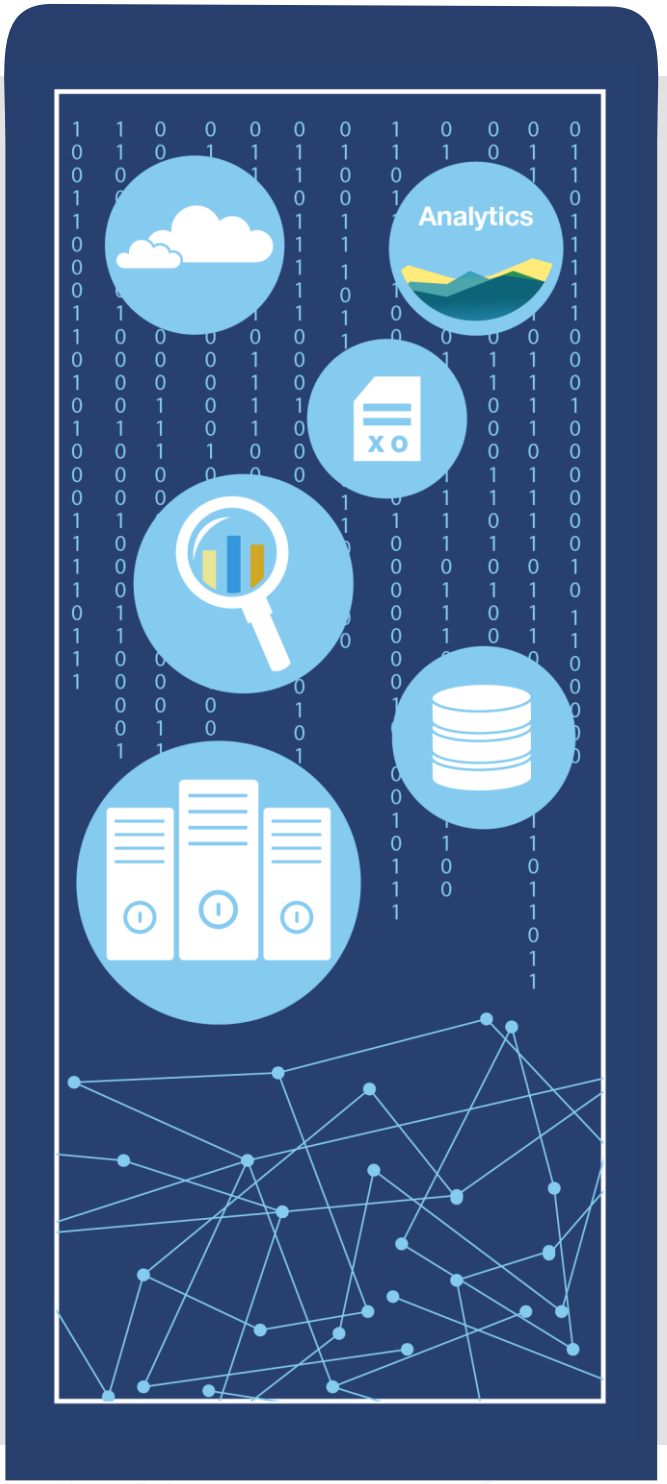
DRIVERS FOR EDGE INTELLIGENCE

ABI Research refers to the trend towards distributed IoT intelligence as a paradigm shift from *connected* to *intelligent* devices. What this shift means in practice can be best summarized by taking a look at the five main advantages that it entails:

- **Make "Big" Data Smaller**: Distributing intelligence across the network allows cutting down and refining the data volumes that are handed over from one level to the next without significantly compromising the integrity and accuracy of the higher-level analysis.
- **Enable Lower Latency**: In IoT applications that involve real-time or near real-time physical interactions with the connected assets or their operating environment, the need for low latency necessitates a certain degree of processing at the edge.
- **Strengthen Availability**: Local storage and analytics reduce dependency on backhaul connectivity and centralized cloud infrastructures. As a result, local units can continue to operate and perform analytics, their resources permitting, if the connection to the cloud level is lost.
- **Maximize Security and Compliance**: By and large, edge intelligence makes IoT deployments more secure, as sensitive and business-critical data payloads can be encrypted at the source, or even fully processed there without being sent on. Moreover, local processing allows enterprises to utilize data that they cannot move to, or store in, the cloud for compliance reasons.
- **Optimize the TCO**: Intelligent devices cost more up front than less sophisticated ones, but their total cost of ownership over a long service life can be substantially lower, owing to reduced connectivity costs and extended lifecycle of battery-operated devices. The relationship between CAPEX and OPEX varies by the nature of deployment, but in general, edge intelligence can bring the biggest savings in dynamic and analytically complex settings.



