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THE POWER OF NOW

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The Time is Now.

Recent years have seen an explosion of the Industrial Internet of Things (IIoT) as enterprises of all shapes and sizes have been implementing new, innovative, smart solutions in pursuit of digital transformation.

After years of slowing productivity and fragmented demand across many industrial segments, innovation is long overdue. Significant forces, such as increased globalization and commoditization, have compelled industrial enterprises to explore new service-oriented, revenue-boosting business models and to reallocate resources to digital technologies and solutions.

What we're seeing now is the Fourth Industrial Revolution or Industry 4.0 which has become the fastest growing market for IoT. But—as with nearly any period of great structural change—the race to digital transformation is about more than just bragging rights. Industrial enterprises that embed IIoT into their businesses will discover:

- *Operational efficiencies that reduce costs*
- *New, ongoing sources of revenue*
- *Enhanced relationships with customers*
- *Accelerated time to market*

Companies that don't define an IIoT strategy risk a competitive disadvantage before even reaching the starting line. And so, for industrial enterprises that have yet to act or have been sidelined by obstacles—this is the moment of truth. Act now, or be left behind.

Fortunately, with the incredible advancement of IIoT and growth fueled by Industry 4.0, there has been no better time than now for the availability of innovative, state-of-the art technologies, resources, and opportunities for digital transformation.

Top Use Cases for IIoT in Industrial Manufacturing:

- Remote asset monitoring
- Remote maintenance/service
- Predictive maintenance and asset management
- Optimized equipment effectiveness

McKinsey, 2019

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The ThingWorx Industrial IoT Platform

The Industrial Internet Consortium defines an IIoT Platform as "a technical system that provides a range of enabling services to support the delivery of IIoT applications." The ThingWorx Industrial IoT Platform offers a rich set of capabilities that enable powerful solutions for design, manufacturing, service, and industrial operations.

Flexible and purpose-built for IIoT, ThingWorx empowers industrial enterprises to digitally transform every aspect of their business with innovative solutions that are simple to create, easy to implement, scalable to meet future needs, and accelerate time to value.

Maximize Revenue
Unlock new business models, such as product-as-a-service, to realize value-add opportunities, scale to new markets, and improve throughput.

Reduce Time
Go to market faster with rapid application development and a vast set of capabilities to wrap and extend existing solutions.

Reduce Cost
Leverage data from connected products and systems to increase productivity, reduce costs, and increase efficiencies.

Improve Quality
Enhance the quality and reliability of information to accelerate secure, scalable innovations for products, service, and factory operations.

Ultimate Flexibility
Flexible deployment options include on-premise, cloud, or a hybrid approach, adaptable to any industrial use case.

Industry Recognition

Gartner FROST & SULLIVAN IDC ANALYZE THE FUTURE BERG INSIGHT

ABIresearch for visionaries FORRESTER® Hewlett Packard Enterprise Microsoft

COMPASS INTELLIGENCE IoT ONE Quadrant Knowledge Solutions THE CHANNEL CO. CRN

IOT ANALYTICS MARKET INSIGHTS FOR THE INTERNET OF THINGS

Should You DIY?

The short answer—No. As more industrial enterprises embark on the journey of digital transformation, many are tempted to build their own solutions. Some give in; few succeed. In fact, a survey of senior business and IT decision-makers at manufacturing companies performed by Cisco1 found that 75% of self-initiated IoT projects were considered a failure.

Many well-intentioned organizations inevitably found that maintaining such infrastructure over-burdened resources, distracted from the core competencies of the business, and were difficult to scale with company growth – offering little to no operational or financial benefit in the end. For some, these realizations came quickly; others spent years investing time and resources in such ill-fated endeavors before turning to an IIoT solution provider.

Focus your expertise and resources on what you do best. For IIoT, ThingWorx offers the industry's most complete platform, with end-to-end capabilities.

