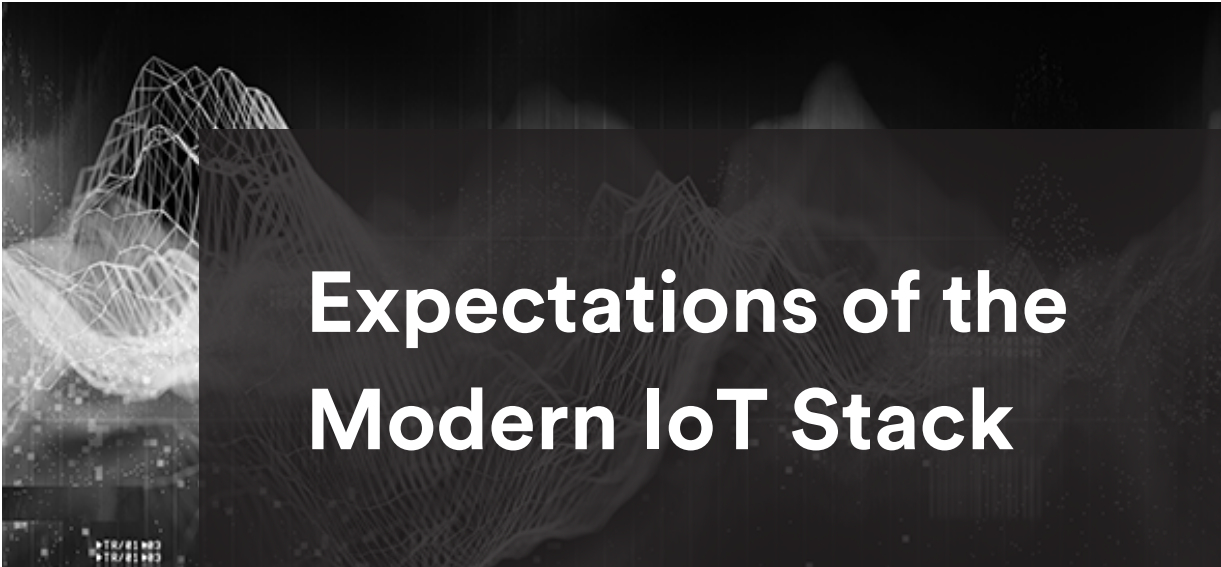




Expectations of the Modern IoT Stack

The Internet of Things (IoT) promises to connect more than 41.6 billion devices by 2025, but there's more to it than a talking fridge or a smart toothbrush.

The growth of the Internet of Things (IoT) technology has brought about new and innovative approaches to connect assets, consume and process machine data, and take action.

The pace of change is good and welcomed yet the challenge remains, how do we keep up? As the adoption of IoT expands with billions of smart, connected “things,” we need to think ahead with regard to the technology and architectures used to enable the IoT today and in the near future.

Depending on where you look, the IoT is viewed and defined in a multitude of ways. While context varies from industry to industry and device to device, the systems that provide and enable IoT in order to consume the data and make it useful continue to be a challenge.

While there are numerous architectures and applications to consider, finding the balance of flexibility, capability, and cost remains a difficult task with a number of confusing pros and cons that strain decision-making.

IoT By The Numbers

Estimates of the future market size of the combined IoT sectors continue to demonstrate opportunities for growth with more than 30 billion devices and equipment using IoT solutions by 2025. And, with respect to the industrial, manufacturing, and field service sectors the Industrial Internet of Things (IIoT) is estimated to reach nearly 20 billion assets by 2025.

Regardless of how it's categorized, the growth is significant and demonstrates the need, benefits, and value that IoT brings through multiple industries.

The IoT growth and increasing demand for smart IoT solutions have created a host of fragmented options. For instance, some IoT solutions are intended to address one narrow use case or only one portion of the architecture. The need for niche solutions often fills some of the initial gaps but as

we've seen they tend to fall short with limited adaptability.

Navigating all of these fragmented choices of software solutions, architectures, hardware, artificial intelligence (AI)/ machine learning (ML), and more, fuels the ongoing challenge to understand and make informed decisions on how best to move forward. If left unaddressed, this confusion and fragmentation have the power to limit the evolution of IoT projects and ongoing adoption.

Did you know that 83% of organizations have improved their efficiency by introducing IoT technology?



The Importance of IoT Alignment

Recently, companies have been working to improve alignment between IT and business units within their organizations. Alignment is important as it helps drive better strategy, proper scope, and clear justifications when considering the adoption of various Industry 4.0 initiatives. As these initiatives continue to evolve, efforts to better align through structures like Centers for Excellence (COEs) ensure that outcomes are mutually aligned and beneficial.

The creative ideas and solutions are seemingly endless with amazing insights and potential to improve businesses, customer experience, and ultimately our lives.

