



What you need to know about IoT platforms

How platforms stack up in IoT



30
billion

devices connected to
the internet by 2020.¹



96%

of enterprises consider
IoT important to help
monitor and control their
physical assets.³



IoT success
depends on
assembling the right
pieces on a flexible
foundation that
can support short- and
long-term growth.



67%

of developers
are currently
developing IoT apps
and solutions.²

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“Building on the right platform enables developers to rapidly create, connect, and deploy IoT solutions. The right IoT platform is solid, scalable, and adaptable, and can be enhanced over time.”

— MIKE TROIANO, VICE PRESIDENT OF PRODUCT MANAGEMENT,
INTERNET OF THINGS, AT&T

An IoT platform is a suite of software components that enables connection and information exchange between IoT devices and IoT applications.

We’re operating in a time when virtually anything can be connected to the internet. From smart city infrastructure and autonomous driving to near real-time management of assets in agriculture, manufacturing, logistics, and more, the possibilities are endless. That’s why you need to build your success on the right IoT platform, so that you can expand your IoT solution with flexibility, choice, and the confidence to connect virtually anything your business needs.

Inside this report, you will not only learn more about how IoT solutions can impact your business, but you’ll discover why building IoT applications on the right platform is the key to success. To future-proof your investments, you’ll not only need to think about the strength of your platform, but scalability and speed-to-market as well. We can help you start building your IoT future today.





The platform
makes the
difference

Why platforms count



IoT is not a single technology. It is a combination of sensors, devices, networks, and software that works together to unlock valuable, actionable data from the Internet of Things. What brings these pieces together is the IoT platform, and choosing the right platform for your business is vital to the success of your solutions – now, and in the future.

Technology is revolutionizing life as we know it. And it's not slowing down

The Internet of Things is rapidly advancing a world in which businesses increasingly need machines to be “smart.” Equipped with sensors, near real-time communications, and analytical capabilities, businesses can use IoT technology to help them sense and adapt to rapid, competitive change.

85%

of global organizations are considering an IoT strategy.⁴

The Internet of Things (IoT) is helping power new revenue streams, eliminating costly waste and creating a competitive advantage for smart businesses.⁴

#1

Efficiency is the number one reason companies are looking to deploy IoT solutions.⁶

Achieving peak efficiency

A recent survey with International Data Corporation (IDC) and AT&T reveals that 96% of global businesses consider IoT important to better monitor and control physical assets.⁵ IDC research also reveals the number one reason why businesses are pursuing IoT: to increase their efficiencies.⁶ Perhaps the most important strategic decision a business will make during their planning will be choosing an IoT platform, because it's the enabler to managing virtually any combination of connected devices. Having flexibility in your platform is key, because improving efficiency is not likely to be achieved by managing only one machine type or process variable.

Millions of devices, and counting

AT&T has connected more than 30 million IoT devices to our network, which spans more than 200 countries and territories. A platform to manage such high device volumes, diversity, and geographies should also have flexibility and scale. This allows businesses to enhance IoT solutions over time without worrying about platform limitations when new devices come along. Flexibility allows businesses to experiment and scale their solutions using multiple devices, network types, applications, APIs, and cloud environments without redesigning the core IoT platform every time a change occurs or as technology evolves.

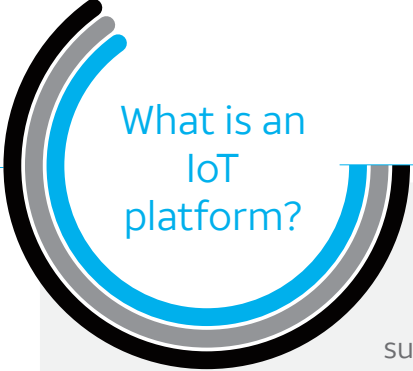
30 million

connected IoT devices on the AT&T network, which spans 200 countries and territories.

