Bringing the Industrial IoT to life with advanced analytics

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Prabal Acharyya, Worldwide Director, IoT, OSIsoft

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There's no shortage of news about the Internet of Things (IoT) these days, but for all the buzz that's been created, there's one side of it whose real-world impact is actually more significant than the coverage it's received. The Industrial Internet of Things (IIoT)—harnessing data produced by connected industrial sensors and devices—is predicted to have a larger impact on global economic output than any of the other big data sources. IIoT data also promises to help solve complex problems that have far-reaching impacts, but deriving the value from that data is going to require the use of sophisticated analytics. For more than 35 years, OSIsoft has been a leader in helping organizations capture operational data from industrial equipment. Today, the company is on the front lines of helping businesses use highly advanced analytics to gain valuable operational intelligence from their sensor-based data.

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With forecasts ranging as high as $15 trillion of global GDP by 2030, the economic promise of the Industrial IoT is so great because data created by industrial equipment holds more potential business value than consumer-focused and other types of big data. Wind turbines, oil and gas pumps, and manufacturing machinery may not grab headlines in the way that smart cars and wearables do, but their economic and societal effects are pervasive, impacting vast populations of the planet in critical ways.

However, the potential benefits of the IIoT will only become a reality when companies have the ability to gain value from the rich operational data that they generate, and there are significant obstacles in the way. Currently, the vast majority of IIoT data is not analyzed, in part due to a historic divide between operational technology (OT) and information technology (IT) within industrial organizations. OT personnel understand how industrial systems work and the problems they face, but they have little knowledge of or access to data analytics technologies. IT staff know the analytics tools well but do not know how to apply them to operations issues.

Moving analytics forward

Long before people were talking about the IIoT, OSIsoft was capturing, processing, and sharing data from industrial sensors and equipment to help its customers optimize their operations. The company's PI System provides data infrastructure for organizations in several key industrial sectors, including oil and gas, utilities, pharmaceuticals, food and beverage, water, metals and mining, pulp and paper, and chemicals. It collects data from more than 1.5 billion sensor-based data streams at over 19,000 sites in more than 125 countries.

By consolidating and visualizing massive volumes of high-fidelity, time-series data & events from disparate sources, OSIsoft helps businesses improve efficiency, sustainability, quality, and safety. Whether it's saving an energy company millions of dollars a year through better wind forecasting or helping a mining company better organize its supply chain to boost iron ore production by millions of tons annually, OSIsoft enables organizations to use their data to improve their operations and make better decisions.

To date, OSIsoft has served its customers well by capturing historical and real-time data to provide descriptive analytics and diagnostic analytics—information that reveals what happened and why. But as industries have increasingly focused on taking advantage of the tremendous business opportunities that the IIoT presents, OSIsoft has recognized the need to adopt new analytics technologies that will help its customers achieve their evolving goals.

From hindsight to foresight

Now, OSIsoft is looking ahead so it can help its customers capitalize on IIoT data to gain more advanced business analytics. "Two years ago, we started on a journey to add a new capability to our offering based on 'future data,'" says Prabal Acharyya, Worldwide Director of IoT at OSIsoft. "With this journey, we're making a whole new analytics layer possible." The vision is to help customers use predictive analytics and prescriptive analytics to derive far greater value from the enormous amount of sensor-based data that they generate.

With predictive analytics, data science and machine learning are applied to the data to try to determine what will happen in the future.
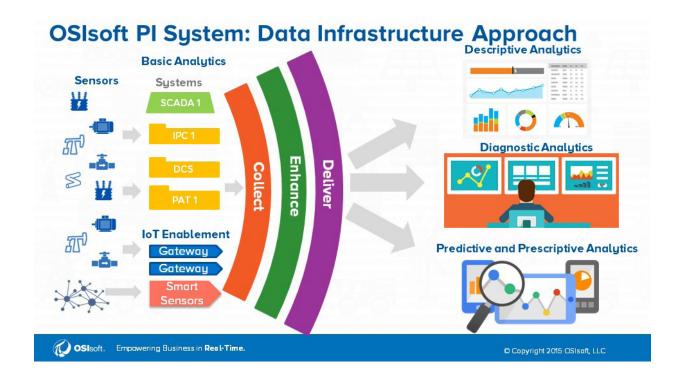
> *"If you look at some cloud providers, infrastructure is presented as a binary thing: it's either cloud or nothing. By working with Microsoft, we can offer customers an end-to-end, hybrid data infrastructure on their own terms. We're bringing together the best of both worlds."*
>
> *Prabal Acharyya, Worldwide Director, IoT, OSIsoft*

Microsoft

OSIsoft PI System: Data Infrastructure Approach

For example, analysis could identify a specific time frame in which a certain pump is likely to fail so that it can be replaced or repaired before it causes a costly shutdown of operations. Prescriptive analytics goes even further to try to recommend action that will produce a better outcome. In the example of pump failures, the analysis might reveal that a change in the pump casing is responsible for the failures that are occurring, and a recommendation could be made to the pump manufacturer before more pumps are sold. OSIsoft customer Archer Daniels Midland, for example, is working to determine the cause of premature equipment breakdowns by examining how multiple variables interact.