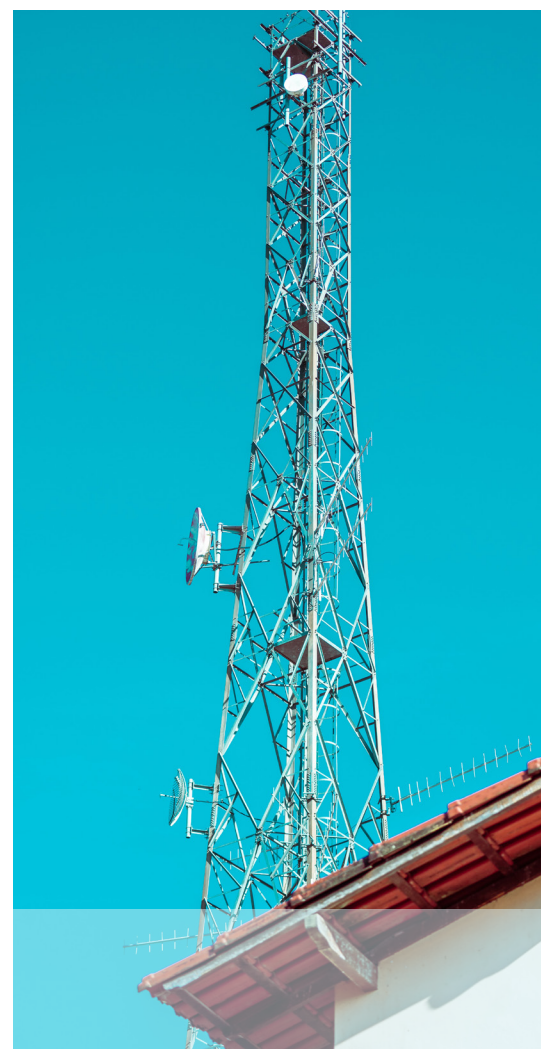
With a plethora of options to consider, what does the modern IoT stack need to ensure quick deployment and adoption? In this white paper, we address this question and provide insights for you to consider.

Navigating the Ever-Evolving Technology Stack

Most organizations have a complex technology stack and in order to keep up with the various needs and demands, mid to large enterprises make significant investments to build, adopt, and manage multi-cloud environments.

Adding IoT data from machines into the mix of these existing technology stacks creates a layer of complexity which leads to questions like...

- Where should the data go?
- How should the data be used?
- Where does the data have the most transactional impact?
- How do we make the IoT data actionable?
- How can all of the various personas make use of the IoT data?



It may seem like a no-brainer to connect the assets, but the complexities of the systems and transactions associated with the IoT are historically difficult to manage. Because of this, companies grapple with the growing backlog of IT projects and technical resources are overburdened which makes it difficult to focus on IoT and other emerging technologies. As a result, companies lose out on opportunities gained from real-time asset data to make IoT operational and actionable.

It shouldn't come as a surprise that many IoT projects become complex science experiments. They lose traction and unfortunately, most IoT implementations fail or simply stall out.

We've seen examples when even large enterprises who have the resources and budgets, struggle and have to rip and replace their IoT stacks because of a build-up of technical debt and technology shifts. Yes, there are band-aid solutions that can be used to mend these problems, but they're simply not sustainable.

If you're among the 40% that have successfully deployed an IoT solution, you still might be wondering, are we getting the full value of the IoT investment? How do we measure it? Is the solution actionable? Are we able to move from a reactive enterprise to a proactive one with this IoT solution?

“It's estimated that as high as 60% of IoT projects fail. That's a staggering percentage and one that we're actively trying to circumvent with our solutions at Bolt Data.”

- Leo Rota, Sr. Director of Business Development at Bolt Data

And, if your company hasn't invested in IoT yet, are you trying to determine if you should embark on a custom homegrown build or buy an IoT solution?

The cost estimates to build can vary widely. The time to scope, design, build, iterate, test, and deploy can be measured in years, and not to mention, the increasing demand and limited supply of talented engineers makes it even harder. If that wasn't enough, there's pressure to leverage and adopt AI/ML which are heavily data-dependent. This adds a new set of issues that IT departments and businesses face.

At its core, technology is intended to make things easier, not difficult. That's why exploring an IoT solution that seamlessly integrates and adapts to current technology landscapes and has the flexibility to scale is paramount to future success.



Setting Expectations: The Modern IoT Stack

The opportunity and adoption of emerging and evolving technology initially creates inefficient technology stacks. IoT is no exception. As it continues its journey to maturity and adoption there are now applications that simplify how IoT engages with technology stacks. Today, the most common components include the following layers:

- Connectivity, device management, processing, and rules
- Visualization and analytics
- Interfaces (API), database, mobile, and security

The emergence of AI/ML has added to this technology stack that IT groups are actively integrating into the existing IoT stacks.