IoT – A look inside

The IoT tech stack

The IoT technology stack consists of multiple layers, including device hardware, connectivity, data management, applications, analytics, and security. IoT platforms facilitate and orchestrate key interactions between each of these layers as well as with other back-end systems in a business. Unlike other technologies that revolve around one predominant architecture, device type, or connection method, IoT is at its core an assembly of disparate technologies. A connected machine does not become “smart” from a single sensor, or modem, or network, or application alone. It is a combination of all of these pieces coming together that creates added intelligence.



What is an IoT platform?

The IoT platform is at the heart of the IoT technology stack. It is a suite of software components that enables connection and information exchange between heterogeneous IoT devices and IoT applications.

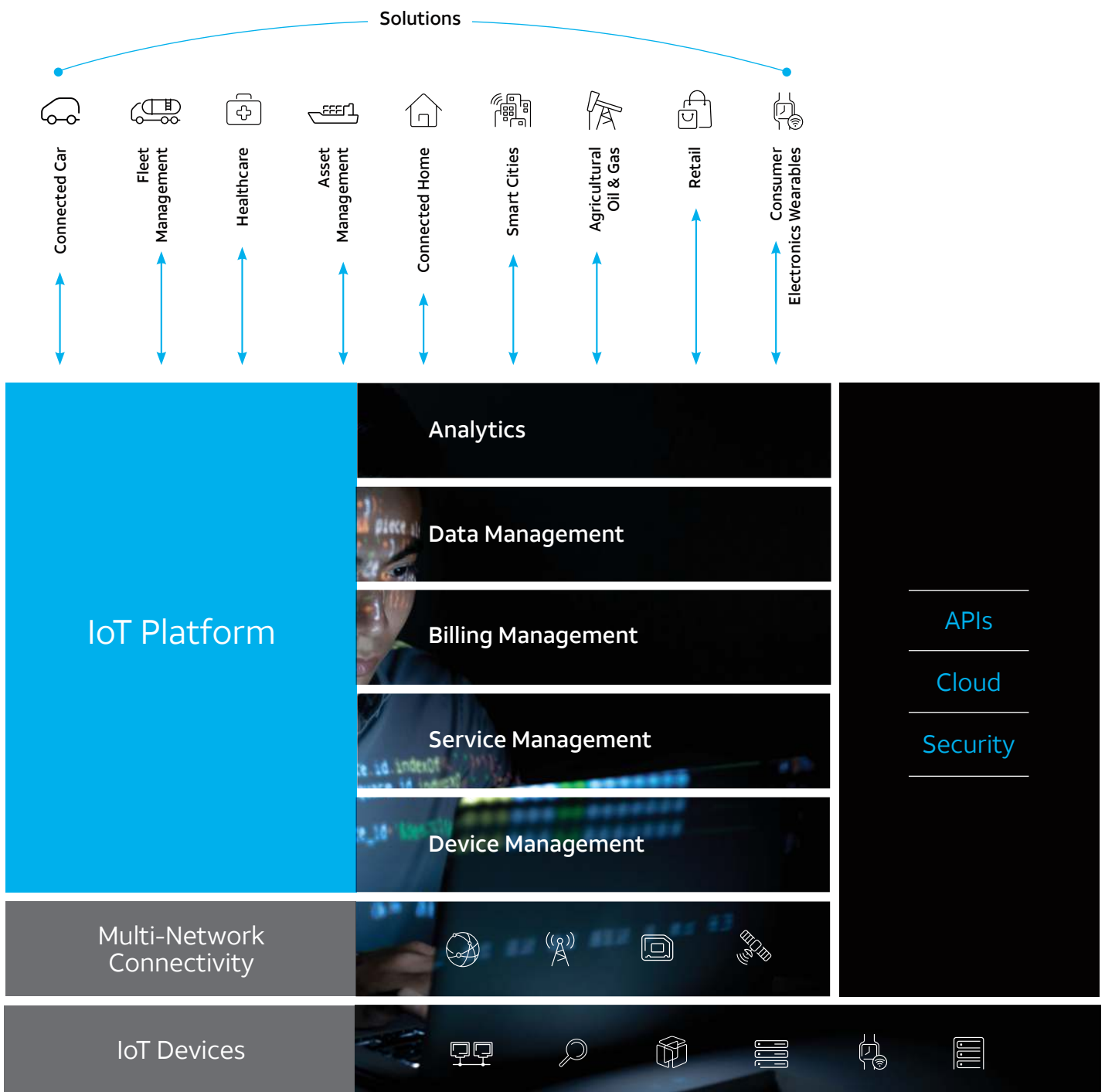
IoT platforms are sometimes referred to as “middleware,” which underlines their functional role as that of a mediator between the hardware and application layers. A robust IoT platform will be capable of integration with almost any IoT device and blend in with the applications used by the device.

