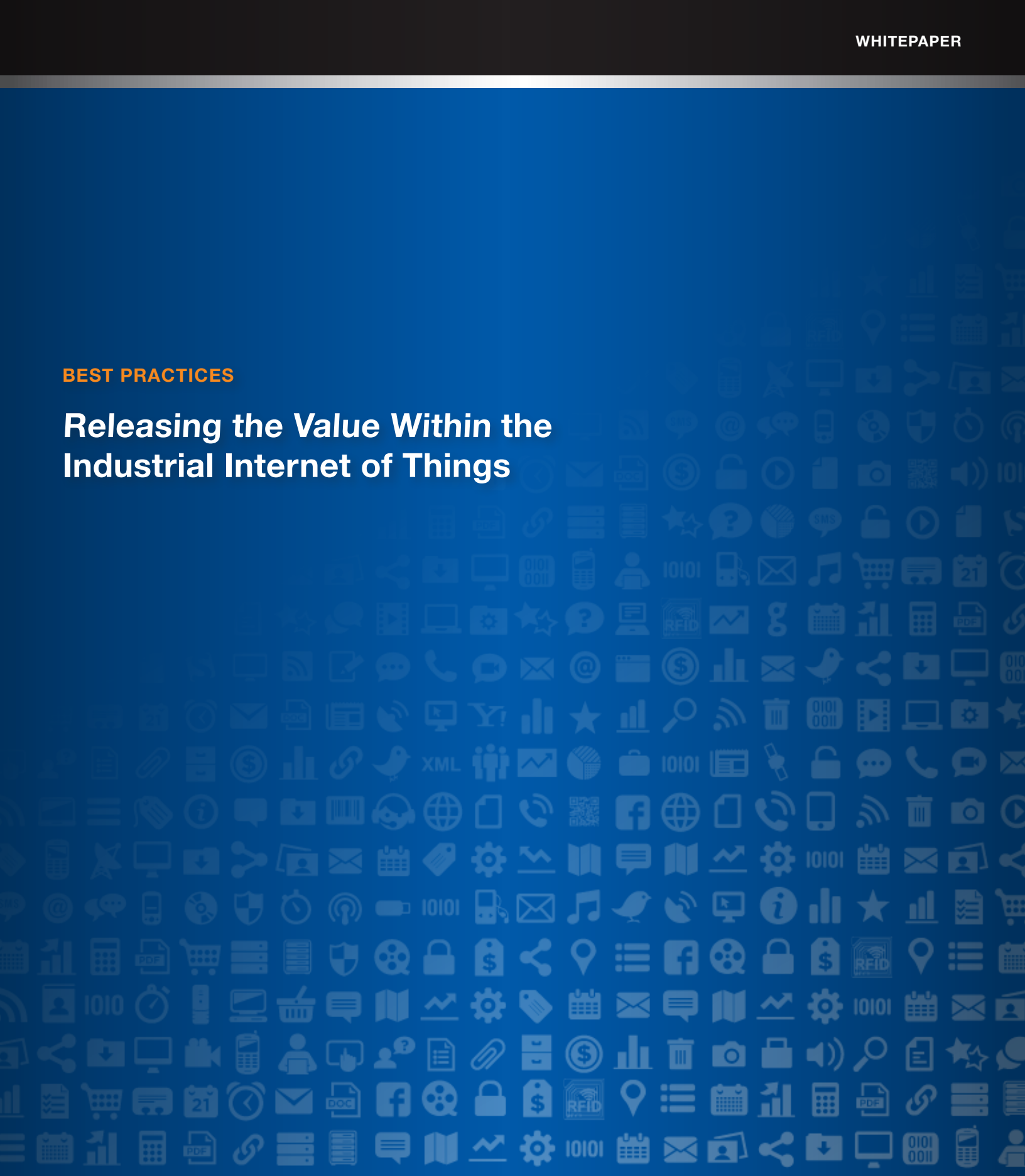
BEST PRACTICES

Releasing the Value Within the Industrial Internet of Things



ATTUNITY

Executive Summary

Consumers are very familiar with the “Internet of Things,” ranging from activity trackers to “smart” appliances, home metering devices for water and electricity, “smart” parking meters, and more. The Internet of Things has also extended into the enterprise. In business-to-business settings, sensors collect data and that information can reduce unplanned downtime, optimize business processes, and support new product and service offerings. The market associated with this Industrial Internet of Things (IIoT) is poised for tremendous growth. General Electric has predicted that the Industrial Internet could increase global GDP by $10 trillion to $15 trillion over the next 20 years.