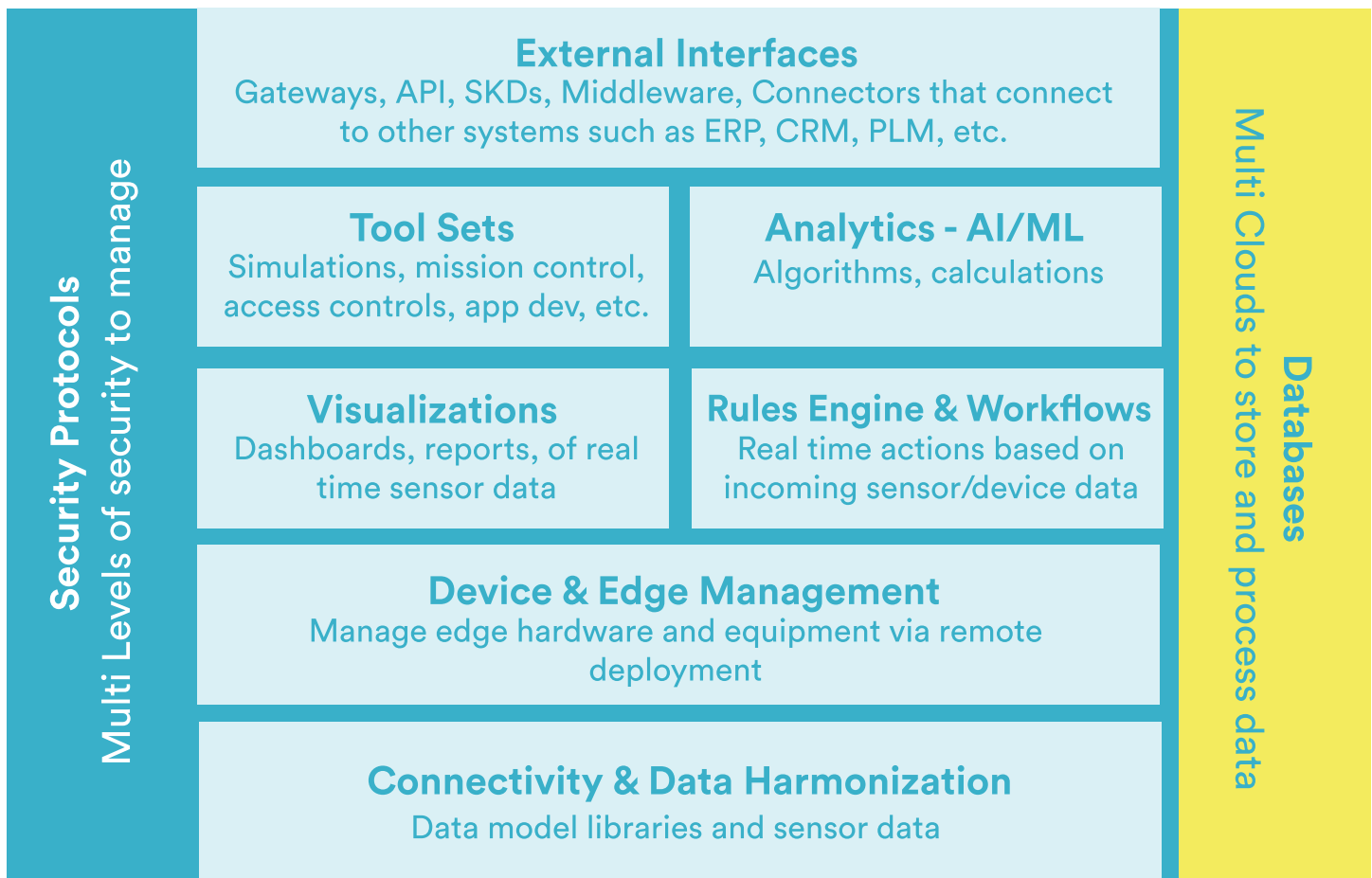
The Components of an IoT Solution

Each of the nine components pictured on the diagram on page six is critically important and necessary for a fully functioning IoT solution. It's commonplace to have multiple independent software solutions, both purchased and homegrown, that are stitched together to make this operational. Today, we're seeing a shift to IoT applications that can manage at least 80% or more of this stack within one application.