In this report, to further explain and define the role of the IoT platform, we will provide more detail on the following:

- IoT networks and multi-network connectivity
- IoT service management
- IoT data management and app enablement
- Analytics
- Security

Elements of a robust IoT platform

A platform will orchestrate many of the fundamental aspects that go into making an IoT solution work. These include determining how a particular endpoint connects to a network, how and where data is collected, and finally, how that data can be used to drive business value. The platform will also work alongside and facilitate interactions with corporate security mechanisms and analytics, which reside outside of the platform itself.



IoT networks and multi-network connectivity

Today, there are many network technology options to connect IoT devices. Your best network choice will depend on how and where it will be used, as well as the type of service level required. For this reason, a comprehensive IoT platform should provide connectivity support across all major IoT network types to offer the greatest flexibility for current and future projects. Here's a snapshot of IoT network options:

A platform that supports multi-network connectivity helps you stay ahead of the future.



• Broadband cellular



• LTE-M



• Short range



• Satellite



• Global wireline

IoT service management

The Internet of Things can help you gain valuable insights to better manage your business, improve efficiency, and optimize operations. To keep IoT solutions working for you, it's important that you not only manage the data, but also your IoT network. IoT platforms should provide you with access to user-controlled software tools to manage the devices and connections that are part of an IoT solution. Convenient, on-demand service management functionality enables you to take control of your IoT network, allowing you to add, move, remove, or change your IoT device reporting functions.

Broadband cellular, 3G and 4G LTE connectivity, and soon 5G, play a major role in IoT device proliferation, supporting a full range of applications from low bandwidth exception-based reporting to those with high bandwidth needs.

LTE-M networks are new on the horizon and intended for IoT solutions that need low power consumption, extended battery life for up to 10 years, and good penetration in buildings and underground.

Satellite networks can be categorized as providing coverage into some of the most remote locations where customers have critical infrastructure and equipment. There are two primary types of satellite-connected devices: satellite-only, and dual-mode cellular and satellite.

Short-range networks for IoT include Bluetooth*, ZigBee*, and Wi-Fi technologies, among others.

Global wireline networks can work together with wireless networks, enabling hybrid networking, and provide additional high bandwidth capabilities and secure operation.

Provision, activate, and de-activate connections

Set and manage roaming restrictions and data limits

Automate rules and notifications

Change data plans

Perform connectivity diagnostics and more



Your IoT platform should include convenient tools to help you manage IoT devices and connections.

