



2020 BUYER'S GUIDE

INDUSTRIAL IOT PLATFORMS

Execute Smart Manufacturing Now

EXECUTE SMART MANUFACTURING NOW

Several developments over the past 50 years have set the stage for the rapid expansion of the Industrial Internet of Things (IIoT). From the invention of the PLC, to industrial automation, to cloud computing and finally the evolution of sensors becoming pervasive on the shop floor, IIoT has come of age.

Now that most factories are connected, they need a simple way to extract and make use of the data to truly execute on Smart Manufacturing. They need a platform to easily collect, analyze, and act on real-time data to improve both operations and IT decisions.

There seems to be no consensus on what to call this digital transformation – IIoT, Industry 4.0, Smart Manufacturing, or something else entirely. The truth is, it doesn't matter. Embracing some level of Smart Manufacturing is no longer optional – the challenging manufacturing landscape requires better quality and efficiency just to stay in the game. Adding a layer of IIoT technology helps companies optimize operations and manage assets. Taken to the next level they can even realize the benefits of machine learning and artificial intelligence for continuous improvement.

Manufacturers can no longer afford not to implement an intelligent IIoT platform; the challenge is choosing the right strategy that will make use of the right data at the right time and in the right place. Choosing the right fit is hard for any company, whether or not they have a dedicated digital transformation team. The good news is there are solutions out there – solutions that don't require a huge investment of time or money in order to realize the value of IIoT.

This IIoT Platform Buyer's Guide will explain the challenges and building blocks for a successful solution, essential IIoT platform capabilities, and most importantly how several leading vendors in this space are positioned to help companies embrace Smart Manufacturing for immediate business value.

30%

**GARTNER PREDICTS THAT BY 2023, 30% OF INDUSTRIAL ENTERPRISES
WILL HAVE FULL, ON-PREMISE DEPLOYMENTS OF IIOT PLATFORMS**

I IOT CHALLENGES

Agreeing on a definition of IIoT helps to frame a conversation around the ideal solution. IIoT solutions are based on Internet-connected machines and analytics platforms that process the data they produce either on-premise or in the cloud. An IIoT platform collects, normalizes and analyzes high volumes of live data from industrial assets and makes it available to OT and IT systems via edge-to-enterprise integration. An Intelligent IIoT solution makes decisions and takes action at the source based on live data as it comes.

Depending on their level of maturity, companies working to embrace IIoT find a number of challenges. First, figuring out how to make use of data from all of the heterogenous controllers and devices on the factory floor. Many factories utilize both modern and legacy assets and devices from various vendors. They utilize various protocols and data formats, although they may be connected to an OT system, they are not usually connected to a solution that can easily share the data with IT systems as well.

The next challenge is understanding the right balance between data processing at the edge and in the cloud. There is a troubling trend in the industry as companies choose to focus on one or the other without realizing they can, and should, do both. Cloud computing has its benefits for long-term analysis and large-scale deployment but is limited by bandwidth and often collects vast amounts of data but only uses a small portion. The value of the edge, or on-premise, lies in taking action at the edge where it has the greatest impact and zero latency. Edge computing enables factory-specific initiatives to empower the shop floor managers who are focused on operations.

Integration is another common challenge for any company working to digitally transform. While many Industrial IoT solutions solve either the OT or IT challenges, and focus on either the edge or the cloud, the best ones do it all. They bridge the gap from OT to IT with seamless integrations that move from the edge to any cloud, big data or Enterprise application.

Even after these issues are solved, many companies struggle to scale IIoT solutions. They might be able to effectively collect data at a single plant but when it comes time to add 10, 20, 30 more plants – the project may stop in its tracks. Successful implementations provide the ability to connect to any number of assets, manage devices, and deploy applications and analytics across any number of sites from one central location.

An intelligent IIoT platform can solve all of these challenges by connecting all industrial devices and systems, enabling companies to collect, normalize, analyze and take action on real-time data at the source. Even better, the right platform can do all of this painlessly without much, if any, onsite development work.