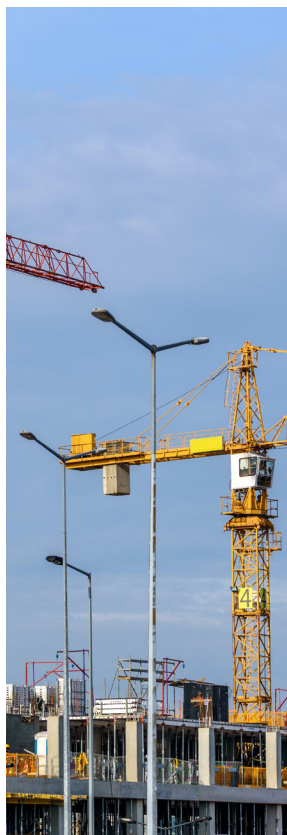
There are clear benefits to a centralized IoT application including:

- Better security controls
- Efficient implementation
- Improved adoption
- Enhanced joint support and ownership between IT and business unit operations

Figure 1: The Components of an IoT Solution



When selecting an IoT solution, allowing for simplification of the technology stack is an important factor to consider. An IoT solution that can manage and affect each of the nine components is needed and should be expected as a new standard. The evolving world of IoT standardizations is improving and having an IoT platform that can flex and adapt to these components should be a critical consideration when selecting an IoT solution.



Choosing an IoT Solution

At Bolt Data, we suggest the core application layer of the solution you choose should be able to manage and interface with the following items:

1. Connectivity and Data Harmonization: Each IoT solution has a connection layer that brings the different protocols and data formats together. Think of it as a data translator that's formatted for proper monitoring of IoT devices. A solution should be able to handle this because not all device data can be treated the same way. Additionally, the solution should have the capability to create templates and libraries for reuse or as starting points for similar assets. Maintaining a growing library of assets is a powerful capability every IoT solution should possess.

2. Device and Edge Management: An IoT platform should ensure the connected devices are working properly and can see the systems are up to date and running in real-time. This includes the provisioning of devices, configuration, over-the-air firmware updates, software updates, troubleshooting, and offline awareness. Having these capabilities in one solution allows users to efficiently manage the IoT solution as it scales and more assets are added.

3. Databases: The use of multiple databases is common today and that's why having a location for IoT data storage is imperative for any IoT platform. An IoT database should auto-scale depending on the volume of data required. A smart solution will determine which data should be stored in the cloud and what data should be processed at the edge gateway. The system should allow users to fine-tune this balance. It becomes especially important when a company has various devices that produce disparate data types and volumes of data. The database should be able to handle the frequency of the data. Some use cases require real-time processing whereas others can process data every hour or more.

4. Rules Engine and Workflow Management: A robust and comprehensive rules engine gives IoT data a voice of action and makes it useful. This should include actionable components that can drive a workflow and present IoT data to become a proactive mechanism for a business. A simple yet powerful example is having an asset raise a maintenance request ahead of premature failure while monitoring its usage.

5. AI/ML analytics: The adoption of AI and ML is quickly advancing and the key components of each require large amounts of data. This is where an IoT solution comes into play. But, in order to get the most out of the data and analytics, AI/ML is integral in providing the IoT solution with the information needed to adapt and learn.

6. Visualizations: They say a picture is worth a thousand words, but in this case, it's worth a thousand data points. Though important, how data is visualized and presented can be easily overlooked. Those that spend time in statistics or six sigma know that representation of data in charts is critical for proper analysis. Capturing before and after stats becomes critical in troubleshooting problems prior to a problem occurring. Not to mention, analysis of system behavior aided by powerful visualizations should not be overlooked when evaluating an IoT solution.

7. External interfaces: The multi-cloud environment of most companies will have ERP and CRM, while others will have added value by IoT solutions. An IoT application should integrate with these existing systems. Having APIs and virtual gateways are important parts of the IoT solution. In fact, the ability of an IoT solution to provide “bring your own cloud” capabilities as part of the standard architecture should be expected as it's not reasonable for most companies to rip and replace or lift and shift platforms.

8. Toolsets: An IoT platform should provide critical tools such as simulators so that setup, modeling, and scenario testing can be done. These components are important because an asset can be set up and simulated without having to wait for the actual asset to come online. This drastically reduces the time to set up an asset and assess how it will interact in the system. Another important toolset is the ability of an IoT solution to integrate with existing communities and portals. It provides a rich and differentiated experience that elevates customer engagement and adds visibility and transparency to the outcomes and actions that IoT solutions provide.



The Case to Buy Rather Than Build

The build scenario has increasingly become less desirable. In our experience at Bolt Data, we've seen companies who set out with good intentions to build their IoT stack, only to have it take two or more years to deploy. Not to mention at least a year to get through a full adoption phase. In that three-year timespan, momentum's been lost and the technology has likely shifted which impacts the build lifecycle.

However, building an IoT stack shouldn't be completely wiped from the conversation as there are some justifications for a hybrid approach. That's because some companies have to build their own edge hardware and IoT cloud for proprietary reasons. This case has become more of an exception than a rule.

