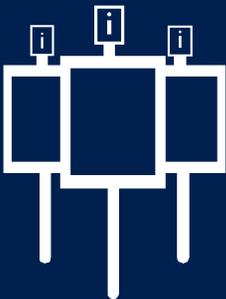


 Windows 10

Where to **start?**



How Windows 10 IoT helps device makers seize the digital business opportunities in healthcare.



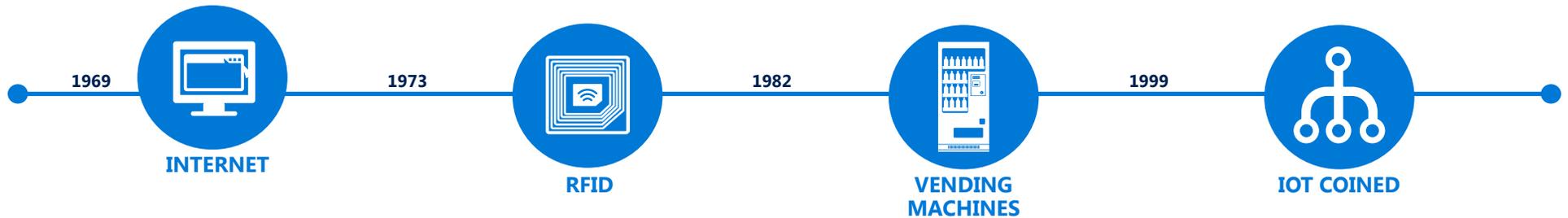
INTRODUCTION

Imagine connected prescription bottles that ensure people follow their required healthcare regimen. Wearables that track a loved one's routine with any abnormal activity triggering alerts on your smartphone. Connected street lights that dynamically adjust lighting to help reduce energy consumption, cost, and maintenance while providing real-time information to drivers via digital signage. From the "driverless car" to the "smart factory," bits and pieces of Internet of Things (IoT) scenarios are starting to move from storyline to mainstream in our everyday consumer and industrial lives.

For years, IoT has been revered for its potential to capture insights, drive productivity, and simplify complex processes. For just as long, the hype has exceeded reality with showcase examples like the "smart refrigerator" trotted out repeatedly as proof of the vision. Hindered by fragmented and disconnected technologies and lacking standards, IoT has yet to come fully into its own.

But change is in the air. A perfect storm is propelling the long-awaited promise of IoT into reality: hardware is cheap, connectivity is ubiquitous, and business is hungry for the next technology wave. The only thing missing is the next generation of smart, connected devices. Your devices. Your *things*.

In this e-book, we look at the drivers compelling device manufacturers to rethink their device strategy, their business model, and their development platform. IoT is ready for prime time, and it's time to take your amazing imagination and great big ideas and build them out on the Windows 10 IoT platform to **get ready to change how business works**.



IoT: Hype or reality?

When the automated teller machine (ATM) entered the marketplace in 1967, it revolutionized retail banking by solving the age-old consumer problem of accessing cash after hours. As technology advanced, the original machine transitioned from archaic cash dispenser into today's modern and sleek, multifunction ATM. Advancements like customer-friendly video display units and expanded functions freed bank employees to focus on higher-value services.

We've seen similar game-changing technology like radio-frequency identification (RFID) improve inventory control with a promise to "tag the world electronically." Throughout the 20th century, industrial robotics have been a vital part of the connected assembly line and as they become "smarter" they become capable of working without human intervention.

What makes an ATM or an RFID tag or an industrial robot relevant to IoT? All these *things* improved employee productivity and revolutionized the way the bank or store or factory worked. That's the real promise behind the Internet of Things. That's the real value of the next generation of smart, connected devices.

Within its 2014 technology "Hype-Cycle," Gartner balances IoT at a precarious, uncertainty-tainted point aptly titled the "Peak of Inflated Expectations." This is a period where a few inspirational success stories are highly lauded, but tales of failure blemish the concept; a time when some companies take action, but "many do not."¹ In short, we've been holding our collective breath, waiting to see what will happen. What's been missing is a catalyst to move IoT from expectation to production. From promise to reality.