50%

REDUCTION IN UNPLANNED OUTAGES

20%

INCREASE IN ASSET PRODUCTIVITY

\$100k

COST OF DOWNTIME PER HOUR

TOP IIOT USE CASES

The desired outcomes for IIoT initiatives are surprisingly similar across industries including Manufacturing, Oil & Gas, Energy, Distribution, and Transportation. Most companies aim for better insight into asset health and performance, improved OEE, predictive maintenance activities, and improved processes and efficiency based on machine learning. Following are four of the most common use cases for IIoT.



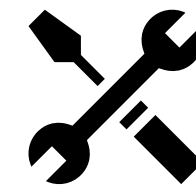
Asset Condition Monitoring

Asset Condition Monitoring is often the first use case for IIoT. Many companies are reactive, solving problems as they see them with their own eyes. Asset Condition Monitoring allows them to move to the next step of intelligence, by collecting and analyzing machine data to understand how assets are performing. Creating KPIs and alerts for basic machine data such as temperature, vibration and velocity provides intelligence that can be acted on in real-time to ensure all machines run as planned.



OEE

OEE (Overall Equipment Effectiveness) is a discrete manufacturing best practice coined in the 1960s that measures productivity. OEE evaluates how effectively a manufacturing operation is utilized by comparing fully productive time to planned production time. OEE calculation is based on three factors: availability, performance, and quality. Although OEE is not a new term, it is a perfect KPI for IIoT because modern technology offers readily available, real-time data to fuel OEE measurements and then help companies determine how they can improve operations over time.



Predictive Maintenance

Anomalies in the production line often lead to unplanned downtime and costly maintenance. IIoT platforms can enable predictive maintenance to reduce the cost of failure. The ideal platforms come with KPIs for asset utilization, uptime/downtime, and more. Customers can setup real-time alerts to take action at the data source based on pre-defined events. Use cases often start with reactive maintenance, move to predictive, and eventually prescriptive maintenance to reduce repair costs, minimize downtime, maximize output, and improve remediation efficiency.

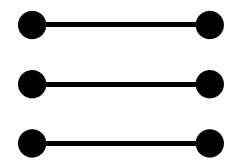


Machine Learning and AI

Machine learning and AI starts with connectivity at the edge. Connecting devices, collecting and normalizing production data and making that data available to big data and machine learning systems allows companies to develop the ML models needed to improve operations. Being able to rapidly deploy and run these new models at the edge, completes the feedback loop, and provides the edge-to-cloud intelligence needed for continuous optimization.

IloT BUILDING BLOCKS

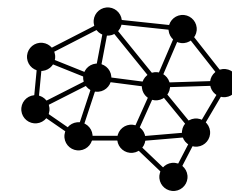
The right IloT platform enables rapid deployment by seamlessly handling data connectivity, edge intelligence, and OT-IT integration for true data intelligence. IloT platforms can meet the needs of any industry with the ability to connect assets, tailor KPIs, and integrate with leading enterprise solutions. A permanent feedback loop between the edge and the enterprise will continually improve efficiency, uptime, margins and quality on the factory floor. The following building blocks are key in choosing an IloT platform.



Step 1 – Data Connectivity

The first hurdle any IloT solution must overcome is data connectivity. Factories have both greenfield and brownfield devices, each with their own custom protocols and drivers. The only way to bring these devices together to harness the data and use it for both OT and IT functions is with a secure, normalized common data layer. Normalized data can be easily shared between any edge, big data, cloud or enterprise system. The ideal IloT platform can connect to the assets with pre-built device drivers, then process and normalize the data so it can be easily used by any system without any extra effort.

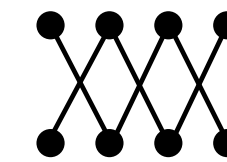
- Large number of native protocols and drivers
- Setup event processing via a drag-and-drop flow editor
- Normalized and structured common data layer



Step 2 – Edge Intelligence

After the data is normalized, it makes sense to keep some of the data processing and analytics functions at the edge to take immediate action at the data source. Many companies send all of their data to the cloud, but most of that data never sees the light of the day. Look for an IloT platform with built-in edge analytics so you can derive value at the edge immediately. It should enable application deployment at the edge, local data visualization, machine learning runtimes and allow for taking action on real-time data.