We suggest that if taking the hybrid approach the application layer should be purchased so the investment in the IoT cloud and edge gateway can be quickly managed and made actionable using a powerful application.



When it comes to buying an IoT stack, companies should approach with caution as some solutions include legacy components and as a result, can be costly and lengthy to implement and adopt as well.

Not to mention, some solutions have a myopic focus with limited use cases and actions they can take. But, when you compare building and buying and weigh the pros and cons, **purchasing an IoT stack is the clear winner.**

Some analysts recommend that if an application has at least 60% or more of the solution in their base product, companies are better off buying rather than building. Software companies are simply better positioned to quickly evolve their products and meet the demands of their customers.

Companies of all sizes that choose to purchase a solution can have it up and running within weeks as opposed to years. This immediately jump starts the process to prove the effectiveness of the solution and then scale it along the way.

The benefits of purchasing an IoT stack allow for **better cost controls, flexibility, and adoption to ramp in smaller groups** which makes change management and training easier.

Companies should seek IoT applications that are inclusive and compatible with the nine core items.

IoT Use Cases

With the right solution in place, the use cases become numerous providing opportunities to become proactive and predictive as opposed to reactive.

Here's a list of a few key use cases that can be applied to numerous industries:

Asset Failure Detection: Remote monitoring of field-based assets can detect anomalies and automate service response in real-time.

Usage-Based Preventive Maintenance: Tracking the actual usage and condition of an asset allows maintenance to be coordinated when it's actually needed. Two of the same machine types may have different usage and as a result, will have different maintenance requirements.

Predictive Maintenance: Analyzing asset performance and applying machine learning over time can identify trends that predict when an asset will fail.

Servitization (Outcomes-Based): Create new revenue models by selling asset uptime and/or usage that can be delivered and accurately monetized.

Autonomous Service Delivery: Fully automate the dispatch of service teams with a parts order for detected machine errors or failures.

Remote Triage and Service: Remotely evaluate asset operating health and whenever possible deliver services without dispatching a technician (e.g., firmware upgrades, asset resets).

Asset Registration: Automatically provision and register newly connected assets to the IoT application. Techs can easily register a new asset and quickly view detailed asset configuration, status, and stream machine

The Solution - Bolt Data Connect

As you read through this resource, you might feel a bit overwhelmed by the various elements and choices you'll have to make to ensure your IoT stack does exactly what you need it to do, when you need it.

There are a lot of moving pieces to consider, and that's why we've done the leg work for you as the core features we've discussed are components that are included in our Bolt Data Connect IoT toolset.

Our IoT and AI offering for service on Salesforce include:

- Connected field service
- IoT cloud processing and storage
- Automated Service Recommendations
- Intelligent edge gateway processing
- Digital Twin Visualizations
- Supports offline detection

Our product is intended to simplify the technology stack to be inclusive of these features within the Salesforce platform and Amazon Web Services (AWS) IoT cloud. We also provide advanced edge hardware and virtual gateways that support the application.

Having an inclusive application layer makes a more predictable total cost of ownership (TCO) and gains full value without taking months to implement or build a homegrown solution. The application layer is the area of focus that's become the critical hub where IoT solutions are managed alongside the actionable outcome the users depend on.

The application provides the core functionality and value that allows for three main objectives:

- 1. Scaling IoT data and rules on the platform:** This enables users to administer connected assets and create IoT rules on the Salesforce platform while processing them in the cloud and on the edge which allows for enterprise scalability and easy management.
- 2. Autonomous service execution in context:** Users can publish relevant Salesforce data to the cloud and edge so IoT processing can occur in the full context of service level agreements (SLAs), asset entitlements, and other parameters that accurately enable service automation.
- 3. Secure asset sensorization, connectivity, and edge processing:** Bolt Data Connect provides secure, commercial-grade sensors, I/O bridge devices, edge gateways, and cloud data solutions for customers without established IoT infrastructure or location connectivity.



The Bolt Data Connect application encompasses and manages the nine component areas as shown in Figure 2. Additionally, Bolt Data Connect can work and adapt within the following architectures as shown in Figures 2, 3, 4, 5, and 6.

Figure 2: Existing IoT (Cloud to Cloud)

A company can provision on-premise or cloud databases to receive and store real-time asset data. Bolt Data Connect provides out-of-the-box connectors to easily connect existing data streams to the Bolt Data Connect cloud.