What's different now?

For the first time, imagination is not limited by hardware.

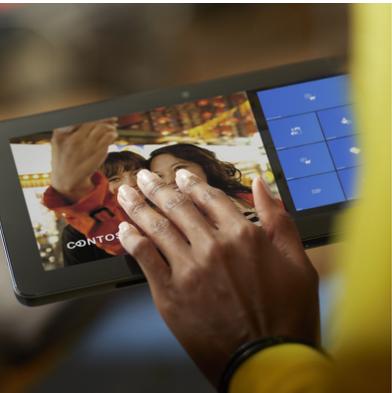
IoT is at an interesting inflection point—it's been around for a long time and been called a lot of different things. But there are a number of things currently intensifying its trajectory.





Hardware is cheap

As chips get smaller and cheaper, and their energy footprint decreases dramatically, new landscapes for invention and growth emerge. Moore's law and Koomey's law are truer than ever: today it is both technologically possible and economically worthwhile to connect even the simplest of things and reap the benefits.



Connectivity is pervasive

IoT is all about connections, from individual, low-power sensors to complex, automated systems. As public broadband continues to grow in availability, the cost of connecting different devices is going down—and fast. The inherent connectivity of Windows 10 IoT for device-to-device, sensor-to-device, and device-to-cloud make it an ideal platform for smart, connected devices as part of an overall IoT solution. And as characterized by Metcalfe's law, the more connected things, the more value. According to investment firm Goldman Sachs, the cost of bandwidth is 40 times less, and the cost of processing is 60 times less than 10 years ago.²



Benefits fuel demand

Companies are realizing that there is huge value in small improvements. Small IoT efficiencies can bring big savings. General Electric believes using IoT to make oil and gas exploration and development just 1 percent more efficient would save the company \$90 billion.³ A recent study by DHL and Cisco states that employee productivity improvements associated with IoT could drive savings of \$1.2 trillion.⁴

Development is easy

It's quite easy if you let IoT development platforms do all the heavy lifting. The good news is that IoT app development is easier than you may imagine, thanks to ready-to-use IoT platforms like Windows 10 IoT and Azure IoT preconfigured solutions that accelerate IoT deployments.



Moore's Law

Processing power for computers doubles every two years.

Koomey's Law

The amount of electrical power needed to run an electronic device is cut in half every 18 months.

Metcalfe's Law

Networks become more valuable the more people use them. The more things we connect, the more value the network (that is, the Internet) provides.

Just as the Internet vastly improved our ability to use computing power by increasing connectivity between our systems, IoT connects these myriad devices to the Internet, giving people the power to build better lives and allowing organizations to transform the way they do business.



New, innovative scenarios are possible

Fueled by inexpensive hardware and fast development as well as readily accessible data, concepts that once seemed plausible only in sci-fi movies are possible now. Windows 10 IoT will drive the next wave of device innovation that is pushing devices past the traditional boundaries of design to create new capabilities. From powering new mobile devices for real-time access, to developing innovative devices that hang on the wall and stimulate collaboration, to incorporating holographic interfaces that inspire fresh ways to create, learn, and visualize, the possibilities are endless.

By integrating cloud technology and the Microsoft Azure platform, enterprises can have immediate, anywhere, anytime access to a wealth of operational data, enabling them to use data in new ways to respond more quickly and compete more effectively. While consumer devices currently garner a lot of attention, according to McKinsey & Company, the biggest market opportunity will be in the B2B arena with users reaping 70 percent of the economic value IoT creates.⁵

No longer hindered by chip or energy costs, device manufacturers can explore new, innovative ideas to bring smart, connected devices to market and drive value in ways we couldn't even comprehend five years ago. These devices are reducing production costs, improving efficiencies, and opening up new landscapes that change everyday work.