Deriving useful analytics from the Industrial Internet of Things can be simplified into three basic steps:

(1) collect data from machines,

(2) send data to a central storage location, and

(3) analyze information and achieve real-time insights.

However, technical hurdles often arise related to low-bandwidth network connections, the need for real-time data replication to support timely analytics, and flexible data collection tools. Leveraging Attunity tools and using an ELT (Extract, Load, Transform) model for data aggregation can help. This approach enables real-time data replication which translates into access to faster, better business insights and more sustainable sources of competitive advantage.

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Releasing the Value Within the Industrial Internet of Things (IIoT)

Forrester Research predicts that the market for Big Data will reach about $12 Billion in 2014[10]. Part of this growth is due to the fact that the Industrial Internet of Things (IIoT) data is Big Data, made up of billions of events and data points, to support some of the fastest-growing areas in global business - Analytics, BI and Predictive Analytics.

Gartner defines the Internet of Things as a network of physical objects that contain embedded technology to communicate and sense, or interact with their internal states or to the external environment.[1] Examples of these technologies in the consumer space include wearable computing like activity trackers, "smart" appliances like refrigerators, home metering devices for water or electrical usage, and "smart" parking meters and bikesharing racks like New York's Citibike system.

The "*Industrial* Internet of Things" is a category of the broader Internet of Things category that focuses on devices and objects used in business-to-business settings.

For instance:

• Sensors can be used to collect and analyze data from machines, facilities, and fleets, resulting in reduced amounts of unplanned downtime.

• Information collected from sensors, chips and devices can provide better control over manufacturing processes.

• Analytics derived from sensor data can lead to more productive oil and gas exploration.

• Through sensors and automated feedback, it's possible to modify energy and water consumption patterns, resulting in more efficient usage.

The market associated with the Industrial Internet of Things is poised for tremendous growth. Overall, Gartner anticipates $309 billion in additional revenue for suppliers of connected devices and associated services by 2020. In addition, Gartner has forecast $1.9 trillion in cost savings, improved productivity, and other factors associated with connected devices and services.[2] The number of devices that will be connected to the Internet is staggering. Cisco's Internet Business Solutions Group has forecast that by 2015, 25 billion devices will be on the Internet and by 2020 that number will grow to 50 billion.[3] This vast network of devices and sensors holds considerable promise for increased productivity. General Electric believes that the Industrial Internet has the potential to increase global GDP by $10 trillion to $15 trillion over the next 20 years, thanks to gains in productivity.[4]

1 Gartner IT Glossary. Internet of Things. http://www.gartner.com/it-glossary/internet-of-things/.

2 'Internet of Things' in Reach. The Wall Street Journal. January 5, 2014. http://online.wsj.com/news/articles/SB10001424052702303640604579296580892973264.

3 The Internet of Things. Cisco. http://share.cisco.com/internet-of-things.html.

4 The Industrial Internet @ Work. General Electric. http://files.gereports.com/wp-content/uploads/2013/10/GE_IndustrialInternetatWork.pdf

10 Attunity Webinar Featuring Forrester Research: Harnessing Big Data for the Industrial Internet of Things. February 2014. http://learn.attunity.com/harnessing-big-data-from-the-industrial-internet-of-things

Additionally, according to GE estimates, just the minor savings due to real-time data from machines can make a great difference. The following graph shows the labor cost for current maintenance, broken out by industry sector, and the potential economic value derived from the Industrial Internet for each[4]:

Industry	Segment	Time to Service (Labor-hours per year)	Estimated Value (Billion US dollars)
Power	Steam & Gas Turbines	52 Million	$7B
Aviation	Aircraft Engines	205 Million	$10B
Rail	Freight	52 Million	$3B
Healthcare	CT + MRI Scanners	4 Million	$250M

The Industrial Internet of Things is top of mind for industry leaders because it is revolutionizing the way business is done. It enables connecting new facilities, machines, manufacturing floors, grids, transportation, engines, devices and other elements to the Internet, which in turn allows these IIoT data points to be accessed, managed and controlled from anywhere. This kind of control and management combined with more thorough information can help to lower cost through predictive failures, improve machine efficiencies and timely repairs, improve safety of people, facilities/environments, and can help to avoid disasters.

