

# A MAINTENANCE MANAGER'S GUIDE TO THE INDUSTRIAL INTERNET OF THINGS



*SEVEN THINGS YOU NEED TO KNOW ABOUT IIOT*

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# INTRODUCTION

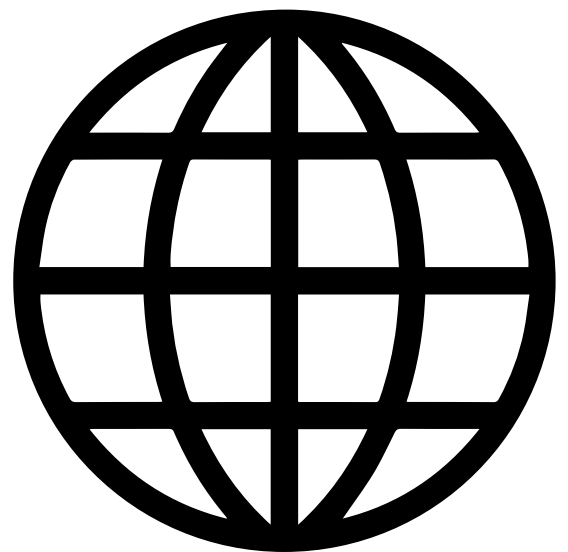


This e-book is designed for maintenance managers, whose work increasingly demands familiarity with the Industrial Internet of Things (IIoT). It's intended to help real-world facility and industrial maintenance professionals understand the basics of the technology. And it's structured around some of the key questions they're likely to be asking.

- What Is the IIoT and How Does It Affect Maintenance Operations?
- What Are the Benefits to the Maintenance Department?
- What and Who Is Driving the Development of the IIoT?
- How Will the IIoT Impact the Maintenance Team?
- Is IIoT Happening Already?
- What Are the Biggest Challenges IIoT Must Overcome?
- How Is the IIoT Taking Maintenance into the Future?

Since the turn of the millennium, the Internet has transformed society with increasing speed and astonishing breadth.

The "mobile Internet" has driven exponential improvements in portable device technology such that today's smartphones contain millions of times more power than all of NASA's 1969 "moonshot" computers. Understandably, easy access to such powerful technology has changed the way we interact with the world.







That change is expanding into more and more areas, a phenomenon often referred to as the Internet of Things (IoT). According to the Internet of Things Global Standards Initiative, the Internet of Things is “a global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies.”<sup>1</sup> More simply put, the IoT conceptualizes every “thing”—such as vehicles, cell phones, factory machines, appliances, buildings, and even people and animals—as a potential data source and receiver. These things, interconnected through a global network, exchange and process information with little or no human interaction to automate functions to a degree that’s never before been possible.

Now the IoT revolution is moving from the consumer world and the “carpeted areas” of the business world to the domain of manufacturing, logistics, and industry. The Industrial Internet of Things (IIoT), as it’s called, combines recently developed IoT technologies with machine sensors and automation technologies that have existed in industrial settings for many years.

The World Economic Forum describes this development:

*Dubbed the Industrial Internet (of Things), this latest wave of technological change will bring unprecedented opportunities, along with new risks, to business and society. It will combine the global reach of the Internet with a new ability to directly control the physical world, including the machines, factories, and infrastructure that define the modern landscape. ... Many important questions remain, including how it will impact existing industries, value chains, business models, and workforces, and what actions business and government leaders need to take now to ensure long-term success.<sup>2</sup>*

Whether the Industrial Internet of Things is coming is not the question. It's already emerging in almost every industry. According to independent global advisory firm Oxford Economics, the IIoT spans industries representing 62 percent of gross domestic product among the 20 major global economies, including manufacturing, mining, agriculture, oil and gas, and utilities.<sup>3</sup> According to an Accenture study, spending on the IIoT is expected to reach \$500 billion by the end of the decade, and predictions of the value it will create in the global GDP by 2030 are as high as \$15 trillion.<sup>4</sup>

What do these numbers mean to maintenance managers? The IIoT is coming and will change how your work is done in the same way other digital technologies have transformed how we live our everyday lives.