Welcome to the era of virtually endless opportunity.

from billions to trillions

IoT isn't coming—
the device revolution is already here.

In 2008,

there were already more “things”
connected to the Internet than people.⁶

Gartner predicts

25 billion

connected “things” will be in use by 2020.

Building IoT devices and applications is
where the market is headed. IDC predicts
it will grow to an estimated

\$1.7 trillion

 in 2020.

70%

of value enabled by IoT will come from B2B
scenarios according to McKinsey & Company.

**Smart, connected devices
are reshaping the industry.**



The impact of IoT devices in healthcare



Calories burned. Steps walked. Hours slept.

Wearables and personal tracking devices are flooding the consumer market and driving a digital revolution.

The ubiquity of cheap technology and a never-ending list of apps allow people to track, monitor, and share the minutia of their lives like never before. It should come as no surprise, then, that consumers are expecting this same kind of access to information in other facets of their lives too, but especially when it comes to their healthcare.

Globally, healthcare facilities are spending millions of dollars on health IT systems digitizing patient information and automating clinical workflows. But that's just scratching the surface of what's possible. From clinical analysis to electronic health records to medical imaging and asset tracking, nearly every aspect of a health organization can benefit from smart, connected devices and cloud technology. In fact, the move to patient-centered networks that use devices to connect home, workplace, community, and the mobile spaces in between is one of the most promising areas of innovation and transformation in healthcare today—and it's driving the exponential growth of the digital healthcare universe.

Enter the Internet of Things (IoT) and a wave of next-generation devices that are helping reimagine the possibilities and create meaning from the resulting data surge. From patient wearables to diagnostic and imaging devices to complex surgical equipment, intelligent devices are connecting to each other and to other systems to build a truly connected infrastructure.

IoT has the potential to change the health, safety, and productivity of billions of people, improving outcomes and delivering significant economic impact. In fact, increasing medical device interoperability could **save the healthcare industry \$30 billion annually** by reducing drug errors and missed diagnoses according to the West Health Institute.⁷

US healthcare spending is expected to reach
\$4.8 trillion in 2021.

To control spiraling healthcare costs related to managing patients with chronic conditions, **70%** of healthcare organizations worldwide will invest in consumer-facing mobile applications, wearables, remote health monitoring, and virtual care by 2018.⁸

By 2020, **80%** of healthcare data will pass through the cloud at some point in its lifetime, as providers seek to use cloud-based technologies and infrastructure for data collection, aggregation, analytics, and decision-making.⁹

In 2025, remote monitoring could create as much as **\$1.1 trillion** a year in value by improving the health of chronic-disease patients.¹⁰

By the year 2025 the Internet of Things foray into healthcare is estimated to rise in total economic impact from **\$170 billion** to **\$1.6 trillion.**¹¹

The device maker's guide to a smart start

Smart objects give industries like healthcare the vital data it needs to track inventory, manage patient information, increase efficiency, and improve the patient experience, thereby saving costs and even saving lives. By 2025, the total global worth of IoT technology could be \$6.2 trillion—with \$2.5 trillion of that value from devices in healthcare.¹² As a device maker, where do you start?

The IoT market will grow so fast that you'll benefit most by thinking first about your long-term strategy. If you focus solely on making embedded devices for current and emerging needs, you're limiting your potential.



What to do



Ask questions.

*Harvard Business Review*¹³ says there are 10 strategic decisions device manufacturers need to make when developing a strategy. These include questions like “Which capabilities and features should we pursue?” and “What functionality should be in the device and what should be handled by the cloud?” and “What data do we need to capture?”



Evaluate the gaps in the healthcare market.

This is where you just let your mind consider the formerly impossible and imagine the possible. We all experience patient care in one way or another. Where are the bottlenecks in service? Where do you experience the greatest frustration? What information or resources do you wish you had access to? Then determine how a next-generation device could help solve for it or improve it.



Consider the cloud.