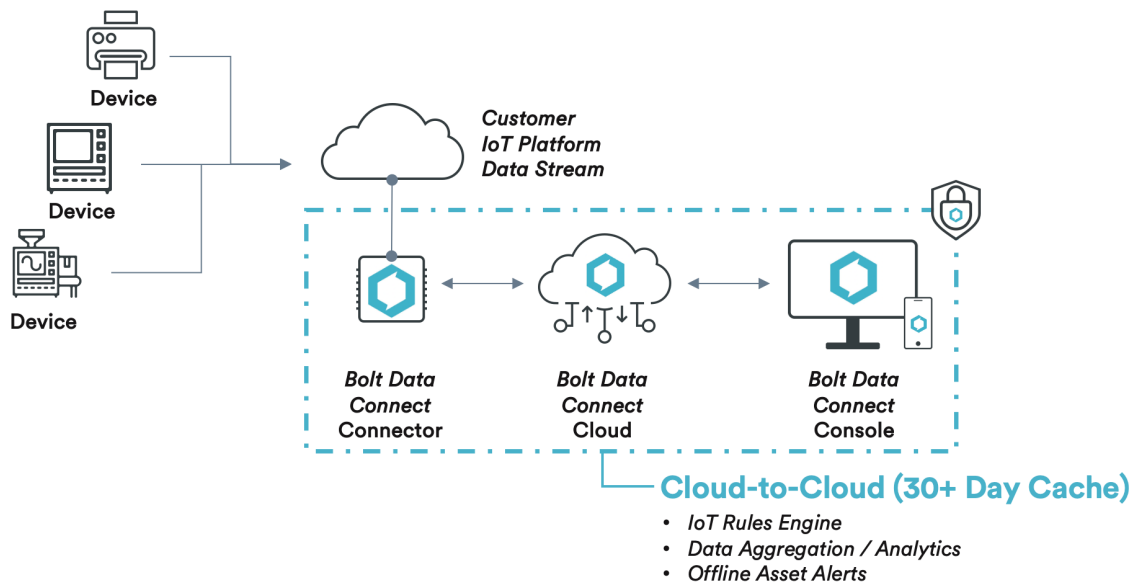


Figure 3: Existing IoT Cloud (Direct Connect)

Company-provisioned on-premise or cloud IoT implementation including data-lake and rules engine processing. Bolt Data Connect offers an easy-to-implement API interface for connecting the Spoke UX to a custom IoT Cloud.

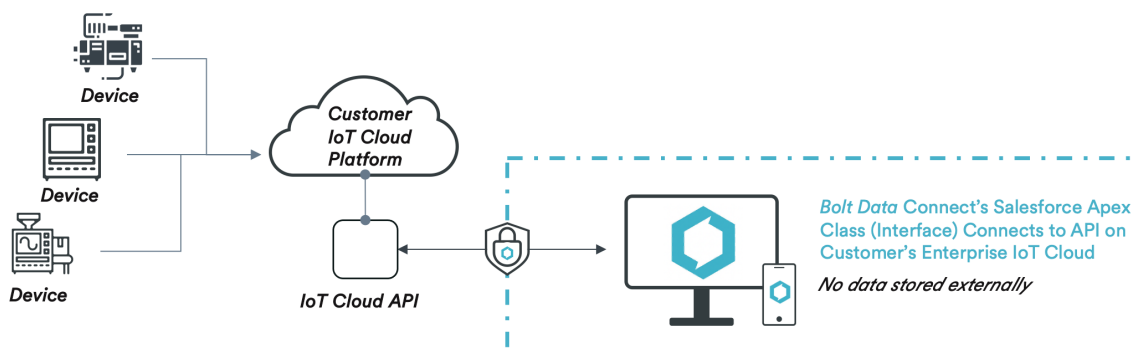


Figure 4: Web API (IoT Data Stream)

Assets are streaming data, but data is not being stored. Assets with a configurable Web API can be set up to publish machine data to a specific Web API or URL and are easily integrated into Bolt Data Connect using our Virtual Gateway model.