**WHETHER THE INDUSTRIAL INTERNET OF THINGS IS COMING IS NOT THE QUESTION. IT'S ALREADY EMERGING IN ALMOST EVERY INDUSTRY. THE IIOT SPANS INDUSTRIES REPRESENTING 62% OF GDP."**

# 1. WHAT IS THE IIoT AND HOW DOES IT AFFECT *MAINTENANCE* OPERATIONS?



**A**s a maintenance manager, you're responsible for the team that monitors and cares for your organization's valuable capital assets. The IIoT will provide you with enhanced connectivity and more detailed, real-time visibility, helping you do that job faster and more effectively.

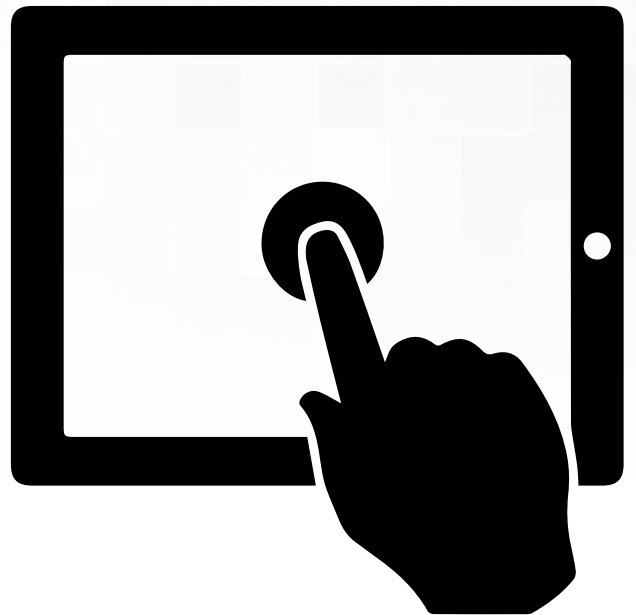
Think of your current environment. Let's say you work for a manufacturer that has 1,000 machines on the plant floor. Today, you and your staff make the rounds and check the readings on those machines; in the best case, you have a mobile device with you and are able to capture the readings on it. And, of course, some industries rely heavily on supervisory control and data acquisition, or SCADA, systems to monitor machine controls and process flow. But these systems are typically closed, proprietary systems that don't expose data to other applications or networks.





The Industrial Internet of Things improves these scenarios significantly. The idea of the IIoT is to make all the data from your capital assets (production machines, HVAC systems, vehicles, buildings, etc.) available in a public or private “cloud” so that it’s accessible in real time to your computerized maintenance management system (CMMS) software and other systems. With this setup, there’s no need to send personnel out to take readings on meters and gauges. You can “subscribe” to the relevant data feeds, and if a reading is out of standard parameters, automatically issue a work order or send digital instructions to the asset to correct itself.

In essence, the IIoT “gives voice” to the assets themselves, empowering them to communicate to their maintainers. It enables assets to broadcast information on their operation that can be leveraged by many different functions within the organization, including maintenance. The department has the ability to see what’s going on in the asset in real time, and to fix it when—or before—it experiences a problem that limits or prevents efficient performance.



**THE IDEA OF THE IIOT IS TO MAKE ALL THE DATA FROM YOUR CAPITAL ASSETS AVAILABLE IN A PUBLIC OR PRIVATE “CLOUD” SO THAT IT’S ACCESSIBLE IN REAL TIME.”**

## 2. WHAT ARE THE BENEFITS TO THE *MAINTENANCE* DEPARTMENT?



*THERE ARE A HOST OF TIME- AND LABOR-SAVING BENEFITS ASSOCIATED WITH INTEGRATING MAINTENANCE AND THE IIOT:*

- **Reduces downtime** by helping maintenance identify compromised assets more quickly, when, or even before, they fail.
- **Better prioritizes** which pieces of equipment get attention; instead of doing maintenance by a schedule, it's done by the condition of the asset, which communicates its state via the IIoT. It's condition-based maintenance with direct input from the asset.
- **Links the asset directly to MRO inventory** to automatically call out parts needed for maintenance requirements.
- **Makes more efficient use of maintenance labor**, keeping technicians and engineers assigned to the highest priority tasks and reducing overtime.

In many organizations, maintenance is currently perceived as a cost center, a necessary expense of doing business. The IIoT is likely to radically change this, as proactive measures taken on the real-time data it delivers drive productivity through less downtime and better-optimized asset performance. Increasingly, maintenance will be understood as a profit center. With less downtime, factories will produce more product. Every penny formerly wasted on unnecessary repair will go to the bottom line.