Determine how to incorporate cloud services, data analytics, and other apps with your devices to make inroads in the digital healthcare universe.

The results of your exploration will likely trigger changes in your business model, as well. In short, just as the next generation of devices is poised to transform the healthcare industry, developing devices has the power to transform your business. Mapping your plan is the first step. The next step is to determine the “how.”

How to get started

The **Windows 10 IoT** editions are designed specifically for a broad range of intelligent devices, from small industrial gateways to more complex devices such as portable CAT-scan machines and surgical robots. Windows 10 IoT brings the power of Windows to your devices and makes it easy to deliver richer experiences such as familiar user interfaces and enterprise-grade flexibility and security.

Connect your devices to the cloud with **Microsoft Azure IoT** services and you can help health organizations capture and analyze untapped data and put the focus back on patient care.

By building innovative, cloud-based devices that health professionals and patients can easily use from virtually anywhere, you can help transform mobility, provide health analytics for everyone, reimagine productivity, and take advantage of cloud innovation.

To learn more contact your Microsoft representative.

Smart, connected devices can help put the "health" back in healthcare.

Building IoT devices and applications is where the market is headed—that's an estimated \$1.7 trillion market by 2020 with an economic impact of \$170 billion to \$1.6 trillion for human health by 2025. Imagine the components and devices you can build to change the way healthcare systems work and enable you to grab a share of that opportunity.

Source: "Unlocking the Power of the Internet of Things." McKinsey.

Beacons enable hospital administrators to track and guide patients through the hospital and provide such information as emergency room wait times and customized health information via mobile devices or smart monitors to help improve the patient experience.

Expanded access to data can improve collaboration between providers.

Smart sensor devices send alerts for systems or specific machines in danger of failing, ensuring the intelligent healthcare system is never down.

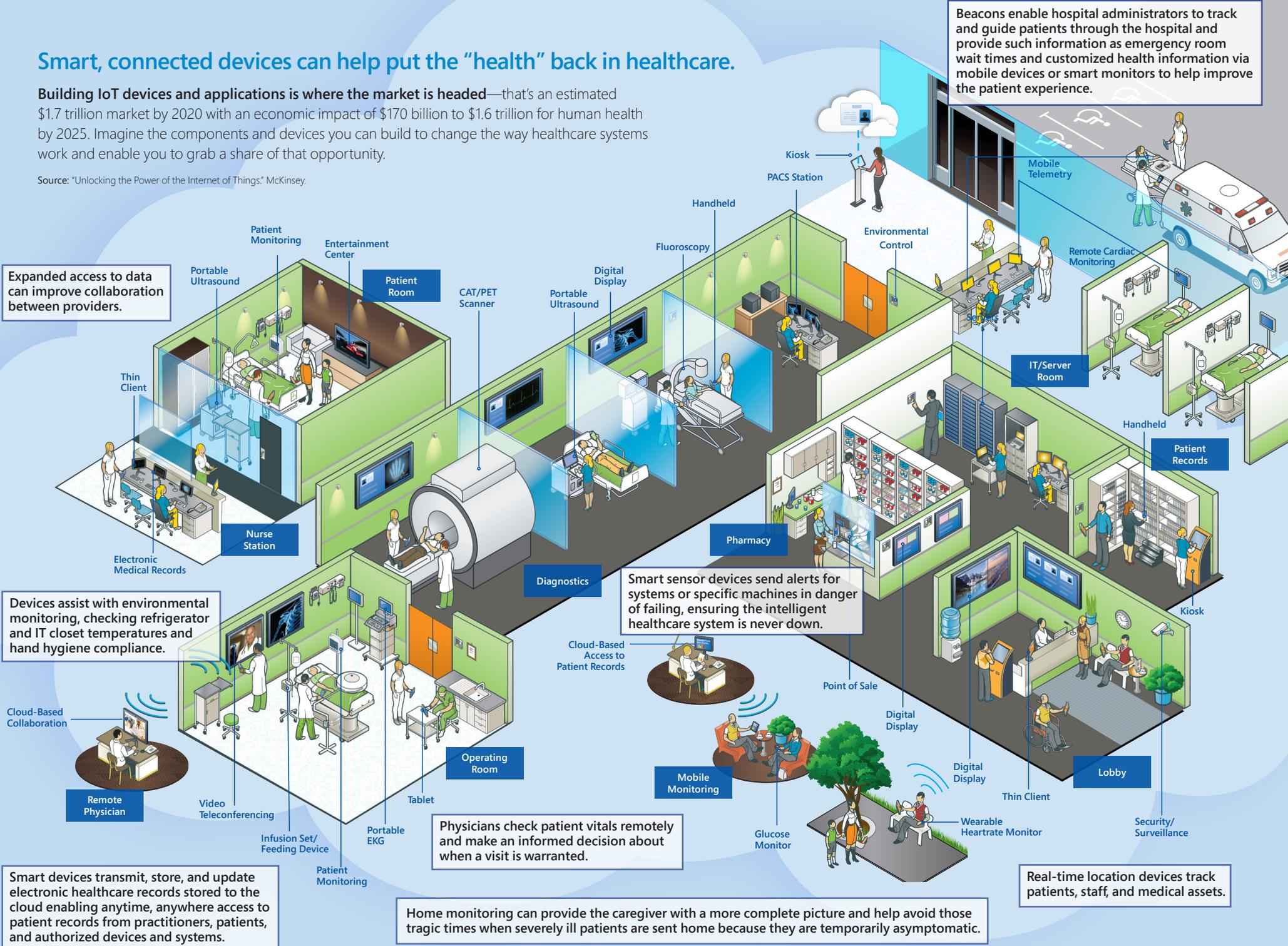
Devices assist with environmental monitoring, checking refrigerator and IT closet temperatures and hand hygiene compliance.