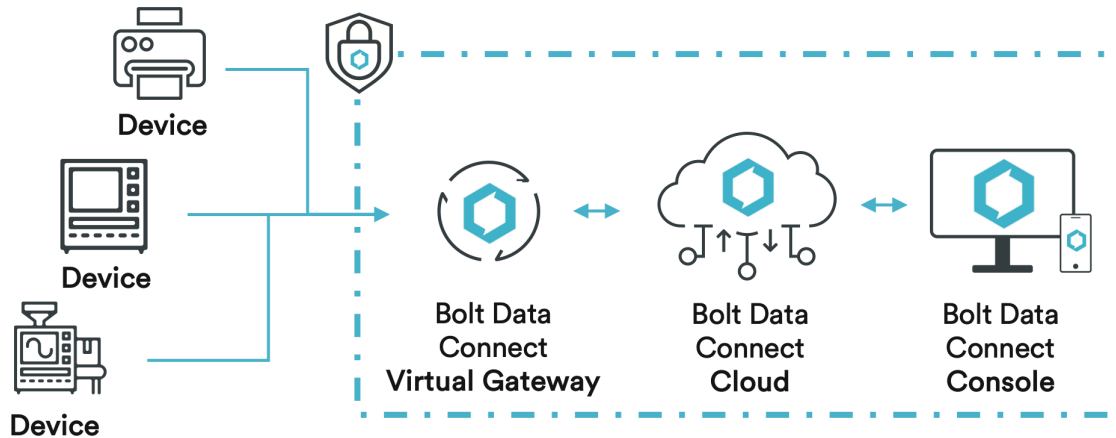


Figure 5: Wired/Wireless/I/O Connections

Assets are equipped with sensors and an I/O port capable of broadcasting real-time machine data. Hardwired data interfaces and wireless connections can be configured to connect to a Bolt Data Connect Gateway to translate the sensor data to/from the Bolt Data Connect Cloud.

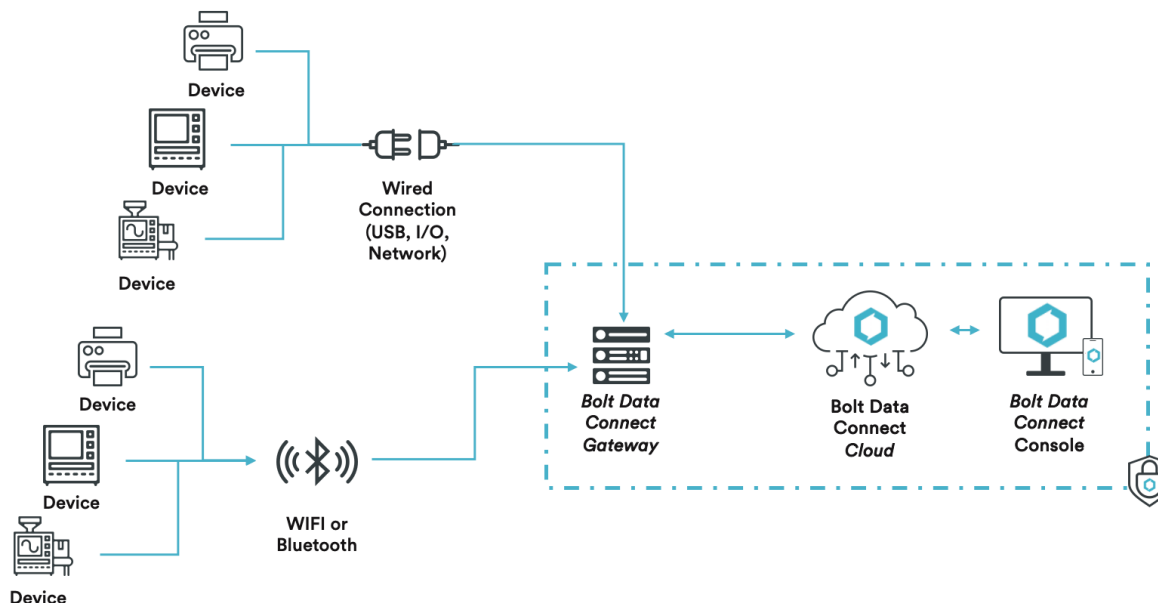
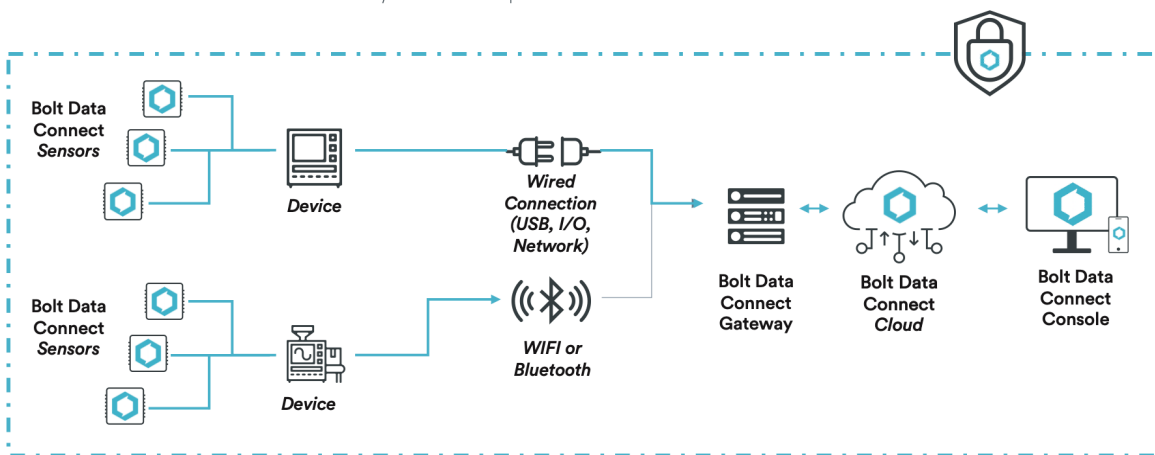


Figure 6: Assets Not Connected

Assets are not equipped with sensors and are incapable of broadcasting machine data. Assets without sensors can be retrofit with commercial-grade sensors to securely monitor and broadcast encrypted sensor data to an external, commercial-grade, secure Bolt Data Connect I/O device; which in turn can be configured to connect to a Bolt Data Connect to translate the sensor data to/from the Bolt Data Connect Cloud.

