Predicting From the Edge in an IoT World

Today, in the Internet of Things (IoT) era, the Internet touches everything. Connected devices are not only used in consumer applications so that you can change the temperature in your home or activate your security system, they also permeate nearly every industry and business application. From utilities and manufacturing to transportation, retail and healthcare, operational devices and machines at the edge of the organization are connected to the Internet and producing volumes of valuable, untapped data.

Organizations that can unlock and act upon the insights embedded in those mountains of unused data will realize dramatic business benefits. They can take actions and make decisions in real time that reduce costs, minimize risk, increase revenue, differentiate their product and services, and accelerate innovation. However, there is a distinct path to achieving the promise of IoT data. In this white paper we'll examine some of the challenges of analyzing IoT data, along with the capabilities and technologies that can help you generate the maximum business value from this burgeoning opportunity.

Economic Impact of the IoT

It's difficult to overstate just how significant the impact of the IoT will be in the years to come. The McKinsey Global Institute estimates a potential economic impact of as much as $11.1 trillion per year by 2025 for IoT applications. An example of this impact is in the area of Predictive Maintenance for Manufacturing and Healthcare, where the economic value is estimated to be approximately $577 billion by 2025 with a potential cost savings of 10%-40%.[1] According to Gartner, there will be 25 billion connected devices online within the next five years.[2] The stage is set for a groundbreaking transformation that will generate new business value in many different ways across many different industries.

> IoT will produce 4,400 exabytes of data – or 4,400 billion terabytes – between 2013 and 2020. (IDC)

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[1] McKinsey Global Institute, "The Internet of Things: Mapping the Value Beyond the Hype", June 2015. McKinsey & Company.
[2] Gartner Press Release, "In 2020, 25 Billion Connected "Things" Will Be in Use." November 11, 2014. http://www.gartner.com/newsroom/id/290571.
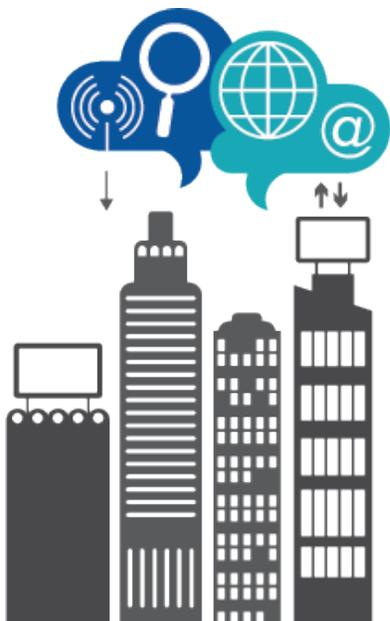
Industries that are producing high volumes of IoT data are often operating in remote locations with limited and periodic connectivity.

This is especially true when evaluating the value that can be secured by connected machines and devices that live on the edge of some of today's most critical applications. Utilities, transportation, manufacturing and healthcare, just to name a few industries, all have very business-critical use cases for the IoT that can transform the economics of their business.

In many instances IoT data is already being collected. Trucks are producing data on their location, safety records and repair needs. Sensors in manufacturing plants are transmitting data on bottlenecks and machine errors. Hospitals are producing data by room and device that can aid in predicting revenue-critical situations, such as impending but invisible equipment failures of an MRI machine or a linear accelerator. Yet, this data, is only that: data. It isn't truly actionable information until it is analyzed and presented in relationship with other data collected around it. That's when the IoT can have a truly valuable economic impact.

The Challenges of Analyzing IoT Data

However, transforming IoT data into actionable business insights isn't a simple proposition. First, the data is very often in motion, not stagnant in a data warehouse somewhere. Thousands of statuses and updates may be transmitted from a sensor every second. In addition, the industries that are producing high volumes of IoT data often operate in remote locations with limited and periodic connectivity. Environments such as windmill farms, mining sites and even highly distributed fleets are producing valuable data at a rapid pace that isn't always captured by a central repository in real time.

As a result, data is typically aggregated and filtered before it's forwarded to central systems where it is analyzed. The value of real-time immediacy is lost, and data blind spots are created that can prevent the identification of critical issues that require immediate action.

Traditionally, analytics tools have not been optimized to manage data with such volume and speed at the edge of the IoT. Organizations need a new way to rapidly consume continually changing information in near real-time to gain an accurate understanding of what's happening in the moment. They need the ability to not only understand historical data, but to anticipate and predict what will happen next to prevent or facilitate certain outcomes.

It's these use cases where immediate, on-the-spot actions are required that can deliver the exponential value and opportunity of analyzing IoT data at the edge. Applications such as predictive maintenance or automated actions that require a real-time action – such as an emergency shut down – can deliver unprecedented value.

