

IoT Device Management

Buyers' Guide

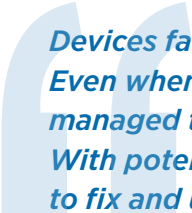
Companies from consumer packaged goods to heavy industry are turning to the Internet of Things (IoT) to become more competitive and enhance operations. More business-critical equipment and assets than ever are connected, presenting an unprecedented opportunity to obtain an incredible amount of information on the health and operation of the machinery that powers your organization.

Accessing this data opens the door to a range of advanced capabilities that can allow your business to boost productivity and safety, stave off expensive unplanned downtime, and extend the life of critical equipment for capital investment savings. One such IoT-enabled capability that's often overlooked is intelligent device lifecycle management.

As connected asset populations increase in size and complexity, the demands of keeping deployments up and running correctly grow exponentially. Necessary tasks that are relatively straightforward when dealing with a handful of devices become daunting and cumbersome at scale. Overcoming these challenges requires scalable, secure IoT device management.

However, choosing an IoT device management solution can be intimidating. Many companies' experience with device management may be limited to IT-run enterprise device management focused on keeping mobile devices, laptops, and tablets secure and up-to-date.

The number of devices is limited to an average of two to three per employee, which doesn't even begin to approach the thousands, or even millions, of connected assets across an enterprise organization.



Devices fail. Their firmware and software need to be updated occasionally. Even when everything is working right, these devices need to be monitored and managed to ensure that they keep working right to prevent system downtime. With potentially hundreds or thousands of devices in a solution, it is not feasible to fix and update devices after they are deployed.

- ABI Research

Industrial equipment directly drives revenues, so ensuring consistent, optimal performance of these devices is critical to a company's viability and success. Generally, operations-focused management solutions are a complex mixture of systems that either suffer from some sort of limitations – often restricted to a specific equipment type or vendor – or feature heavy customization that required years of development and great expense.

Today's IoT solutions offer the ability to interface with all types of machines, management and control systems, and other enterprise programs that can provide context or enhance effectiveness through integration – such as parts, repair, and inventory systems.

Organizations can more easily set up pilot projects to test initiatives and then expand those efforts across the enterprise much more quickly than in the past. Beneficial use cases can be rolled out at a scale that is impossible for legacy systems and human workers to support.

So, where do you start once you've decided to embark on an IoT device management project? The first step is to explore some of the key hurdles you are likely to encounter.

IoT device management challenges

Scalability – Managing the operation and health of a few – or even hundreds – of machines is feasible using existing applications and personnel, but expanding to deployments numbering in the thousands to millions will eventually strain legacy systems.

Costs for additional personnel, network bandwidth, storage, and application development can quickly spiral out of control. Additionally, valuable data is often discarded in an attempt to avoid overwhelming existing systems, essentially defeating the purpose of the solution.

Device diversity – From connected vending machines to oil well pumps, manufacturing robots, and semi-trucks, device deployments can be dizzyingly diverse – featuring an array of different sensor types, communications protocols, connectivity methods, and operating systems.

Device lifecycle management – From initial onboarding and provisioning through decommissioning or retirement, effective lifecycle management can extend the life of expensive equipment and ensure optimal productivity.

During an asset's useful life, it requires configuration; periodic updates of software, firmware, and content; as well as monitoring and diagnosis of potential issues.

The ability to directly control each machine and automate tasks – remotely, across thousands to millions of assets – exceeds the capabilities of legacy systems.

IoT Device Management Solution Checklist

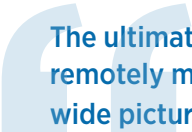
- Scalability
- Support for Diverse Devices
- Remote Control & Monitoring
- Software & Content Management
- Security Capabilities
- Device Grouping & Searching
- Real-time & Historical Data Access
- Edge Computing Capabilities

Grouping and searching – Trying to locate and identify specific equipment or groups of equipment by attribute, model, location, or other variables can be difficult, if not impossible when they operate in isolation or in disparate, disconnected groups.

Security – Operational data constitutes an entirely new business asset. Harnessing this level of device insight can become one of a company's most valuable tools in establishing competitive advantage.