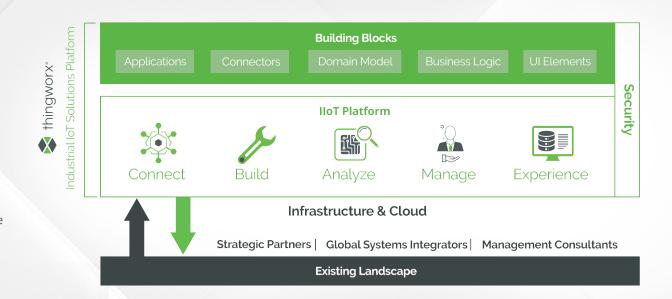Cisco, "Internet of Things challenges, Breakthroughs, and Best Practices", 2017.

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The ThingWorx Industrial IoT Platform

A pioneer in IIoT, PTC has spent years identifying trends and usage patterns among industrial enterprises that define the most common use cases for IIoT solutions. PTC leverages this insight to continually hone its IIoT platform architecture to enable enterprises to create, scale, customize, and implement solutions that meet their requirements and achieve their objectives. The ThingWorx architecture incorporates modular functionality that simplifies development and includes pre-built applications for fast, easy implementation of IIoT solutions for common use cases in a variety of industries.

ThingWorx Industrial IoT Solutions Platform

Building Blocks
- Applications
- Connectors
- Domain Model
- Business Logic
- UI Elements

Security

IIoT Platform
- Connect
- Build
- Analyze
- Manage
- Experience

Infrastructure & Cloud

Strategic Partners | Global Systems Integrators | Management Consultants

Existing Landscape

ThingWorx Architecture

Building Blocks
Pre-defined configurations that provide a foundation for IIoT solution development with the flexibility to customize specific features and functionality. Building Blocks consist of:
- Applications – pre-built, grouped building blocks based on use cases, that accelerate digital transformation and drive time-to-value
- Connectors – enable access to data from disparate devices and systems
- Domain model – a conceptual model of the domain that incorporates behavior and data
- Business logic – encodes real-world business rules that determine how data can be created, stored, and changed
- UI elements – a library of control elements used to construct the graphical user interface for customization and extension of application functionality

Platform Capabilities
A complete set of tools and functionality to:
- **Connect** disparate devices and applications to enable access to multiple data sources
- **Build** complete IIoT solutions and augmented reality (AR) experiences quickly and easily
- **Analyze** complex industrial IoT data for real-time insights, predictions and recommendations
- **Manage** the performance of connected devices, processes, and systems
- **Experience** and engage with physical objects in a more contextualized, actionable way

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The Power to...
CONNECT

Any IIoT journey begins, of course, with **connectivity.**

The "things" that make up an industrial enterprise—the machines, tools, devices, and field assets—represent a rich source of data insights. These things, however, are not always digital-ready. Industrial equipment and environments are often rife with obstacles to establishing connectivity, including disparate systems, incompatible technologies, aging equipment, or inadequate DIY support systems.

ThingWorx solves these challenges with a wide range of pre-built options that simplify industrial connectivity. With a library of more than 150 device drivers, client drivers, advanced plug-ins, and connectors, ThingWorx enables connectivity to thousands of devices and systems, establishing a single source for collecting, aggregating, and enabling secure access to IIoT data.

Connection Services
Secure, embeddable, and easily deployable tools and functionality for connecting devices and systems across any network topology and any communication scenario
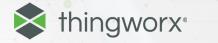
ThingWorx Flow
A complete set of built-in, system-specific and standards-based connectors enable users of any skill level to visually orchestrate connections between devices and systems

ThingWorx Kepware
Multiple, standardized connectivity options support a wide variety of disparate assets and enable secure, real-time connection capabilities at the data source

By connecting the physical world of industry and the digital realm of business, ThingWorx empowers enterprises to access, analyze, act upon, and monetize industrial IoT data.

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The Power to...