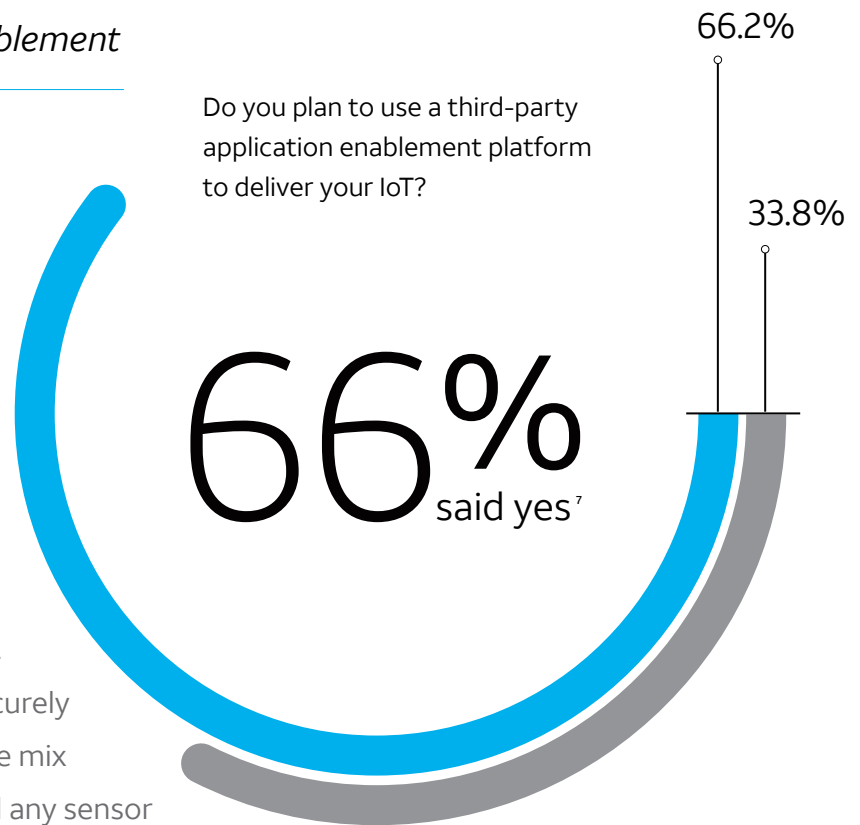
IoT data management and app enablement

Orchestrating data

Most IoT solutions leverage a variety of sensors that can generate a high volume of data over time, such as location, condition, and status. The data is collected and stored as data streams. Each data point is usually small; however, the amount of data collected can amass quickly, depending on the reporting frequency of IoT devices.

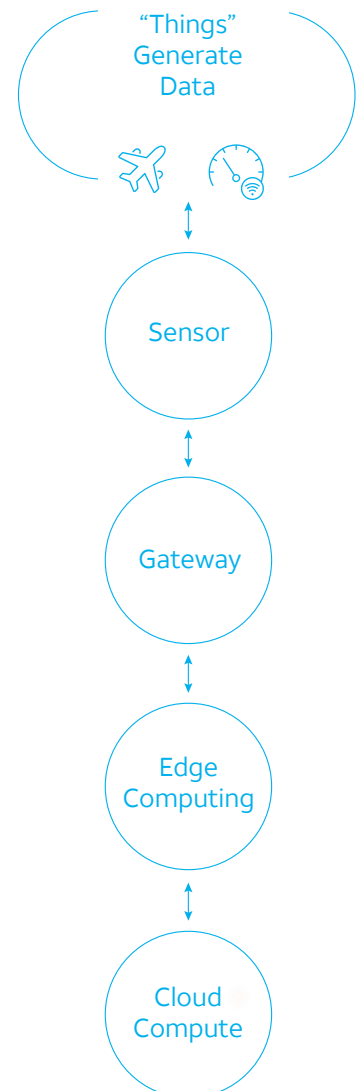
An IoT platform provides the ability to securely store and normalize data from this diverse mix of IoT endpoints – virtually any device and any sensor reading. It can receive streams of data coming in from multiple devices and break them down, so that the data can be easily processed, used, or reacted to by applying commands based on the information received.

Do you plan to use a third-party application enablement platform to deliver your IoT?



Bring your own cloud

One of the key capabilities of an IoT platform is the ability to orchestrate the movement of data between devices and various cloud environments. A flexible and “open” platform will make it easy to do this with any type and combination of cloud environments, be they private, public, or hybrid. Many of the leading cloud environments have now begun to integrate with IoT platforms. AT&T Flow Designer now includes a library of built-in nodes for AWS, Microsoft Azure, and IBM Watson. By pre-integrating third-party cloud support, end users get significantly faster development times, and take advantage of the tremendous elasticity and geographic distribution of the top cloud environments.