Physicians check patient vitals remotely and make an informed decision about when a visit is warranted.

Smart devices transmit, store, and update electronic healthcare records stored to the cloud enabling anytime, anywhere access to patient records from practitioners, patients, and authorized devices and systems.

Home monitoring can provide the caregiver with a more complete picture and help avoid those tragic times when severely ill patients are sent home because they are temporarily asymptomatic.

Real-time location devices track patients, staff, and medical assets.





Take part in the healthcare revolution

Smart, connected devices and IoT promise a future for healthcare that is more personalized and more rapid than ever before. The devices you imagine and build can transform the healthcare industry as you know it today, enabling new business models and moving the dial from volume to value-based care. For billions of people—especially where access to medical care is more limited—devices such as a mobile ultrasound ecosystem have the potential to connect patients with first-world medicine and technology that is literally in the palm of their hands. Next-generation mobile devices have the potential to deliver real-time access to medical care through the power of the cloud.

With Windows 10 IoT, one common platform, and the Microsoft Azure platform for capturing and analyzing previously untapped data, your ability to impact the healthcare industry is bound only by your imagination. Grab your share of this exploding market by building devices that:

- Empower clinicians to work more efficiently and provide better care wherever they and their patients are.
- Facilitate patients to better manage chronic diseases and conditions with wearables and mobile testing and reporting devices that use cloud technology.
- Reimagine innovative healthcare devices like hospital-grade chemotherapy dispensing stations, cardio-monitoring stations, portable heart monitors and defibrillators, ECGs, and ultrasounds for mobile and home use.
- Enable patients to capture their health data with mobile medical applications or wearable devices.
- Equip hospitals to keep tabs on the location of medical devices, personnel, and patients.
- Provide real-time access to electronic health records (EHRs) and patient data for remote provider/patient consultations.
- Pull together unstructured and structured data—from EHR and medical imaging systems to handwritten notes and social media to smart medical devices and simple sensors—and marry diverse data types in ways never before possible.

Use cases of the Internet of Things in healthcare not only save costs, they also save lives, and we're just getting started. Join Microsoft on this amazing, exciting journey and put the Internet of Things to work in healthcare today.