### 3. WHAT AND WHO IS *DRIVING* THE DEVELOPMENT OF THE IIOT?



The principal driver of IIoT development is an economic one: its ability to optimize operations, increasingly critical in a global marketplace defined by change, volatility, and constantly increasing competition. Consulting and advisory services firm McKinsey & Company notes that the biggest competitive gains come from better decisions being informed by IIoT data:

*For example, in factories, sensors will make processes more efficient, providing a constant flow of data to optimize workflows and staffing: sensor data that are used to predict when equipment is wearing down or needs repair can reduce maintenance costs by as much as 40 percent and cut unplanned downtime in half. <sup>5</sup>*

To be sure, technology itself is a driver, in terms of development and cost. It's better, faster, and cheaper than ever before. This trend is sure to continue as costs drop while functionality increases every year at an ever-faster rate. Among the areas where we're seeing the most improvement:





- Network connectivity is rapidly improving across factories and other facilities—not just in the “carpeted areas.”
- A wider range of providers is offering higher-capacity, lower-cost cloud-based storage.
- “Big data” analytics provide a means of turning the ever-increasing stream of asset data into actionable information. (Gartner defines “big data” as high-volume, high-velocity, and/or high-variety information assets that demand cost-effective, innovative forms of information processing that enable enhanced insight, decision-making, and process automation.)
- Smaller, more reliable, and more intelligent sensors for virtually all types of assets and measures are becoming more readily available at affordable prices.

While some of the earliest and most recognizable benefits of the IIoT are seen in maintenance, it’s not likely that maintenance as a department will be the primary driver of such initiatives within organizations. The organization has to see benefits across the enterprise to justify the investment. When this economic case is made





(and maintenance efficiencies are part of that case), business and operational leaders will buy into the IIoT and drive it. Once this is done, maintenance will benefit from the decision.



**WHILE SOME OF THE EARLIEST AND MOST RECOGNIZABLE BENEFITS OF THE IIoT ARE SEEN IN MAINTENANCE, IT'S NOT LIKELY THAT MAINTENANCE WILL BE THE PRIMARY DRIVER OF SUCH INITIATIVES."**



## 4. HOW WILL THE IIoT IMPACT THE *MAINTENANCE* TEAM?



Perhaps the biggest impact of the IIoT on maintenance teams is that the skillsets used for work will have to be retooled. The implementation of the IIoT means more data (a great deal more) in real time, and maintenance personnel will need to be trained to take advantage of the value these data streams deliver. Where readings were once done on the floor at the machine, increasingly they'll be read on a computer screen. The nature of the work changes as the physical and digital worlds of the organization merge. While there is always some natural resistance to change, the manager's job will be to help their team get past this resistance and stay ahead of the curve as technology continues to advance.

Ultimately this shift will make workers able to do more with better accuracy and less time and effort, as real-time data provides better insights into the assets being maintained. These improvements will lead to greater understanding of how the assets are working and their true costs.



In most organizations, there has been a traditional division between operational technology (OT) and information technology (IT). OT has dealt with the plant, with things like sensors, gauges, and SCADA technology. IT has worked with enterprise software and systems, and taken place in “the carpeted areas” of the company. What’s been missing—and what maintenance is destined to be on the forefront of as the IIoT takes hold—is the convergence of OT and IT.

To understand this convergence better, global professional services firm Accenture contrasts today’s realities with the imminent vision of a connected OT and IT:

### **TODAY’S REALITIES**

- The software, sensors, and controls running today’s facilities and equipment are outdated and difficult to upgrade. Companies cannot readily incorporate new features and improvements.
- Limited integration between internal systems (managerial apps, plant data sources) and external partners creates data siloes.
- Aging operating systems and vulnerable operational technologies pose security risks because they cannot be easily retired or replaced.
- Limited embedded computing or intelligence control exists at the device, product, or plant level.