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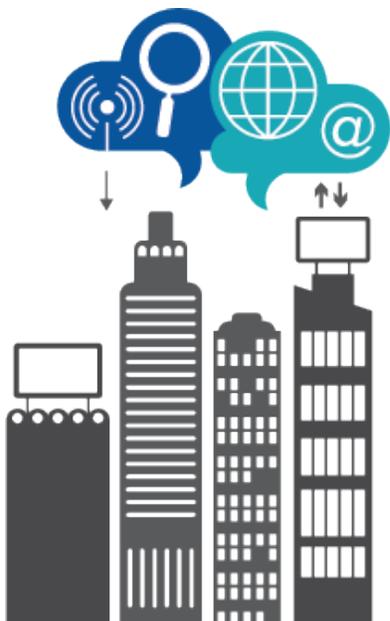
Take a mining application for example. A truck driver in a remote mining operation is performing his part in a carefully orchestrated sequence of drilling, excavation and hauling. If his truck has a failure, it can shut down the entire operation, not only losing the operational value of one truck, but the entire fleet as every truck is stopped in its track waiting for a single repair. Because the mining operation is remote, data from his truck will take too long to get to a centralized cloud where decisive action can be taken. Instead, what if real-time data was collected on the spot and analyzed in real time? An impending failure could be identified before it impacted the truck – and in turn the entire fleet. The mining operations manager can gain a holistic view of the operation and see which trucks are at risk of failure at any moment in time. Repairs can be quickly made before a failure happens, avoiding costly downtime across the entire mining operation.

The IoT Opportunity

As with the mining operation example, the insights derived from IoT data can be applied to anticipate problems and improve outcomes across many other operational, tactical and strategic areas of an organization. From improving operational productivity and minimizing operational expenses to identifying new revenue opportunities, the benefits are significant, including:

- **Business and Process Optimization:** Reducing operational expenses for key processes such as supply chains and field operations, enabling more efficient practices to speed time to market, improving customer responsiveness, lowering operational overhead, optimizing the utilization or consumption of goods, enhancing customer experience.

- **Investment Protection:** Protecting investments in large equipment by predicting costly failures and downtime, reducing maintenance costs through optimized repair schedules, optimizing equipment usage for maximum returns, avoiding cascading failures by preventing small problems before they turn into larger issues and lost revenue across the business.

- **Accelerated Actions:** Automating critical actions and decisions in real time to prevent losses and enhance profitability, such as avoiding downtime of critical equipment or making the right offer during customer interactions to avoid attrition and increase lifetime value.

- **Realization of New Opportunities:** Identifying new products, services or business opportunities based on the mountains of data generated by the IoT about how products and services are used by end customers and businesses.
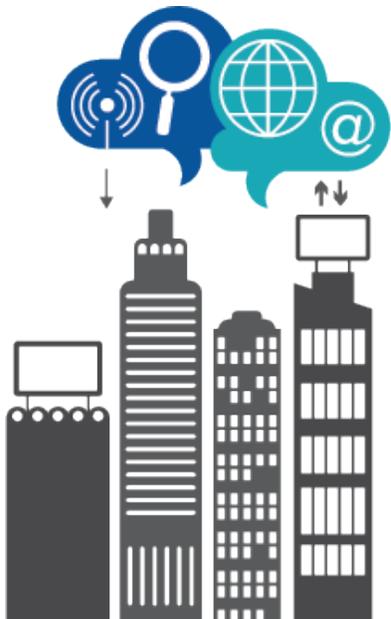
Predixion has the only predictive analytics platform for the IoT that can run on the device, on the gateway, and in the cloud.

Leveraging IoT Data From Everywhere for Immediate Insight

The key to achieving these benefits is the ability to apply predictive analytics in real time to IoT data that is produced or collected anywhere. That could be a database, data warehouse, the cloud or directly off of edge machines and devices. The analytics must be able to produce immediate, actionable insights when you need them, and where you need them. In nearly all cases, the IoT data to be analyzed will be sourced from either the cloud, a gateway or directly from a device.