Analytics

The ultimate goal of data gathering is to fuel better business outcomes through increased visibility



and insight. An IoT platform should facilitate a full complement of data analytics capabilities that can extract value and keep businesses from drowning

in a torrent of new information that might be poorly coordinated.

This will include analytics built into the IoT platform, as well as the ability to leverage specialized third-party analytics software via secure API and services.

10%

A recent study by IDC estimates that by 2020, 10% of the world's data will be produced by edge devices.

Edge computing

Flexibility in platforms also means accounting for technology trends that will continue for many years to come, including the rise of “edge” computing. As IoT-connected devices and sensors proliferate within an enterprise, managing, sifting through, and analyzing so much data can be a massive challenge. In an edge computing model, sensors and connected devices transmit data to a nearby edge computing device, such as a gateway device (a networking device like a switch or router) that processes or analyzes the data, instead of sending it back to the cloud or to a remote data center.

By shifting intelligence from a core centralized cloud to a gateway at the edge of an organization's network, near real-time decisions can be made closer to where they need to occur. This model reduces the impact on the network by having data crunching and analytics move closer to the edge, with smaller data streams being forwarded to the cloud. Edge computing can also help solve latency challenges and enable companies to take better advantage of opportunities leveraging a cloud computing architecture.

An IoT platform that includes tools to push data processing and independent applications to run at the edge of a solution is important to planning ahead.



Edge computing lets this refrigerator send data to the cloud only when it needs to.

Security with multiple layers

Security is a major concern for any business in IoT. Following core security principles and practices will reduce the risks and maximize the benefits of leveraging new types of connected devices. Here are six of the most important IoT security considerations:⁸

- 1 Adopt a risk-driven approach. Understand the risk matrix of your devices, then apply security controls appropriate to the level of risk involved.
- 2 Assess IoT device security characteristics. From the simple to the complex, ensure every connected device meets certain security requirements.
- 3 Look beyond IoT device security. With many levels and types of communications networks within different IoT solutions, look beyond the device for any security risks, including applications that drive those solutions.
- 4 Where possible, extend existing security solutions. With the increase in connected endpoints, IoT-based data may strain the capacities of existing systems, and new types of controls may be required for unique types of IoT risks.
- 5 Consider the entire IoT ecosystem. Evaluate the security capabilities and responsibilities of your IoT product and services vendors. Establish clear lines of accountability and, in worst-case scenarios, liability.
- 6 Automate security, where possible. With increases in connected endpoints and devices, IoT deployments are driving the need for increased automation in data monitoring, threat identification, and other facets of security.

While the majority of companies are taking measures to secure their data, customer trust is hard to achieve.

Key issues manufacturers face in gaining customer permission to collect data from connected products:



My company is taking measures to secure data collected through its connected products.



Download

To get the latest AT&T Cyber Security Insights Report, visit att.com/security

“Each little device out there may not represent a significant threat, but when you put millions of them together, the nit becomes a really significant issue. It’s death by a thousand needles.”