The business potential of these types of insights is enormous, but they don't come easily. Before data can be analyzed, it must be prepared to ensure that it is complete, accurate, and presented in a consistent form. In the past, predictive and prescriptive analytics required data scientists to perform months' worth of data preparation. Now, OSIsoft has created the PI Integrator, a new product that uses a process that OSIsoft calls CAST—cleanse, augment, shape, and transmit—to make the data fully ready

to be processed by advanced analytics solutions such as Microsoft SQL Server 2016 R Services and Azure Machine Learning.

"All the years that our OT people have put into creating context and insight is now in the PI Integrator," says Acharyya. "We are opening up the value of the data and making it much simpler for customers to do advanced analytics projects."

Unique on-premises analytics capabilities

One of the first and most anticipated integrations is an on-premises solution using SQL Server 2016 R Services. With this solution, the PI Integrator for Business Analytics: Data Warehouse Edition enables SQL Server R Services to access the analytics-ready data to perform predictive analytics. Business intelligence can then be provided via a range of tools, including Microsoft SQL Server Reporting Services, Excel, and Power BI Service with Power BI Gateway - Enterprise. If customers require greater scale, a hybrid option is available to extend data to the cloud using Microsoft Stretch Database.

The solution is already helping to streamline customers' IT operations. Cemex, one of the largest cement companies in the world, has employed it to slash the time needed to prepare data for production analysis. Previously, collecting data from its 70 plants took up to 744 hours. With the integrator technology fully installed, it takes 5 minutes.

By putting the power of advanced analytics into the hands of the people who face operational challenges and understand the decisions that need to be made, the solution helps close the gap between OT and IT. "Now the data can get shaped differently based on people's roles and the questions that they have," says Acharyya. "For example, an engineer looking into the reason for a pump failure is going to need a different type of report than a financial person who is trying to buy a pump." Different roles have access to various types of information that can be accessed in different ways, including mobile, paginated, and interactive reports, or via a web portal or Power BI dashboards.

The range of tools that are available through the Microsoft platform enables OSIsoft to give customers options that would otherwise not be available in an on-premises implementation. "Our customers are starting some good initiatives with the cloud, but most of their data collection and operations are still on-premises," says Acharrya. "Microsoft SQL Server 2016 with R Services, Reporting Services, Power BI Desktop, and Azure Machine Learning with Data Management Gateway give us an advantage by being able to provide advanced analytics close to customers' operations."

Serving customers on their own terms—fast

OSIsoft is creating a new PI Integrator for Microsoft Azure to work with several other Azure-based analytics technologies, including solutions that integrate with Microsoft Azure IoT Suite, Power BI, and Microsoft Cortana Intelligence Suite. Expanding its cloud and hybrid offerings is a critical part of OSIsoft's plan to meet its customers' needs based on the unique architecture that each customer has in place.

"If you look at some cloud providers, infrastructure is presented as a binary thing: it's either cloud or nothing," says Acharyya. "By working with Microsoft, we can offer customers an end-to-end, hybrid data infrastructure on their own terms. We're bringing together the best of both worlds."

The PI Integrator solution also enables OSIsoft to connect customers with the information they need in far less time than it would have previously taken. "This makes it

much simpler for customers to do advanced analytics," says Acharyya. "It's no longer going to require six months to a year to get it in place. Now they are able to some of these projects very quickly, in three or four weeks."

While the most compelling results that OSIsoft's customers experience are often related to cost savings, many are now looking forward to being able to tackle other types of problems that have greater significance, whether it concerns water and energy conservation, environmental impact, safety, or other broader concerns. For example, a car manufacturer is applying Cortana Intelligence to PI System data to determine the energy management implications of a 5-day factory work schedule versus a 6-day work schedule so that the company can reduce its environmental impact.

Acharyya points out that one of the more exciting new capabilities that makes it possible to address different issues is the ability to ask natural-language questions using either Microsoft Power BI or Cortana Intelligence. Instead of having to use structured queries, customers can use natural-language queries through Power BI Q&A and Cortana that can solve new problems by gaining additional insight into the data.

"It's amazing what's possible now," says Acharyya. "We're combining the world of IoT with PI Integrator and Microsoft innovation so customers can do far more than just the traditional cost-savings types of projects. With these new capabilities, they will be able to do things they were not able to do before, and we're bringing that together for them."

Software and Services

- Microsoft Azure Machine Learning
- Microsoft Cortana Intelligence Suite
- Microsoft Data Management Gateway
- Microsoft Excel
- Microsoft Power BI Desktop & Service

- Microsoft Power BI Gateway - Enterprise
- Microsoft SQL Server 2016
  - R Services
  - SQL Server Reporting Services
  - Stretch Database

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