BUILD

With ThingWorx, you don't have to be an expert to create powerful IIoT-enabled applications, dashboards, workspaces, and mobile interfaces. ThingWorx provides user-friendly tools and technologies that simplify the creation of complete, customizable solutions for enterprise deployment.

The role of the ThingWorx IIoT platform is to provide the foundation and building blocks to create solutions for industrial use cases, enable the capabilities to tailor applications as needed, and facilitate a repeatable process that minimizes time and effort required to build future applications.

Develop	**Deploy**	**Integrate**	**Connect**
Visual application modeling, templates, plus drag-and-drop tools enable rapid development of applications with robust functionality	Applications can be deployed anywhere – in the cloud, on premise, or a hybrid environment – and are scalable from small edge deployments to millions of connected devices	Built-in capabilities simplify 3rd-party integrations – such as CRM, ERP, SCM – and enable seamless integration of data into all connected tools and systems	Multiple available tools connect device and systems to ThingWorx-enabled solutions across any network topology or communication scenario

ThingWorx empowers industrial organizations to be uniquely innovative – to think outside the box, create new solutions, enhance current product offerings, establish new business models, and set and achieve new revenue and performance goals across the enterprise.

The Power to...
ANALYZE

Connected devices are massive producers of data, some generating thousands—or even millions—of data points daily. Within all of that data, lies the real value of your IIoT investment: new, detailed insights.

ThingWorx uses advanced artificial intelligence and machine learning techniques to analyze large volumes of complex IIoT data, generating the insights you need to make smart, real-time decisions; to diagnose and resolve issues quickly; to predict and prevent interruptions; and to better anticipate the future. Data insights are operationalized with easy-to-understand outputs suited for non-expert users.

Multiple analytic methods yield varying levels of insight, based on the basic questions that need to be answered.

Descriptive
What happened?
Useful insights generated with pre-built calculations and transformations for better understanding of data

Diagnostic
Why did it happen?
Patterns and correlations in data are identified to explain data, establish baseline "normal" behavior, and detect anomalies quickly
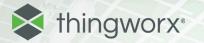
Predictive
What will happen?
Applies machine learning to historical data to make predictions about future outcomes – machine failures, consumable depletion, etc.

Prescriptive
What should I do?
Integrated models simulate behavior of physical objects in the digital world to generate recommendations and improve outcomes

ThingWorx is built to understand and tackle the unique challenges of IIoT data and simplifies access to the information industrial enterprises need to make informed decisions quickly.

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The Power to...
MANAGE

As IIoT solutions become ingrained throughout the enterprise, more users in more business functions—and with varying degrees of technological expertise—will interact with IIoT-related applications, data, and processes. Usability, process efficiency, automation, and collaboration are essential for users in any role to simplify cumbersome tasks associated with managing IIoT implementations.

ThingWorx delivers a robust set of applications and capabilities to streamline system administration, increase visibility, and foster maximum productivity to ensure optimal performance of connected devices and systems:

ThingWorx Flow
Visual environment with user-friendly tools allows users to easily wire together connections between systems, then create flows of data that execute specific processes
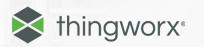
ThingWorx Solution Central
Centralized portal in the cloud that allows system administrators to efficiently discover, deploy, and manage ThingWorx applications across the enterprise, from a single location

ThingWorx Software Content Management
Secure, reliable interface to remote assets simplifies mass software distribution—deployment, content scheduling, testing, monitoring, and audits

Effective management of the IIoT ecosystem empowers operations to provide substantial value in the form of increased uptime, reduced costs, enhanced visibility and control, preventive maintenance, and improved compliance.

The Power to...
EXPERIENCE

The extent to which any industrial enterprise realizes the positive impacts of digital transformation is largely determined by how effectively IIoT data is captured, translated into meaningful insight, and operationalized throughout the enterprise. Data insights are rendered nearly meaningless without getting to the right people at the right time in formats that are easy to digest, interpret, assess, and share.

