



Mastering the **6 LEVELS** of IoT Success

How to use a purpose-built IoT platform to unlock the benefits of smart, connected products



Connected Product Maturity Model

 **Level 1: Unconnected**

 **Level 2: Connected**

 **Level 3: Service**

 **Level 4: Analysis**

 **Level 5: Integration**

 **Level 6: Innovation**

Achieve Innovation with Connected Capabilities

It can be easy to take a follower approach to finding new value through Internet of Things (IoT) initiatives. The IoT solutions marketplace is crowded and confusing, and other priorities seem easier and faster to tackle.

But whether or not your company is ready, the IoT already is changing how businesses make profits from products. Hundreds of success stories show how manufacturers with mature IoT capabilities are generating new, recurring revenue streams through efficient connected-product development and delivery.

But getting there is a process of change, both technically and tactically.

To help business leaders understand the requirements of change as they add more connected products to their portfolios, we have developed a connected-product maturity model. It is based on best practices gleaned from hundreds of engagements over more than 10 years with product manufacturers from nearly every industry.



The Connected Product Maturity Model describes the capabilities, considerations and requirements that organizations experience as they improve their ability to drive value through smart, connected products.

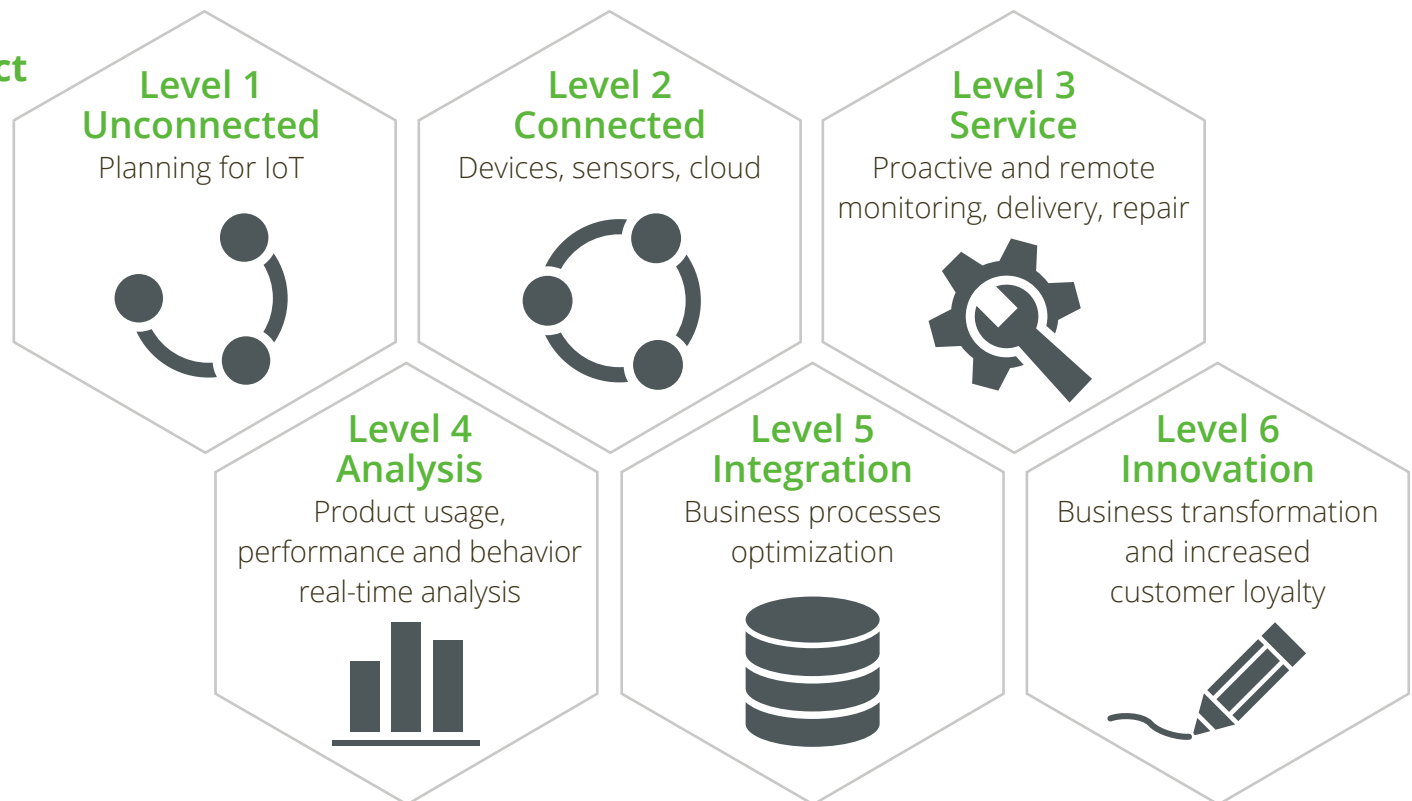
Having a model helps business leaders visualize the big-picture resource commitment needed to move quickly to value creation. Many companies are choosing to buy purpose-built IoT platforms — instead of building their own — to shorten that timeline and streamline technical and tactical changes.