**For more information on the benefits of Windows 10 IoT devices visit:
InnovateOnWindows10IoT.com**

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How you approach IoT device development is up to you

Device manufacturing is undergoing unprecedented transformation—moving from technology hype to great business hope. You have the power and the tools to build IoT devices that can help you act now to capture your share of the exploding IoT market, but you first need to take a closer look at your strategy.

Physical, smart, and connected components all play a part in shaping smart, connected products. How you pull the elements together to deliver your next-generation devices depends on what's best for your business. Based on *Harvard Business Review's* "10 strategic decisions for OEMs," we've identified four tactical approaches you can consider to transform your business model.





Build

- Components for the IoT devices.
- Embedded devices that transform enterprises' business.
- IoT tools that offer monitoring, control, optimization, and autonomy.
- Connected devices that plug into the existing enterprise infrastructure and harness the power of IoT.

Borrow

- Existing platforms and use Windows 10 IoT, one common platform, to connect and amplify the impact of your components and devices.
- Software to personalize components and devices for end users.
- Partner capabilities and offerings to extend your solution suite.

Blur

- The distinction between devices and services by building devices that use cloud technology to empower a mobile workforce.
- Maintenance requirements, with devices that can predict environmental and product changes and signal the need for proactive maintenance.
- The traditional definition of product performance, with continuously updating and optimizing devices.
- Traditional device sales to include ongoing technology evolution without changing hardware, DaaS, and other ongoing revenue streams.

Blend

- Interoperable, intelligent components, configuring them seamlessly into next-generation devices.
- Autonomous and "dumb" devices that work in perfect harmony.
- Customer knowledge and device data to place strategic bets on new innovations.
- Products and product clouds for greater control and personalization.
- Partner relationships in new ways to serve enterprise needs for data-optimized processes and interconnected infrastructures.

Source: Harvard Business Review¹⁴

Why Windows 10 IoT?

So how can Windows 10 IoT help you capture your share of the exploding IoT market?



Streamline processes with one common platform

Using Windows 10 IoT, one common platform enables you to:

- Use one universal app platform, one security model, and one development and management approach to develop next-generation components and devices.
- Build and deploy apps using the same tools and code for PCs, phones, and other industry devices.
- Use device data and Microsoft Azure insights to acquire enterprise-wide transparency into your sales and operations, from a global to an individual product line.
- Access a steady cadence of innovations, with 10 years of support.



Benefit from enterprise-grade security

As connected devices proliferate, security will become an even greater concern to enterprise CIOs and CTOs. You can use Windows 10 IoT to offer:

- Strong security controls that protect devices from unauthorized access or app downloads.
- Security-hardened devices with advanced lockdown capabilities, ensuring devices are only used for their intended purpose.
- Devices with two-factor identification and data encryption to enhance user and information security.
- Ongoing security updates to meet the latest generation of threats.



Improve organizational productivity

Devices built on Windows 10 IoT increase your productivity. You can:

- Use a single development, deployment, and management approach to increase your organization's efficiency.
- Enable your developers to use their existing skill sets, reducing training and learning time for new employees, and improve image design time.
- Develop an app once and deploy it across a variety of device types and form factors.



Harness the world of IoT connectivity

With Windows 10 IoT devices and components, you can move beyond the product sale and embed yourself in your customers' businesses. You can:

- Use the most appropriate Windows 10 IoT edition to develop your connected device, from simple gateways to complex industry devices.
- Connect your next-generation devices and customers' legacy assets with Windows 10 IoT.
- Enable your customers to tap into the power of Microsoft Azure services and access real-time data and visualization tools they can use to drive performance.
- Empower the enterprise to use preconfigured solutions for common IoT scenarios to accelerate time to value.
- Deliver device-as-a-service (DaaS) offerings with device telemetry, configuration and updates, preventive maintenance, supplies, and access to Microsoft productivity solutions.