Additionally, valuable data from devices can be transmitted to people in real-time to support better decision-making and greater collaboration. Thanks to predictive software that can identify which machines need service and when, operations teams will have easy access to information that will enable them to troubleshoot problems and respond to issues more rapidly than ever before. Likewise, organizations that use insights derived from the Industrial Internet of Things will have greater competitive advantage over other companies in their market segment.

4 The Industrial Internet @ Work. General Electric. http://files.gereports.com/wp-content/uploads/2013/10/GE_IndustrialInternetatWork.pdf

How Are Companies Using the Industrial Internet of Things?

The Internet of Things use cases focus on seven key industry segments, as outlined in the Forrester Research graph below[10]:

Transportation	Manufacturing	Retail and finance	Utilities	Healthcare	Security	Consumer services
• Telematics • Industrial fleet management • Proactive monitoring • In-vehicle entertainment • Vehicle navigation • Safety services • Concierge services • Remote engine diagnostics • Personalized insurance	• Supply chain management • Asset, cargo, and container management • Geofencing • Machine diagnostics • Machine telemetry • Inventory control • Industrial automation control • Real-time equipment monitoring	• Smart payments • Smart cards • Point-of-sale terminals • ATM and kiosk monitoring • Vending machine monitoring • Digital signage • Electronic billboards	• Meter reading • Proactive alerts • Alarms • Smart grid applications • Remote building temperature control	• Home healthcare monitoring • Hospital patient monitoring • Hospital equipment monitoring • Remote telemedicine • Remote physician consultation • Body sensor monitoring • Remote diagnostics	• Electronic surveillance • Video surveillance • Video-enhanced industrial security • Enterprise security sensor monitoring • Security alerts	• Smart home appliances • Connected home electronics and devices • Home security services • Home alerts • Remote home thermostat control • Video feed monitoring

Tens of billions of devices will be connected to the "Internet of Things," driving demand for real-time data processing and analysis.

In the more focused sub-segment of the Industrial Internet of Things, organizations in many different industry sectors are leveraging it to improve operations, service levels, and product quality. Here are a few examples:

» **Increased Production and Quality.** McKinsey & Company recently wrote about a paper manufacturer who embedded temperature sensors in its kilns. These sensors monitor and automatically adjust the flame shape and intensity. Reliance on the sensors produced a five percent increase in production for the company, as well as improved product quality.[7]

» **Better Service Levels.** Sensors that monitor weather and traffic conditions, as well as vehicle locations, are very helpful for logistics managers. As they analyze data from all these sources in real-time, they can make adjustments to vehicle routes. This lowers congestion costs, while increasing network capacity.[5]

» **Streamlined Maintenance.** Some airplane manufacturers have begun to build networked sensors into airplane bodies. Once a plane is in operation, a continuous data feed with information about wear and tear is sent to computers. With this information, it's possible for airlines to improve their proactive maintenance activities. General Electric has estimated that the Industrial Internet of Things could dramatically reduce the cost of industrial maintenance. Consider the expense associated today with maintaining different types of equipment:

  - » Steam and gas turbines at power plants -- $7 billion
  - » Aircraft engines -- $10 billion
  - » Freight trains -- $3 billion
  - » CT and MRI scanners in healthcare facilities -- $250 million

5 The Internet of Things. McKinsey Quarterly. http://www.mckinsey.com/insights/high_tech_telecoms_internet/the_internet_of_things

7 'The Internet of Things. McKinsey Quarterly. http://www.mckinsey.com/insights/high_tech_telecoms_internet/the_internet_of_things