**THIS SHIFT WILL MAKE WORKERS ABLE TO DO MORE WITH BETTER ACCURACY AND LESS TIME AND EFFORT, AS REAL-TIME DATA PROVIDES BETTER INSIGHTS INTO THE ASSETS BEING MAINTAINED.”**



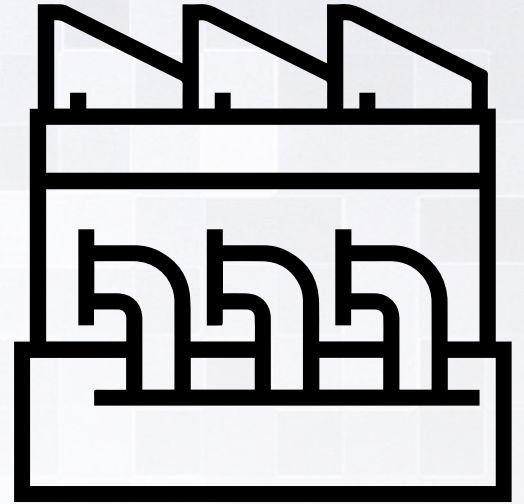


## *TOMORROW'S VISION*

- Sensors, communications, and other operational technologies work together with information technologies, most likely in the cloud.
- Standard, fast software development techniques are used to create intelligent industrial products.
- A common data model and sensing and control architecture supports the flow of insights and actions throughout an organization and its ecosystem of partners.
- The IIoT infrastructure is trustworthy and resilient to compromise.<sup>6</sup>



One of the inevitable outcomes of this convergence will be a change in maintenance mentality. Historically, IT has continually looked to improve performance, adding functionality, performing upgrades, etc. IT is, essentially, the maintenance team for information technology assets. The hard assets of OT deserve that same level of attention, and the IIoT enables this shift. Taking that mentality to hard assets will be one of the outcomes of IT-OT convergence; adapting that mentality will be part of the retooling of maintenance skillsets.



**SENSORS, COMMUNICATIONS, AND OTHER OPERATIONAL TECHNOLOGIES WORK TOGETHER WITH INFORMATION TECHNOLOGIES, MOST LIKELY IN THE CLOUD."**



## 5. IS *IloT* HAPPENING ALREADY?



In a word, yes; the vision is quickly becoming reality. Already there are IloT implementations that monitor some of the most critical metrics in factory environments: machine runtime, pressure in pressure vessels, amperage draw for electric motors, bearing temperature, and many more.

*A recent post on the blog of IOT analytics platform vendor Vitria notes, Manufacturing and IoT are undoubtedly experiencing a major growth phase in 2017. Manufacturers of all types are leveraging IoT and advanced analytics to drive value in a wide variety of applications in their business. Many are progressing past simple measurement and monitoring to advanced techniques with predictive analytics and machine learning.<sup>7</sup>*

It's important to understand that IloT initiatives are no longer the exclusive domain of huge multinational organizations; the functionality necessary to leverage IloT technology is increasingly available as software continues to be developed to allow virtually any size manufacturer to take advantage of the IloT. As this access improves, the cost of entry will continue to fall.



**MANUFACTURING AND IOT ARE UNDOUBTEDLY EXPERIENCING A MAJOR GROWTH. MANUFACTURERS OF ALL TYPES ARE LEVERAGING IOT AND ADVANCED ANALYTICS TO DRIVE VALUE IN A WIDE VARIETY OF APPLICATIONS IN THEIR BUSINESS."**





Further, manufacturers are progressively realizing they have the ability to leverage the IIoT with their legacy assets. A company may have a lathe that has been doing a job well for many years; with today's sensors, equipment like this can be easily retrofitted to integrate to the IIoT. Such upgrades, once thought impossible or not considered at all, are now more feasible. For maintenance teams responsible for legacy equipment, this has significant implications.







A recent article in Plant Engineering details why the IIoT is now gaining real momentum in the maintenance arena:

*The IIoT is not so much about automated factories as it is about delivering the full range of services that the equipment in the factories was designed to provide—consistent high quality output at a predictable rate. The same can be said about reliability-centered maintenance (RCM) in general, and condition-based maintenance (CBM) in particular. In fact, the IIoT is a great way to accelerate the productive impact and the financial return that RCM can deliver. You might even say the IIoT enables something closer to just in time (JIT) maintenance because it is now more technologically and economically feasible to provide a wider range of data for CBM in real time, eliminating the wait for inspection results or worse, a call from operations about a drop in quality or output or even failure. With an IIoT-connected maintenance program, staff can be dispatched immediately, before failure occurs, in response to a sensor's report that an asset's condition has strayed beyond acceptable limits.<sup>8</sup>*

It's better to prevent a failure than fix one, and the IIoT is enabling maintenance to do this more comprehensively and effectively than heretofore possible.