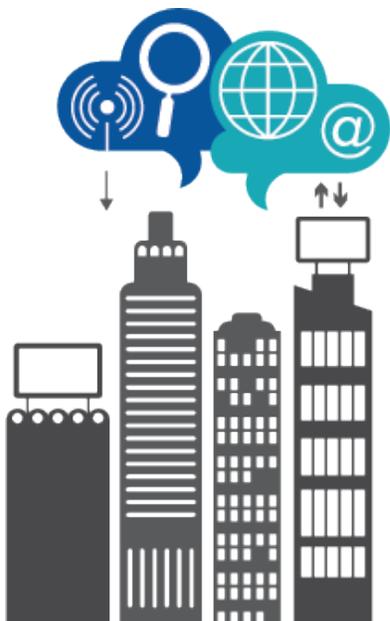### Advanced Analytics Embedded on the Device

When you have analytics embedded on the device, it enables real-time alerts whether the device is connected or disconnected. This is important for use cases that require actions that must take place immediately at the source, such as before a costly failure. It's also critical for organizations that plan to leverage automation for immediate corrective actions or process optimization.

Advanced Analytics at the Gateway

Gateways often serve as an aggregation, filtering and relay point for IoT data. By running predictive models at the gateway aggregation point, applications can avoid time lags to the   cloud and stave off data blind spots. This keeps actions closer to the edge and can help operations by quickly scheduling local services to increase efficiencies and avoid impending failures.

Advanced Analytics in the Cloud

Using the cloud as a centralization point is the most common use case for predictive analytics. It's ideal for decision makers that need a broader view of the business and are looking for the actionable insights to make longer term decisions such as uncovering new business opportunities or outlining new policies and procedures based on operational data. Here comprehensive insights can be evaluated for a deep visibility across the business.

Predixion Software: Advanced Analytics for the IoT

Predixion has the only predictive analytics platform for the IoT that can run on the device, on the gateway and in the cloud – so the analytics are exactly where you need them, when you need them. It provides the critical capabilities to produce insights at the decision point where they are most actionable, whether that's on a mobile device, in an app or dashboard, or on a device or machine as a simple alert.

Predixion's patented MLSM™ (Machine Learning Semantic Model) empowers organizations to rapidly create, adapt and improve predictive models for specific IoT applications. Predixion takes IoT data from anywhere and analyzes and models it using its platform engine to produce a "MLSM package." The MLSM technology streamlines and simplifies this process, eliminating the need to understand the inner workings of machine learning such as shaping, managing and transforming data.

This MSLM package is the entire analytic workflow – all the data preparation steps, transformations, multiple predictive models, etc. – in one small portable package that is production-ready and easy to embed in a variety of environments. This greatly expedites the development and deployment of predictive models. Predixion can create a model from start to finish that is production ready in a fraction of the time it takes traditional analytic tools.

The "Last Mile of Analytics"

The MSLM package can be placed anywhere. It's small, portable and production ready, so data off the devices runs through Predixion's scoring in real time or batch mode and the results are presented rapidly for action.

This is a process that can be called the "last mile" of analytics. Predictive insights are delivered directly to the agents of decision making. That may be a nursing supervisor who needs to improve patient outcomes, an engineer who needs to predict equipment failure before it happens, or to an automated process or action that saves money or improves process efficiency and effectiveness. By delivering actionable insights directly at the point of impact, Predixion enables organizations to achieve the ultimate payoff of the IoT and transform their operations.
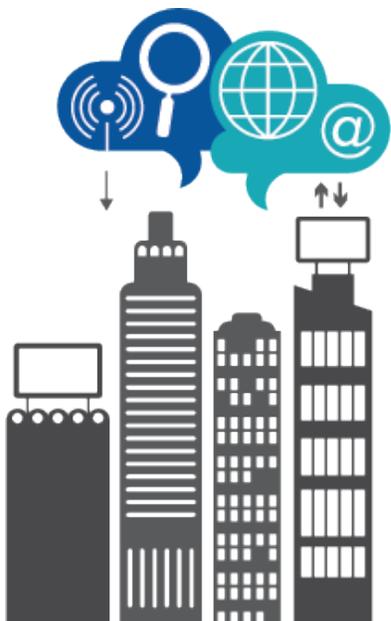
Conclusion

From utilities and manufacturing to transportation, retail and healthcare, the IoT can deliver exponential value and even new opportunities never previously imagined. With predictive analytics being performed and delivered exactly where and when they are needed most – whether that's in the cloud, at the gateway or on the edge – businesses can have actionable insight like never before and the ability to respond instantly for greater process optimization, investment protection and business innovation.

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Predixion Software was founded on the belief that predictive analytics has the power to create a smarter, safer and healthier world – and that access to that power should not be limited. To achieve this vision, Predixion developed Predixion Insight™, a real-time predictive analytics platform that specializes in the "Last Mile of Analytics" — that is getting the power of predictive insights to the front lines where decisions are made. More than 200 companies worldwide rely on Predixion to make better decisions every day.

For more information about Predixion, call us at 1-877-867-0945 or visit our website: http://predixionsoftware.com