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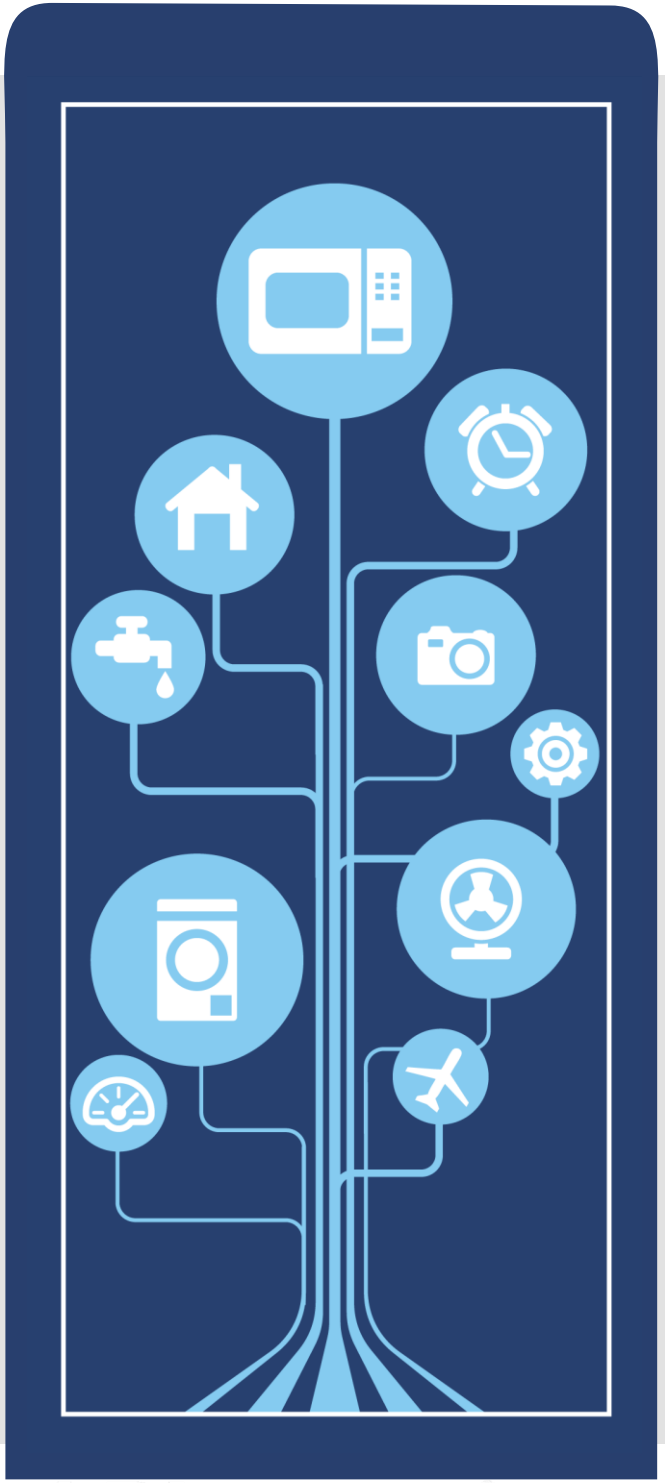
CONCLUDING REMARKS

Despite the crucial role of data in the new connected world, it would be incorrect to state that running analytics alone were enough to justify IoT investment. Having the right kind of data gives visibility over assets and operations, but in order to get to the next level – initiating real life controls and actions based on the data – the analytic workloads need to be embedded into applications. This is also what is needed to unlock the final, prescriptive phase of analytics, where the power of robust predictions is extended to recommended actions and decisions.

For this to happen, there is a strong case for application platforms and analytics engines to partner, and thus simplify the often highly complicated and multi-vendored IoT deployments for the end user. Bringing these two adjacent layers of the IoT stack closer to each other can make both the solution procurement and the technical integration easier. This, in turn, allows the enterprises to focus more of their attention and efforts on tasks that matter more to their strategic interests: designing and developing new and innovative products and processes.

Finally, it should be stressed that edge analytics is not displacing or replacing the cloud-level kind. On the contrary, the two are highly complementary. The increase in edge intelligence is making the available architecture choices more nuanced, and allowing IoT-driven organizations to transform their operations in novel ways.



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ABOUT THIS WHITEPAPER

This whitepaper has been written and produced independently by ABI Research. It has been co-sponsored by ThingWorx and ParStream.

About ThingWorx

ThingWorx™, a PTC (Nasdaq: PTC) business, provides a platform designed to build and run the applications of today's connected world. ThingWorx combines capabilities from PTC Axeda® solutions to deliver a complete IoT Platform, which includes connectivity, device cloud, business logic, big data, analytics and remote service applications. The combination delivers an IoT technology stack that enables companies to connect assets, create applications, and innovate new ways to capture value. Companies already leveraging this technology represent a wide range of markets, including manufacturing, energy, agriculture, transportation, and government. For more information, please visit the website at www.thingworx.com.

About ParStream

ParStream is a leading IoT analytics platform company. The ParStream analytics platform was purpose-built to handle the massive volumes and high- velocity of IoT data. The platform delivers a new breed of analytics for the enterprise, such as Geo-Distributed Analytics, which enables analytics at the edge. ParStream has earned multiple accolades, including Cisco Entrepreneur-in-Residence, M2M Evolution's IoT Excellence Award, and CIO Magazine #1 Big Data Startup. A wide range of companies use ParStream to generate value from their data, including leaders in manufacturing, telecommunications, telematics, and renewable energy. ParStream is based in Silicon Valley, online at www.parstream.com and on Twitter @ParStream.

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