Customizable, dynamic, visualizations and interfaces in ThingWorx applications engage users in smart, connected environments, allowing them to be more responsive, productive, and adaptable. Data is integrated with third-party applications to share insights and enhance collaboration across business functions and geographies.

Visual Experiences
Compelling data visualizations, customized dashboards, and dynamic user interfaces simplify data consumption, increase user engagement, and encourage sharing

Enhanced Insights
IIoT data is combined with relevant 3rd party data for more complete, contextualized insights and can be accessed in real-time to foster more proactive user engagement

Vuforia Integration
Vuforia integration enables users to create immersive AR experiences from IIoT data, accessible on mobile or wearable devices, for meaningful 3D interactions with facilities, processes, and equipment

Visual, dynamic content and AR experiences are tailored for the intended audience, which makes them more consumable and actionable, increasing the positive impact of digital information across the enterprise.

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Out-Of-The-Box Enterprise
Solutions

ThingWorx provides a selection of enterprise solutions that are flexible, quick to deploy, and designed to scale across multiple sites to ensure rapid ROI. .

Digital Performance Management (DPM)

Closed-loop operational excellence solution that empowers manufacturers to identify, analyze, and improve bottle necks while surfacing critical issues and areas of improvement in their factory operations—and it puts th at power directly at their fingertips with enabled AI-enabled analytics.

Connected Work Cell (CWC)

Deliver up to date, digital, and in-context information to operators on the shop floor. Combining data from multiple production sources to provide operators a seamless bi-directional interaction with all data required to perform daily work.

Asset Monitoring and Utilization (AMU)

Connect existing assets, remotely monitor them in real-time, generate alerts based on abnormal conditions, and deliver critical insights with data trending and analysis tools.
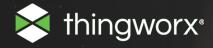
Ready to Experience More ThingWorx?

The ThingWorx Developer Portal is full of resources to learn more about ThingWorx—learning guides, videos, FAQs, blogs, product documentation, and more. Plus, you can sign up for a free trial to test drive the core capabilities of ThingWorx by following a Learning Path or Developer Guides. Experience how easy it is to create your first application!

Visit developer.thingworx.com to start exploring!

PTC Marketplace

PTC Marketplace is a digital space where partners and customers are able to access exciting IIoT apps, access market-ready solutions, and promote innovative technology. PTC's latest enhancements make it easier than ever for solution builders to find market-ready solutions and customized accelerators while providing a marketplace for PTC partners to promote and showcase their innovative IIoT and AR technologies, solutions, services, and industry expertise to customers and prospects looking to utilize them.

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PTC and Partners

The PTC Partner Network enables technology providers, solution providers, and global system integrators to innovate with leading technologies, collaborate with partners and customers, and maximize the IoT market opportunity. They join the PTC Partner Network to explore new business opportunities that drive solutions to market, inspire innovation, and expand into new geographies and industries.

PTC has formed Strategic Alliances with several key partners including Rockwell Automation, Microsoft, and Ansys. With unmatched expertise, PTC's global Strategic Alliances empower customers to capitalize on the new innovations, solutions, and markets these partnerships will develop for IIoT and digital transformation.

Partner Network Engagement Models

Complement
Expand market visibility by aligning your complementary hardware and software products with PTC's market leading platforms and solutions. Secure more customers quickly by validating that your products and applications work well with PTC and publish your offerings on the leading IoT Marketplace.

Sell
Grow and scale your business by selling or distributing PTC products and solutions. Get authorized to sell the industry's leading IoT solutions portfolio and engage with a world-class partner ecosystem. Build upon your industry knowledge and regional presence to offer the integrated solutions customers need.

Services
Expand your services business by building your practice with PTC. Joining the PTC Partner Network will give you access to PTC technology and allow you to expand your business by providing first-class services and training to your customers.

OEM
Rapidly build and commercialize your solutions by embedding or bundling PTC technologies. Offer game-changing smart, connected solutions powered by the ThingWorx IoT platform or Kepware Industrial Connectivity. Access training and partner success resources to support your design development and launch.

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