- Processing at the edge for accelerated time-to-value
- Ready analytics like time series analysis and anomaly detection
- Built-in KPIs such as asset utilization, uptime/downtime



Step 3 – OT-IT Integration

Once the data is collected, normalized and analyzed at the edge, data should be easily integrated into third party cloud, big data, and Enterprise applications. Seamless integration means OT and IT play nice together and data can be shared across any organization to meet multiple business needs. Data should also be pushed back to industrial devices to complete the feedback loop for continuous optimization and to run machine learning models at the edge. Companies can decide which data to store and action at the edge and which to move to the cloud.

- Leverage data collected at the edge and send it to the cloud
- Pre-integration with enterprise applications and databases
- Feed big data systems for deeper analytics

INTELLIGENT IIOT PLATFORM

Companies looking for an intelligent IIoT platform should consider the following requirements. The platform should collect data from any PLC, CNC, sensor, robotic system, or SCADA/MES/ historian, normalize and manage the data, perform analytics at the edge, integrate with third party applications, enable application orchestration, and provide the tools to manage the lifecycle of edge computing devices from a central location. Data should also flow from one side to the other freely, for a continuous feedback loop between the edge and the cloud.

ALL-IN-ONE PLATFORM

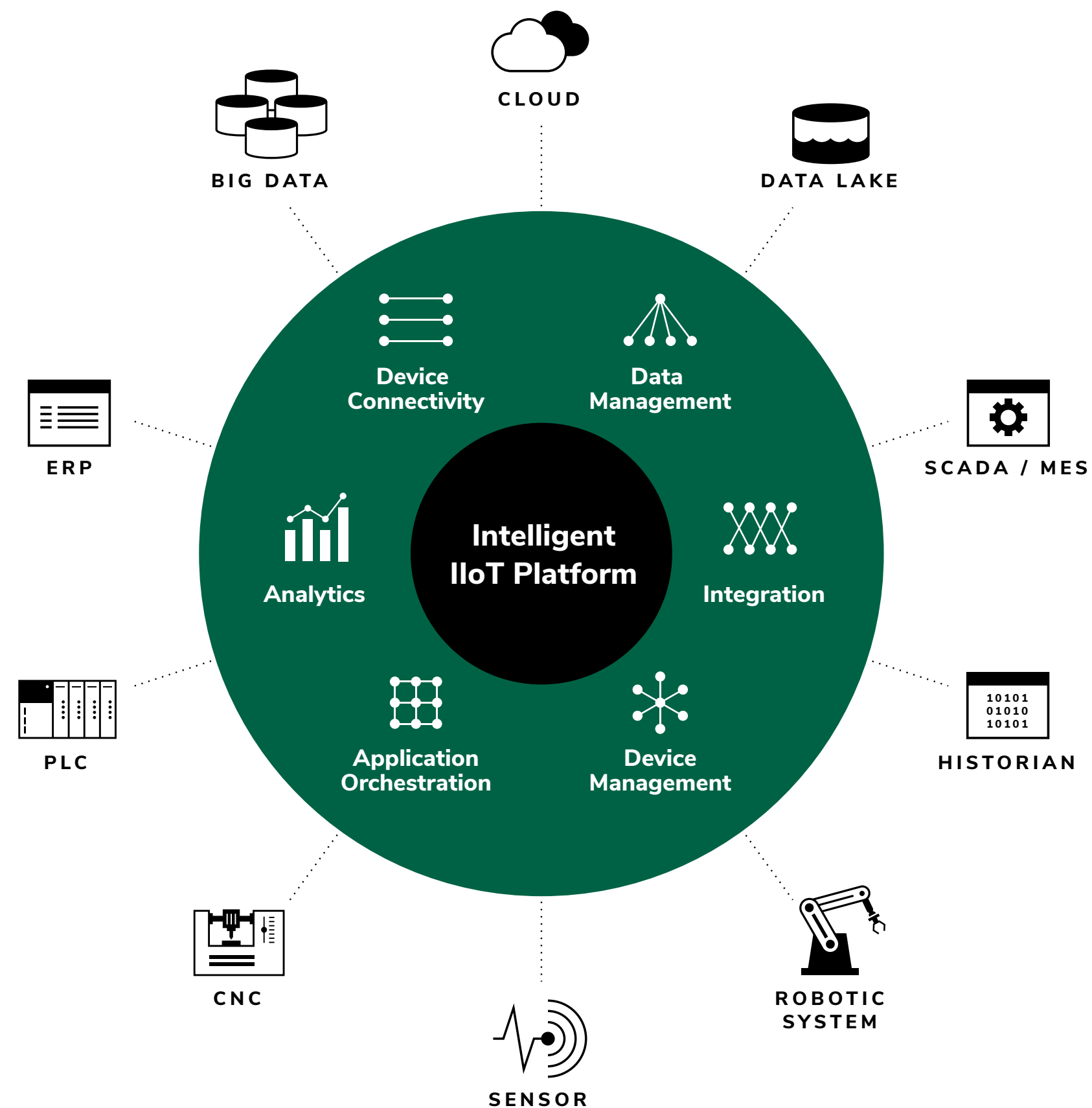
An IIoT platform delivers value by collecting, normalizing, analyzing and taking action on real-time data from the factory floor to meet business needs across the organization with one single solution.