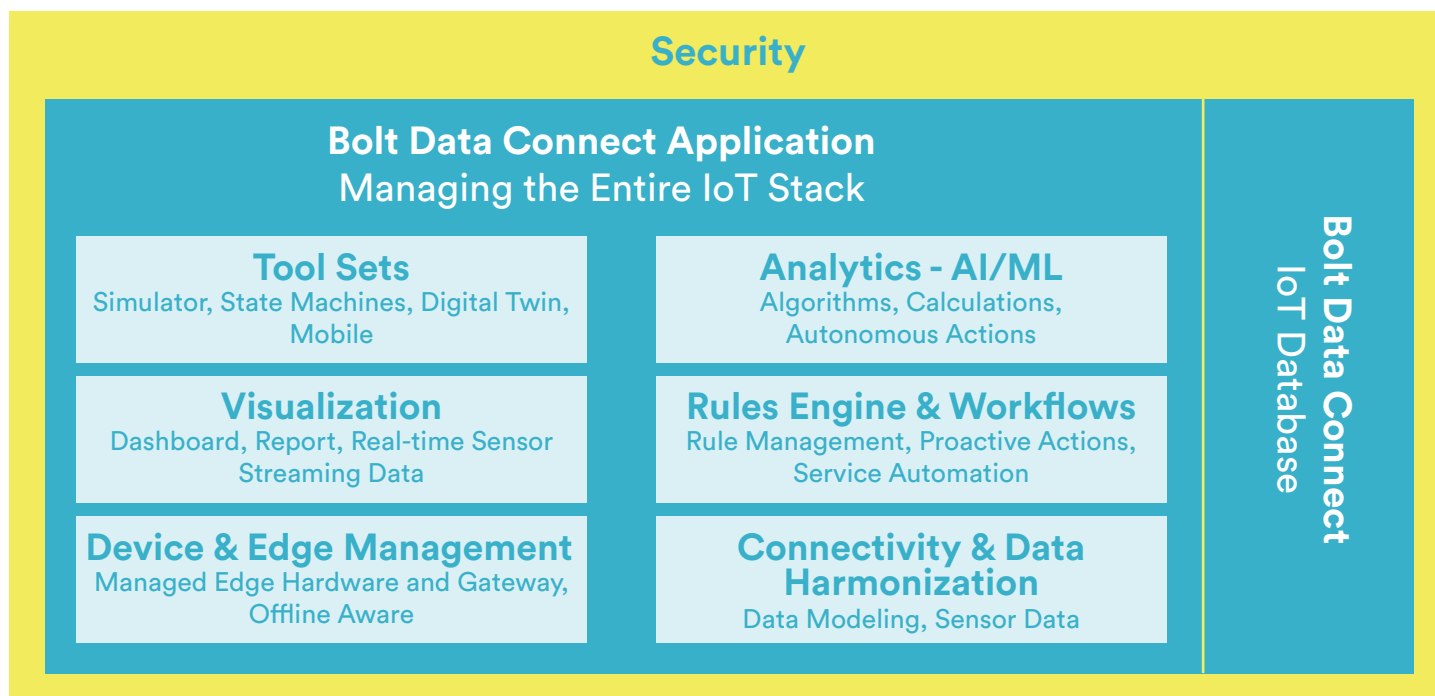


What does this all mean? Next Steps

When considering an IoT platform, our team at Bolt Data believes flexibility and an inclusive solution are the most important factors to consider when tackling the various challenges outlined in this resource.

The IoT technology stack should be managed from a more central application and be able to seamlessly manage each of the nine key areas. With Bolt Data Connect we can demonstrate how our solution handles all of these components as shown in figure 7.

Figure 7: The Application



The Top Benefits of Bolt Data Connect

1. Solves the problem of fragmentation in the IoT stack with an inclusive and comprehensive app
2. Integrates with existing technologies easing the IT demand to manage and support
3. Preserves investments and extends capabilities rather than rip and replace
4. Implements a complete solution within weeks and easily scales at your pace

To learn more and see a demo of Bolt Data Connect and how it can help your efforts, contact us at hello@bolt-data.com