Another reason companies opt for such a platform is that managing connected products is complex. Connections

proliferate among people, networks and devices/things — and high-value data is traveling along those connections. IoT-specific platforms provide single-point management for connected products and integrate security and scalability into development.

Once a business gets started, it shouldn't stop. Moving into the later maturity levels (5 and 6) is important to achieving maximum benefit from connected-product investment. It is when companies move through these last levels that smart, connected products return a perpetual loop of value creation through low-resource development and delivery of new offerings.

Connected Product Maturity Model

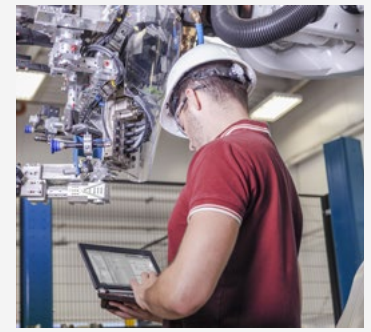


Complete IoT Platform Capabilities

PTC has the most robust Internet of Things (IoT) technology in the world. In 1986, we revolutionized digital 3D design, and in 1998, we were first-to-market with Internet-based Product Lifecycle Management (PLM).

Now our leading IoT and Augmented Reality (AR) platform and field-proven solutions bring together the physical and digital worlds

to reinvent the way companies create, operate and service products. With PTC, global manufacturers and an ecosystem of partners and developers can capitalize on the promise of the IoT today and drive the future of innovation. Our platform has been [recognized by Forrester](#) as a leader among IoT platforms.



CONNECT



ANALYZE



IMPLEMENT



MANAGE



EXPERIENCE



SCALE



SECURE





Level 1: Unconnected

Unconnected manufacturers are constrained because they cannot effectively connect people, processes and things. Start by asking, *What would be possible if we could connect people, processes and things — and seamlessly and securely view, share and activate information as it moves among them?*

Choose your best opportunity and determine what capabilities you will need to design, deliver and service the new product(s). Then, get connected.

Consideration: Basic enablement, network connectivity, security, middleware services, cloud services, application development and other device-management functions are needs that must be addressed when launching a connected-product initiative.

Requirements: Embedded software, network communications, device protocols, provisioning, real-time data processing, advanced web services, security, data management.

Flowserve's IoT Opportunity

Flowserve is a global provider of industrial fluid-control pumps and has been in business more than 200 years. When the company sought to identify its best IoT opportunity, predictive maintenance rose to the top.

Machine learning could elevate the performance of predictive maintenance technology on Flowserve pumps. This would add direct value to users' bottom lines by eliminating low-priority alerts and system shutdowns that cost manufacturers billions in potential profits each year.

☒ **Flowserve Benefit:** IoT capabilities expanded Flowserve's value proposition without major product overhauls, and elevated Flowserve equipment with self-assessing, self-diagnosing and self-healing predictive-maintenance features.

PTC can help your company identify and prioritize IoT use cases.

[Contact us](#)



Level 2: Connected

Once connected, enterprises can begin to realize new ways to achieve growth and a sustainable service position. Connected product services typically generate a recurring revenue stream, require less fixed capital and provide potentially higher margins.

Consideration: Encourage development of solutions that are resilient to change and allow for applications to capitalize on — rather than be hindered by — manufacturing devices proliferation.

Requirements: Reaching Level 2 is accomplished by connecting a product to a network (Internet, cellular or satellite) and enabling data transmission back to an enterprise server or system for processing.

Flowserve Uses IoT To Create New Value

Flowserve needed a way to connect pump equipment, the enhanced predictive maintenance data and maintenance professionals.

Using one of its pumps, the ThingWorx IoT platform, sensors from National Instruments and HP's high-performance computing Edgeline System, Flowserve designed and built a closed-loop, self-learning fluid control system that monitors, detects and corrects fluid control without manual intervention.

✓ **Key Benefit:** Flowserve was able to work with key partners to innovate using a raw material that was plentiful and within reach: systems performance data.

Read about the [benefits of connecting](#) business processes and applications.



Level 3: Service

Each and every product in the company's portfolio requires some level of service and support at Level 3, which is operationalized by enabling remote access for identification, diagnosis and resolution of service issues.

Consideration: The most effective solutions provide a secure and scalable platform to process and store machine data, and applications to deliver remote services.