DEPLOYED AT THE EDGE

Deploying at the edge allows the customer to use real-time data analytics, monitoring, visualization and insights to act on machine data at the source, where it has the greatest value.

ANY DATA SOURCE

The ideal IIoT platform collects data from any source with no programming required, then processes and normalizes the data automatically so it can be shared easily with other systems.



ANYWHERE-TO-ANYWHERE

Data can be analyzed at the edge, pushed to the cloud, into data lakes, or to any enterprise application, then back to the edge for true anywhere-to-anywhere connectivity.

DATA INTELLIGENCE

Operational data can be leveraged for instant analytics and pre-built KPIs, then integrated with cloud and big data applications to create machine learning models. Rapidly deploy and run new machine learning models at the edge to improve continuously improve asset and process performance.

BUILD ON EXISTING INVESTMENTS

An IIoT platform should be able collect and integrate data with existing MES, SCADA, historians and other industrial automation systems. The right IIoT platform ensures previous investments are preserved, and new value and benefits are derived.

CAPABILITIES MATRIX

An intelligent IIoT platform must provide the following features: device connectivity, data management, integration, edge device management, application management and orchestration, analytics, and flexibility and ease-of-use. The IIoT platforms market is maturing rapidly with new entrants each year and some long-standing players.

		Litmus	AWS	Azure	Foghorn	Inductive	PTC	Telit
Device Connectivity	Out-of-the-box support for a wide variety of industrial systems, devices, protocols, and controllers.	●	◐	◐	◐	◐	◐	◐
Data Management	Collect, process, normalize and store data at the edge, ready for use by cloud, big data and enterprise systems.	●	◐	◐	◐	◐	●	◐
Integration	Pre-built OT and IT data integration as well as support for standard interfaces like Kafka, MQTT, REST API and OPC UA.	●	◐	◐	◐	◐	◐	◐
Edge Device Management	Edge computing device lifecycle management including provisioning, remote configurations, templates and over-the-air-updates.	●	◐	◐	◐	○	○	◐
Application Mgmt & Orchestration	Public or private application marketplace at the edge, as well the ability to deploy applications and ML models to edge devices.	●	◐	◐	◐	○	◐	◐
Analytics	KPIs, visualization, dashboards, video processing, statistical and analytical queries, timeseries data, machine learning runtime.	◐	◐	◐	●	◐	◐	◐
Flexibility and Ease-of-Use	How quickly and easily the platform is deployed (on prem or cloud) and configured, how easily the platform can be integrated.	●	◐	◐	◐	◐	◐	◐

VENDOR ANALYSIS

The IIoT space is crowded, with several vendors filling niche roles and others working to offer most of the capabilities of an intelligent IIoT platform. The following vendor descriptions look at where each vendor is strongest and where they fall short as an end-to-end solution for collecting, storing, normalizing, and acting on data at the edge for IIoT use cases.