It can also present an equally significant liability if not sufficiently protected. Protecting all devices, and the corresponding data paths, is a vital aspect of guarding against hacking and unsanctioned control.

Device constraints – Many devices are constrained in some way – whether by limited power, processing capabilities, memory, or network bandwidth – making it impractical to rely solely on centralized (cloud- or data center-based) data collection and analysis. Such limitations may make it necessary to perform these functions on or near equipment, at the network edge.



The ultimate objective for any IoT device management system should be the ability to remotely manage all connected assets from a centralized location and access a network-wide picture of the health of all your assets.

Recognizing knowledge limits – Companies can be unaware of, or unwilling to recognize, their strengths and weaknesses. Organizations often embark on a do-it-yourself IoT project without a clear understanding of what's required to achieve success at scale.

Expertise in machine function and operation doesn't necessarily translate into designing the technology that can take machine data and turn it into operational insight.

Lack of IT-OT alignment – One of the biggest hurdles for any IoT project is organizational. It is vitally important that the IT and operational technology (OT) groups work together to avoid duplication of effort and resources.

They can also learn from each other, with IT contributing in-depth security expertise and familiarity with managing heterogeneous device populations (albeit on a small scale), while OT delivers the critical knowledge necessary to keep a company's revenue-generating equipment running.

Operations may be hesitant to tinker with existing systems for fear of upsetting the delicate balance of keeping things running. However, continuing with the status quo can stand in the way of companies achieving the business goals they seek with IoT.

Aligning these two disparate organizations requires a significant cultural and organizational change that must be driven from the top.

What to look for in an IoT device management system

Once your company has made the commitment to a broad-scale IoT device management initiative, there are several elements that will pave the way to success.

Plan for scalability – A system's ability to scale to support thousands or even millions of devices is non-negotiable.

Take the long view and assess how IoT may be able to help your business beyond the functions of device management.



Device management appears to be the technology element of the modern IoT platform where vendors spend the least amount of effort and investment.

-Gartner

Support for myriad devices – The system should be able to communicate with all manner of devices, from remote monitoring equipment with limited power, connectivity, and memory, to factory equipment on a high-speed network connection.

It should support multiple connectivity types, from 4G and LoRaWAN to Wi-Fi and Bluetooth, and be able to ingest a wide range of data formats from numerous operating systems.

Control and management capabilities – Look for direct machine control capabilities that enable automatic monitoring and control of asset status, health, and performance.

This can range from monitoring a fleet of vending machines to track inventory and automatically initiate restocking orders to monitoring operating conditions of a heavy-duty truck to identify a pending failure and route the vehicle to a service center equipped with the necessary parts for immediate service.

Data-driven automation is a core capability that sends rules-based commands to configure or reconfigure machines, power them on and off, modify operation based on external conditions, and other tasks. Reconfiguration of a factory line is a good example, where a production line can be quickly modified to perform a new task with little or no human intervention.

Real-time and historical data – By examining both real-time and historical machine data, you can more easily track the entire lifecycle of each asset, starting with start-up provisioning and moving through its entire history of configurations, software changes, and repairs and maintenance, including timing and actions taken, until the asset is decommissioned. Historical records also make it easier to restore earlier configurations.

Software and content management – Advanced software management capabilities for the wide variety of specialized software, firmware, and content being used across the entire population of assets are important for peak equipment operation.

Over-the-air (OTA) update delivery is a must, and allows you to overcome restrictions of a technician's capacity to manually carry out physical uploads.

Operational Tips for IoT Device Management Success

- Leadership **must** make the value of this effort clear to the company.
- Establish an organization specifically responsible for the IoT project.
- Include stakeholders from across the organization.
- Bring in partners to collaborate with your SMEs to scope and optimize IoT solution.
- Look into commercial off-the-shelf (COTS) solutions to accelerate initiatives.
- Consider a hybrid approach to your solution deployment structure.
- Outsource integration expertise to overcome any technological obstacles.

The IoT system should keep track of what software or firmware each device uses along with versions, types of licenses (perpetual or non-perpetual) and whether licenses have been revoked. It should also be able to notify administrators of any unauthorized access attempts.