– BRIAN REXROAD, AT&T SECURITY MARKETING

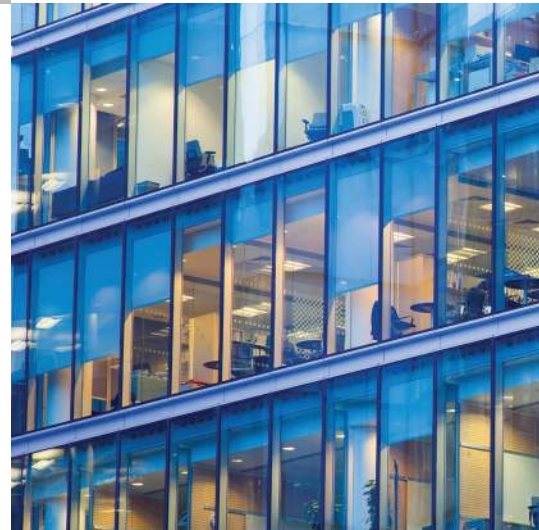


Business
Process



Organization
Design

Start smart



IT Infrastructure

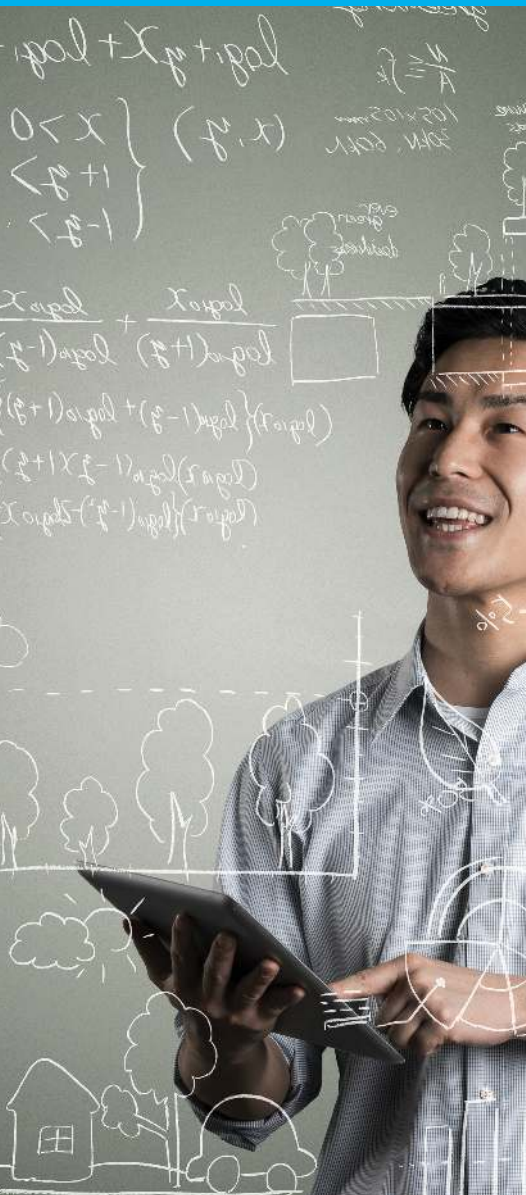
At the onset of an IoT project, implementing solutions may be difficult for businesses of any size. One challenge is balancing the speed of prototyping solutions with the more deliberate pace required for proper long-term resource planning. A robust IoT platform can help bridge these dual requirements by allowing businesses to start projects quickly, with the confidence that they will be able to effectively scale when ready. Having the right developer talent in place and utilizing rapid prototyping tools can also help businesses move forward efficiently.



Culture of
innovation



Developer
Talent



Rapid prototyping

With the increased demand for developer talent, organizations need access to rapid prototyping products and platforms. Rapid prototyping is an ideal way to prove ideas, from concept to product realization. Before electronic boards for prototyping were available, creating new hardware was expensive and accessible only to a select few. Now, with online orders and a wide variety of learning tools and other developer sources, it's never been easier to bring the culture of innovation into your organization.

The AT&T IoT Starter Kit

The AT&T IoT Starter Kit comes with everything you need to easily start and connect your next IoT project. The kit includes tools and services to help your company build, deploy, manage, and connect on the AT&T nationwide LTE cellular network. The IoT Starter Kit offers out-of-the-box compatibility with AT&T M2X Data Service, AT&T Flow Designer, Microsoft Azure,* and IBM Bluemix.* With the SIM and hardware kit, you also receive both an LTE module and an extensible developer board to connect sensors and other computing hardware.



*Trademarks are the property of their respective owners.

The right IoT platform

When assessing IoT platforms, decision-makers may quickly learn that available options may lack a comprehensive set of services and capabilities for large-scale IoT management.

One way to reduce your risk is by conducting a thorough review of the current technology against your needs today, plus thinking toward the future to anticipate what you may grow into as your solution needs change.