Requirements: An IoT platform that enables application development and includes a suite of tools to monitor assets, gain access remotely and manage processes/content remotely. The solution would handle hosting, security and scalability. It would also have flexible application programming interfaces (APIs).

Supersized Service: One View, Many Pumps

With Flowserve's IoT-enhanced pumps, users receive more than sensor readings. They also receive insights that inform them how to react. Machine learning puts context around the numbers as it analyzes them, and then feeds the insights into an easy-to-use interface that could be on-site or remotely linked through a network.

☒ **Key Benefits:** By upping performance of predictive maintenance capabilities, Flowserve flipped its value proposition from provider of industrial fluid-control equipment to provider of data-driven, resource-optimized fluid control solutions. Flowserve users can more effectively deploy their maintenance resources, thus saving money and protecting uptime.

Hear Flowserve Vice President Aric Zurek on [the future of service.](#)



Level 4: Analysis

At Level 4, IT leadership's focus turns to analyzing the data and developing user-facing tools and applications that facilitate data analysis, provide insights and improve business functions.

Consideration: An enterprise-ready IoT platform that has built-in analytics and dashboard-building tools will help your team find actionable insight in IoT data.

Requirements: Data from the connected products need to be organized and stored in a way that makes it easy to report on and analyze.

The Key to Better Predictive Maintenance

At the core of Flowserve's IoT value proposition is new knowledge that wasn't easily obtainable before. That knowledge starts as sensor data, but is transformed into actionable insights with ThingWorx IoT platform's built-in analytics engine.

- ✓ **Key Benefits:** Machine learning gives the platform the knowledge to diagnose more precise system conditions than has been possible with previous predictive maintenance capabilities. Such precision can dramatically lower maintenance and shutdown costs.

Why [rethinking data and analytics](#) is critical to IoT success.



Level 5: Integration

Manufacturers that have reached Level 5 find that the real “gold” of IoT is taking data from connected products and integrating with enterprise systems (CRM, ERP, PLM or data warehouses). This optimizes critical business processes like closed-loop product lifecycle management and essentially “IoTizes” their organization.

Consideration: ThingWorx IoT platform offers a framework to integrate with business systems by feeding IoT data from connected assets into CRM/ERP/PLM systems to optimize business processes.

Requirements: First, IoT data must be made available to integrate with other systems. Second, IoT data must deliver additional value by combining information from connected products with information from complementary sources and systems to enable people and processes to collaborate and extract even more value.

Connected Applications Improve Response

Sysmex, a leading producer of medical lab-analysis equipment, enabled secure equipment connectivity to deliver service and support, seamless data integration into its entire business, and the ability to build value-added applications.

☒ **Key Benefits:** Customers experience improved equipment uptime, response time and labor utilization. Data cues also trigger automated materials replenishment, new usage-based billing and up-sell opportunities.

See more [IoT use cases](#) from PTC.



Level 6: Innovation

Level 6 is the ultimate goal for product- or device-driven businesses. That is, to develop new customer experiences, and thus new streams of recurring revenue through IoT and [Augmented Reality](#) (AR) enablement. Innovation is achieved by enabling end-users and customers to reinvent their experiences through smart, connected products.

Consideration: A purpose-built IoT platform enables innovators and developers to build immersive experiences using AR, and, as a result, transform how users create, offer and service products.

Requirements: The organization needs to be able to create custom applications that can enhance the utility of a product. And application leaders and developers need to be able to receive technical data back from products.

A “Critical New Discipline”

“Through a smartphone or tablet pointed at the product, or through smart glasses, augmented reality applications tap into the product cloud and generate a digital overlay of the product.

“This overlay contains monitoring, operating, and service information that makes supporting or servicing the product more efficient. Constructing these powerful digital interfaces is another critical new design discipline.”

— From the article “How Smart, Connected Products are Transforming Companies,” *Harvard Business Review*

✓ **Key Benefits:** Augmented Reality can improve productivity by presenting enhanced instruction, such as guiding a service technician through a repair. It can also be used to grow business. Imagine how Augmented Reality can turn flat proposals into living visions.

More on “How Smart, Connected Products are Transforming Companies”
[Download the article.](#)

Conclusion and Next Steps

Whether an organization is a beginner at connected-product development or has advanced to an upper level of the Connected Product Maturity Model, a purpose-built IoT platform can streamline the transformation process, reduce resource requirements and shorten time-to-benefits.

The [ThingWorx IoT platform](#) provides complete capabilities for connecting products, analyzing data for user and customer benefits, implementing IoT solutions and applications, managing connected devices, and creating new, transformative experiences for users and customers. [Click here](#) to learn more.

**Take the next step
in IoT maturity:**

 [Contact an IoT Expert](#)



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