Intelligent grouping and searching – The ability to search and filter large numbers of devices by specific characteristics such as type, geolocation, or software version is important. Separating specific segments from the larger population enables enhanced examination and management. By grouping devices in logical ways such as by asset model, attribute, geolocation, or IP subnet range, they can be studied and manipulated as a group.

For example, a construction fleet operator can search for all graders operating in a particular location to help determine if excessively hot weather is causing some to overheat and, if so, which ones.

Strong security – Advanced security capabilities such as role-based user authentication, certificate authentication, HTTPS, and SSL encryption are critical to protect valuable machine data from the point of origin, through the enterprise, and to the cloud.

New devices should be verified before interacting with the system, and you should be able to segregate assets into subnets for monitoring and analysis.



84% of organizations have experienced an IoT-related security breach.

- Making Sense of IoT

It's important to bring in security experts at the outset of scoping the project. Incorporating their guidance from the beginning will help you better develop security best practices and determine what data should be shared with whom.

Also consider the relative merits of cloud-based deployments. While organizations may hesitate to embrace a cloud-based approach due to lack of familiarity and greater perceived risk, today's IoT cloud providers generally have exponentially greater security staffing and technology resources than most enterprises.

Overcome constraints – An edge computing client residing either directly on or near the equipment can play a critical role in managing many deployments.

By enabling analysis of device data to occur onboard or nearby, it eliminates constraints resulting from factors such as remote locations, connectivity issues, or data volume and facilitates accelerated, intelligent data management.

Looking beyond technology

The importance of the organizational and cultural changes required for IoT success cannot be overemphasized. Leadership **must** make the value of this effort clear to the company. Establishing an organization specifically responsible for the execution, success, and ongoing oversight of the IoT project is a good way to convey this importance and foster a unified vision while optimizing coordination.



It is critical for end users to have a device management strategy in place during initial solution planning in order to effectively manage the heterogeneity and diversity of devices that can be deployed in the solution.

- ABI Research

Any initiative must include stakeholders with the knowledge and experience to accurately scope the company's operational assets and capabilities, security and IT experts, as well as members of other influential groups, such as legal and marketing.

Bringing in partners who can collaborate with company SMEs, and other vendors if applicable, to scope and optimize your IoT solution significantly enhances your ability to turn aspirational business outcomes into reality.

They should have expertise in bringing together an extensive variety of assets – along with any associated systems – and integrating other enterprise systems that can add context and expand use cases for IoT.

The use of commercial off-the-shelf (COTS) applications can accelerate implementation and pave the way for a newer generation of software developers to manage systems and functions that currently require workers with esoteric skills and knowledge.

That said, overcoming the technical and practical hurdles of IoT device management is not a plug-and-play exercise. Even with a COTS application, navigating the unique complexities of an industrial enterprise deployment requires a thorough understanding of the devices, operation, and software itself to operationalize IoT.

This breadth and depth of knowledge can prove daunting, so much so that companies often compromise and settle for less effective solutions. But voluntarily limiting the possible benefit of your device management solution isn't necessary.

Forming partnerships to outsource integration expertise and services can help companies overcome deployment obstacles and access full potential of IoT.

The ultimate objective for any IoT device management system should be the ability to remotely manage all connected assets from a centralized location and access a network-wide picture of the health of all your assets.

The worldwide IoT device management market is projected to exceed

\$20
billion by 2023.

-ABI Research

It should use two-way data communication to perform and automate control and management functions including provisioning, inventory, and software, content, and configuration updates. The capabilities put into place by a well-designed IoT device management system should establish a foundation that can be easily expanded into other beneficial use cases that can stimulate new business models and improve profitability.

About Bsquare

For over two decades, Bsquare has helped its customers extract business value from a broad array of assets by making them intelligent, connecting them, and using data collected from them to improve business outcomes. Bsquare software solutions have been deployed by a wide variety of enterprises to create business-focused Internet of Things (IoT) systems that can more effectively monitor assets, analyze data, predict events, automate processes and, in general, optimize business outcomes. Bsquare couples innovative software with advanced professional services that can help organizations of all types make IoT a business reality.