For long-term success, organizations need a provider that can help design an IoT system that is scalable, flexible, and highly secure.

We recommend looking at six critical factors when selecting your IoT platform provider.

The platform should provide:

A **track record** that gives confidence the platform provider will have long-term staying power

An **ecosystem** of best-of-breed partners and service providers

A **global footprint**, so projects can easily grow from local to global

Multi-network solution development and management capabilities

The ability to **adapt and scale** to solve specific business challenges

Support for multiple private, public, and **hybrid cloud environments**

6

critical questions
to ask when
evaluating IoT
platforms





Is it proven?



Is it supported by a broad ecosystem of hardware and software providers?



Is it global?



Can it work across multiple networks simultaneously?



Is it flexible, scalable, and highly secure?



Does it support multiple cloud and computing environments?

Developer Stories



To watch how Grindbit and Saritasa utilize IoT technology, visit att.com/IoT

Identify internal developer talent

Engaging IT groups at the genesis of IoT projects will help your business future-proof your plan from day one. It will also be a way to tap into internal developer talent. Since IoT spans across many technologies, it is important to consider both the developer resources that reside within your organization and the external developer community. Both groups can be used to help create applications and functionality that extend the value and reach of your IoT investment. As more businesses embrace an open development construct, IoT platforms need to support a variety of programming approaches that match developer preferences.



Tips and Tricks

Code it your way

Which approach do you use most often for application development?

Native language

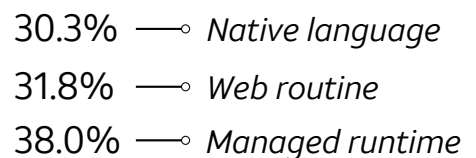
(e.g., C/C++, QtC++, Objective-C)*

Web runtime

(e.g., HTML5, JavaScript, CSS)*

Managed runtime

(e.g., Java, C#, Python, Adobe AIR, Silverlight)*



*Trademarks are the property of their respective owners.

Flexibility for the future



Be prepared
for multiples

Multi-network connectivity is not the only multiple in IoT. A flexible platform should support many devices, networks, transport protocols, and cloud environments. Options for each of these functional areas, via “plug-and-play” capabilities with rapid integration and configuration of third-party devices and applications, is critical to achieving flexibility. Such an approach allows a business to confidently embrace new requirements in the future without being hindered by device limitations.

Size and geography: Why scaling matters

Because IoT projects tend to start small and then scale fast once a particular use case is proven valuable, the ability to seamlessly scale in size and geographic reach is necessary to be prepared for high growth.

A robust platform will be able to seamlessly scale from supporting single devices and data points during the prototyping phase to supporting millions and even hundreds of millions during full deployment. Similarly, projects that start off in just one geographic area will often be expanded over time to include all countries where a business’s operations, customers, and supply chains reside.

More than

50%

of developers actively
working on IoT solutions
are thinking globally.¹⁰

GO FOR IoT!

Time to take advantage of today's IoT potential



The possibilities are virtually limitless on what IoT technology can do for your company, and what your company can do with IoT. As your organization looks to invest in IoT development, it is helpful to understand that it will be an iterative process that requires buy-in across your organization, investment in IT infrastructure, and a strategic vision of how IoT can transform your business. For many businesses, success in the IoT marketplace ultimately depends not on your device or app, but on choosing the right IoT platform to support new services for a rapidly evolving marketplace. In the push to create the next great IoT solution, it's not enough to simply connect your devices to the Internet of Things. You need to build on a foundation

that will support the growth of your solutions well into the future.

AT&T has helped companies large and small connect more than 30 million IoT devices to our network, and the number grows every day.

Is your business ready to take advantage of the new potential the Internet of Things delivers? We're here to help bring your IoT solutions to life with the highest levels of innovation, technology, security, and experience.

To get started, or for more information on our complete suite of IoT solutions and services, visit us at att.com/IoT.



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