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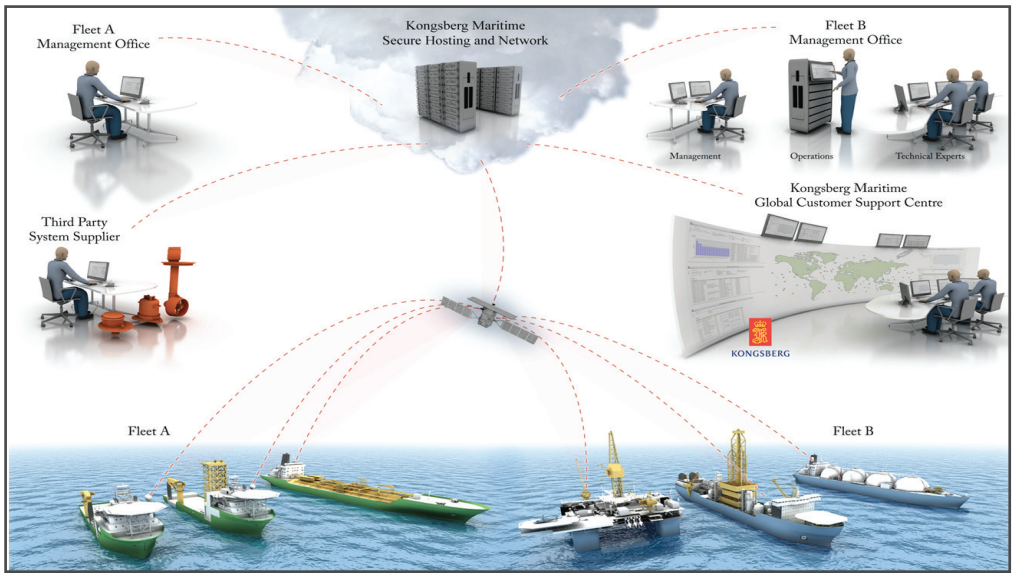
How Are Companies Using the Industrial Internet of Things? (cont.)

» **Improved Situational Awareness.** Kongsberg Maritime delivers systems for dynamic positioning and navigation, marine automation, safety management, cargo handling, subsea survey, and satellite positioning to large offshore operations, shipyards, and energy exploration and production industries. Kongsberg Maritime has created a collaboration platform called K-IMS which provides customers with improved decision-making and support. This reduces the need for service personnel onboard vessels, improves troubleshooting, and increases safety thanks to visualization and supervision. K-IMS combines data flows with operational knowledge. All data sources on a vessel can be connected and used for scenario playback, as well as incorporated into views that are shared with other vessels and users.[9]



Accessing Analytics from the Industrial Internet of Things

The mechanics of deriving analytics from the Industrial Internet of Things can be simplified into three basic steps: (1) collect data from machines, (2) send data to a central storage location, and (3) analyze information and achieve real-time insights. Not surprisingly, however, technical hurdles often arise:

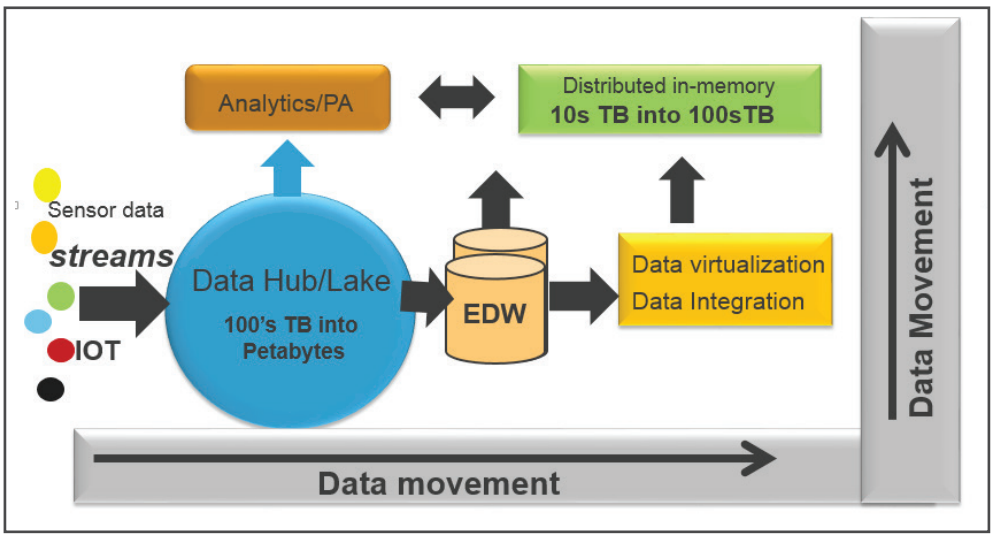
» **Moving data through low-bandwidth connections can be challenging.** While the Internet is a powerful tool, the available bandwidth isn't always sufficient for sending large volumes of data rapidly.