There's a Windows 10 IoT edition that's right for your strategy

Windows 10 IoT editions were designed for a wide range of smart, connected devices, from small industrial gateways to larger, more complex devices like point-of-sales terminals and ATMs. Build on Windows 10 IoT and experience the expanded opportunities that come from harnessing the full breadth of Microsoft technologies. And with Microsoft Azure IoT Suite, you can capture and analyze untapped data to help transform business.

Windows 10 IoT Core

provides a great platform to build your small-footprint and low-cost industry devices with the enterprise-grade security, management, and servicing similar to the rest of the Windows 10 editions.

Windows 10 IoT Mobile Enterprise

brings the capabilities of Windows 10 Mobile Enterprise to line-of-business mobile devices that are looking for a natural user experience with enterprise-grade security and manageability. Instantaneous application access, native support for bar-code scanning, and other peripherals as well as a security-hardened device experience enhance productivity for a variety of mobile scenarios.

Windows 10 IoT Enterprise

brings the capabilities of Windows 10 Enterprise to a wide range of industry devices across retail, manufacturing, healthcare, finance, and other industries. Windows 10 IoT Enterprise devices run powerful line-of-business applications and perform a specialized function in a security-enhanced, reliable, and streamlined way to support mission-critical industry devices.

Microsoft Azure IoT Suite

is a collection of integrated cloud services—analytics, computing, database, mobile, networking, storage, and web—that help you connect line-of-business assets and acquire, store, and convert different data types into powerful intelligence. Use preconfigured solutions for common IoT scenarios to start quickly, add your devices, and begin tailoring Azure to your needs.

Some see devices and data. We see opportunity.

Whether you mark the birth of IoT at the creation of the ATM or on the day tech pioneer Kevin Ashton first uttered the phrase, the Internet of Things is here. It's real. And it's up to you to decide to make history or watch it happen.

Remember, it's not the Internet itself that makes IoT transformational, it's the next-generation things—the devices that you make, now bound only by your imagination. You have the platform and tools to reinvent your business. You have the potential to change how factories, stores, and healthcare organizations work. And you can reap the benefits.



Your amazing ideas + Windows 10 IoT = endless opportunity.

Get building

Get started with Windows 10 IoT. Visit us at www.InnovateOnWindows10IoT.com and start building today.

¹ <http://www.gartner.com/technology/research/methodologies/hype-cycle.jsp>

² <http://www.goldmansachs.com/our-thinking/pages/iot-infographic.html>

³ http://www.ge.com/docs/chapters/Industrial_Internet.pdf

⁴ http://www.dhl.com/en/about_us/logistics_insights/dhl_trend_research/internet_of_things.html#VqXFKPrLIU

⁵ Johannes Deichmann, Matthias Roggendorf, and Dominik Wee, "Preparing IT Systems and Organizations for the Internet of Things," McKinsey, http://www.mckinsey.com/insights/high_tech_telecoms_internet/preparing_it_systems_and_organizations_for_the_internet_of_things.

⁶ <http://www.fool.com/investing/general/2015/02/06/17-internet-of-things-statistics-you-dont-know.aspx>

⁷ <http://www.westhealth.org/projects/the-value-of-medical-device-interoperability-improving-patient-care-with-more-than-30-billion-in-annual-health-care-savings/>

⁸ <http://www.idc.com/getdoc.jsp?containerId=prUS25262514>

⁹ <http://www.idc.com/getdoc.jsp?containerId=prUS25262514>

¹⁰ http://www.mckinsey.com/insights/business_technology/the_internet_of_things_the_value_of_digitizing_the_physical_world

¹¹ http://xenonhealth.com/the-effect-of-internet-of-things-on-healthcare-technology/#_edn6

¹² McKinsey Global Institute

¹³ <https://hbr.org/2015/10/how-smart-connected-products-are-transforming-companies>

¹⁴ <https://hbr.org/2014/11/how-smart-connected-products-are-transforming-competition>