## 6. WHAT ARE THE BIGGEST CHALLENGES *IIoT* MUST OVERCOME?



*THERE ARE THREE PRINCIPAL CHALLENGES TO IMPLEMENTING IIOT IN ORGANIZATIONS:*

1. Security
2. Standards
3. Organizational skillsets

The number one challenge to IIoT implementation is concern about security. If your operations are exposed to the world via the Internet, how can they be protected? The anxiety is understandable.

High-profile examples like the Stuxnet worm (that the U.S. used to disable nuclear centrifuges in Iran) and attacks that took down part of the power grid in Ukraine are rightly seen as cyber warfare. TechRepublic recently noted, though, "As more and more industrial systems become connected, similar attacks could be seen among businesses in the future."<sup>9</sup>





There are already best practices and a wide array of evolving technologies companies can employ to minimize risk. But it's important to remember that organizations don't necessarily need to expose metrics or controls to the Internet to move forward. While this doesn't eliminate the threat altogether, it does lessen it considerably. The benefits of IIoT technology can be leveraged internally, if a company chooses not to connect beyond its own facilities. This can be a great option for small and mid-sized companies that aren't operating across borders or on a global scale.



**IT'S IMPORTANT TO REMEMBER THAT ORGANIZATIONS DON'T NECESSARILY NEED TO EXPOSE METRICS OR CONTROLS TO THE INTERNET TO MOVE FORWARD.**





Standards are another important issue that relates to interoperability. Currently, six or seven standards bodies are working on standards for the IIoT; all are hedging their bets (and many players are involved) as the industry moves toward developing a single or unified standard. Until “a standard” is reached (i.e., that provides standardization in the technology stack and ability to integrate across technology vendors, standard protocols for sharing between IoT systems, and standard access to external data sources), companies are well served to choose flexible technology solutions that can work with any standard.

Finally, the challenge of organizational skillsets is primarily a cultural one, with the principal need being the integration of OT and IT. The challenge is also an educational one of upgrading or retooling maintenance staffing to operate in the new ecosystem the IIoT creates. Recruiting and hiring practices, too, will need to be re-examined.

## 7. HOW IS THE IIoT TAKING *MAINTENANCE* INTO THE FUTURE?



*FROM THE MAINTENANCE MANAGER'S PERSPECTIVE, THE IIOT OFFERS COMPELLING BENEFITS THAT CAN TRANSLATE INTO SIGNIFICANT OPERATIONAL IMPROVEMENTS:*

- Less downtime
- Fewer repairs and lower repair costs
- Longer asset life
- A more comprehensive view of asset health for better maintenance planning
- The opportunity to use staff more effectively and efficiently by focusing them on the assets that really need attention

A recent report by audit and assurance firm PwC indicates that IIoT transformation is not just imperative, but urgent:



*As industrial companies take these implications on board and develop their IloT strategies and approaches, a question that commonly arises is how fast they need to move. How long is their window of opportunity? Do they have five years to transform to a new technology and operating blueprint for the IloT world? Two years? Just six months? The answer may vary by industry. But in virtually every case, we think the available timeframe for IloT transformation is shorter than companies currently believe. Similar to other industries, the Internet will accelerate disruption.<sup>10</sup>*

We agree. The combination of the IloT and CMMS software can bridge data communication, so that maintenance teams can make a more positive and strategic impact on their organizations. The real power of the IloT isn't in the sensors and devices per se. It's the software that stores and processes that data that makes the difference. CMMS software helps maintenance organizations make sense of what to do with the data gathered by these devices, directing them to take action when the asset indicates the time is right. When an asset's condition changes, CMMS lets you know so your team can react to any problems immediately, improving the reliability of your assets while reducing risk and driving down costs. Ultimately, CMMS is where data becomes action to keep your assets operating efficiently and minimize downtime.

The IloT is coming to maintenance, whether you're ready or not. But those who lead will be preparing for its arrival. To learn more about how MPulse Software can help you implement IloT in your maintenance organization, contact our industrial technology experts today. We'll get you where you need to be at a pace that works for you.





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## WHAT'S THE *NEXT* STEP?



### *NEED HELP GETTING STARTED?*

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**+1 (541) 302-6677 Outside of USA and Canada.**



The journey of a thousand miles begins with one step, and the journey to better maintenance management begins with a simple phone call.

Now is the time to think big. Good maintenance managers know that plans are fluid, and they need to adapt to changes in their field. The future of maintenance management is coming, whether you are ready or not. Stay ahead of the game and ride this exciting wave to position yourself and your company for success.