» **Timely analytics require real-time data replication.** Sensors in the Industrial Internet of Things are constantly collecting information. This trove of information is useful, but valuable business insights depend on having up-to-date information as a foundation for analytics. Organizations must have tools that can accommodate transfer of continuous data flows to information repositories. Without access to real-time information updates, the value promised by the Industrial Internet of Things is diminished.

» **Effective data collection often needs flexible tools.** Industrial networks are complicated. In order to leverage the value of information derived from these networks, organizations may need solutions that support data processing and bi-directional replication.

9 Kongsberg Embeds Attunity Technology in Real-Time Business Intelligence Solution for the Global Maritime Market. July 17, 2013. http://www.attunity.com/news/kongsberg-embeds-attunity-technology-real-time-business-intelligence-solution-global-maritime

The following Forrester Research Inc. graph illustrates the data management platform needed to support the Industrial Internet of Things:[10]



Using Attunity to Make the Industrial Internet of Things Work for You

Attunity can help organizations harness the power of the Industrial Internet of Things. Traditional technologies like ETL (Extract, Transform, Load) tools simply aren't suited to handle the complexity and volumes inherent in Big Data. Whether you want to aggregate information from remote sensors into an on-premises data warehouse or cloud-based data repository, you may want to reconsider whether ETL is truly needed. In most situations, where heavy transformations are not required, an ELT (Extract, Load, Transform) model is better suited for Big Data.

By leveraging ELT, a best practice recommended and supported by Attunity, companies can move data fast, easily, and securely over WAN networks and low-bandwidth connections, including satellites and the cloud. Real-time replication of data to analytics platforms means access to faster, better business insights and more sustainable sources of competitive advantage.

Attunity solutions, like Attunity Replicate which leverages innovative TurboStream data transfer and change data capture (CDC) technology, are optimized to support high-performance transfer of data over LAN or WAN with ease and efficiency. Using Attunity data loading or replication within an ELT model, organizations can achieve real-time analytics for better decision making. And using Attunity, organizations are able to capture the business potential held in the Industrial Internet of Things - greater efficiency, better productivity, and a 360-degree view of operations for significant competitive advantage.

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About Attunity

Attunity is a leading provider of information availability software solutions that enable access, management, sharing and distribution of data, including Big Data, across heterogeneous enterprise platforms, organizations, and the cloud. Our software solutions include data replication, data management, change data capture (CDC), data connectivity, enterprise file replication (EFR), managed-file-transfer (MFT), and cloud data delivery. Using Attunity's software solutions, our customers enjoy significant business benefits by enabling real-time access and availability of data and files where and when needed, across the maze of heterogeneous systems making up today's IT environment.

Attunity has supplied innovative software solutions to its enterprise-class customers for nearly 20 years and has successful deployments at thousands of organizations worldwide. Attunity provides software directly and indirectly through a number of partners such as Microsoft, Oracle, IBM and HP. Headquartered in Boston, Attunity serves its customers via offices in North America, Europe, and Asia Pacific and through a network of local partners. For more information, visit www.attunity.com or our In Tune blog and join our community on Twitter, Facebook, LinkedIn and YouTube, the content of which is not part of this press release.

Over 2,000 companies — including over 2/3 of the Fortune 500 — trust Attunity solutions.

Attunity exclusively focuses on engineering high-performance information availability solutions that are fast to deploy and easy to operate, empowering enterprises to simply and cost-effectively ensure business-critical information is accessible when, where and how it's needed to become a more agile, intelligent enterprise.

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