AWS

AWS is a public cloud provider that offers a range of IoT services that work together from edge to cloud. The solutions must be combined for a complete solution, and AWS does not specialize in collecting data from OT systems nor do they offer ready analytics, visualization or workflow at the edge. AWS IoT Core is well-designed for generic IoT devices and works well for always-on Internet connections. AWS IoT Device Management is also available but limited to generic IoT devices. AWS IoT Greengrass can orchestrate services at the edge as a framework that the customer has to build upon. The strength of AWS lies in data warehousing and analytics, and they are a key part of the IIoT ecosystem, but not an end-to-end solution alone.

Inductive Automation

Inductive Automation is a purpose-built SCADA platform with limited edge capabilities. They have some device drivers and bring the data into a central database inside the factory, then build SCADA visualizations on top. They have limited edge connectivity and data collection capabilities, requiring another product inside to fill the gaps. They only support standard integrations such as MQTT, which requires customers to build the rest. Inductive has a proven SCADA system, however, if customers are looking for strong data collection and easy, pre-built integrations with enterprise applications, they should look elsewhere for a complete solution or add an IIoT platform alongside Inductive Automation.

Azure

Azure IoT is a collection of Microsoft-managed cloud services that allow customers to build and deploy IoT applications using a portfolio of services. Like AWS, Azure offers a number of services separately, but does not function as a comprehensive IIoT platform. They do not offer OT data collection but do tightly integrate some tools like Litmus into the Azure IoT Hub and Azure IoT Edge. Most of their services require a Cloud connection and cannot be deployed behind a customer firewall or on-premise as many manufacturers prefer. However, they do enable next level capabilities such as machine learning and AI. Like AWS, they are a key part of the IIoT ecosystem when combined with an industrial data connectivity platform.

PTC

PTC's offerings include ThingWorx and Kepware, both of which focus on the data collection piece of the puzzle and require the user to do quite a bit of work such as writing code to extract the data. PTC has a solid list of drivers for device and data connectivity; however they do not clean, normalize or restructure the data. PTC's strength lies in application enablement with a design and runtime engine that enables creation of applications. The platform is Windows-based and includes pre-built edge analytics but does not come with any big data, cloud or Enterprise integrations out-of-the-box, nor does it offer centralized edge device management. PTC offers several of the essential functions of an intelligent IIoT platform but leaves a lot of the work for the user in the end.

Foghorn

Foghorn focuses on real-time event processing and analytics of data at the edge. They have developed strong complex event processing and machine learning engines. All data is brought in through OPC UA or some light connectors, but their data connectivity offerings are sparse – they ingest data but need it to come from a standard protocol or interface. Foghorn can manage their own software but not devices, they can orchestrate their own applications but not third party. They have some data handling with a few integrations such as MQTT or IoT clouds. Foghorn can run as a series of containerized applications, so they can be combined well with other IIoT platforms such as Litmus.

Telit

Telit offers a little in each area, but not enough to make the platform the best choice for a start-to-finish IIoT solution. They focus on device management with some pre-loaded device drivers and third-party integrations, but not as many as industry leaders. Telit's solution is Windows-based, which takes a toll on management and offline first deployments are not possible as a result of their dependency on cloud-connected bootstrapping mechanisms. The product is not API-driven which limits automated deployment and applications cannot be managed or orchestrated at the edge. Telit's solution plays out like a typical middleware which can collect and push data, without a lot of the value-added features that make an IIoT platform all-inclusive.

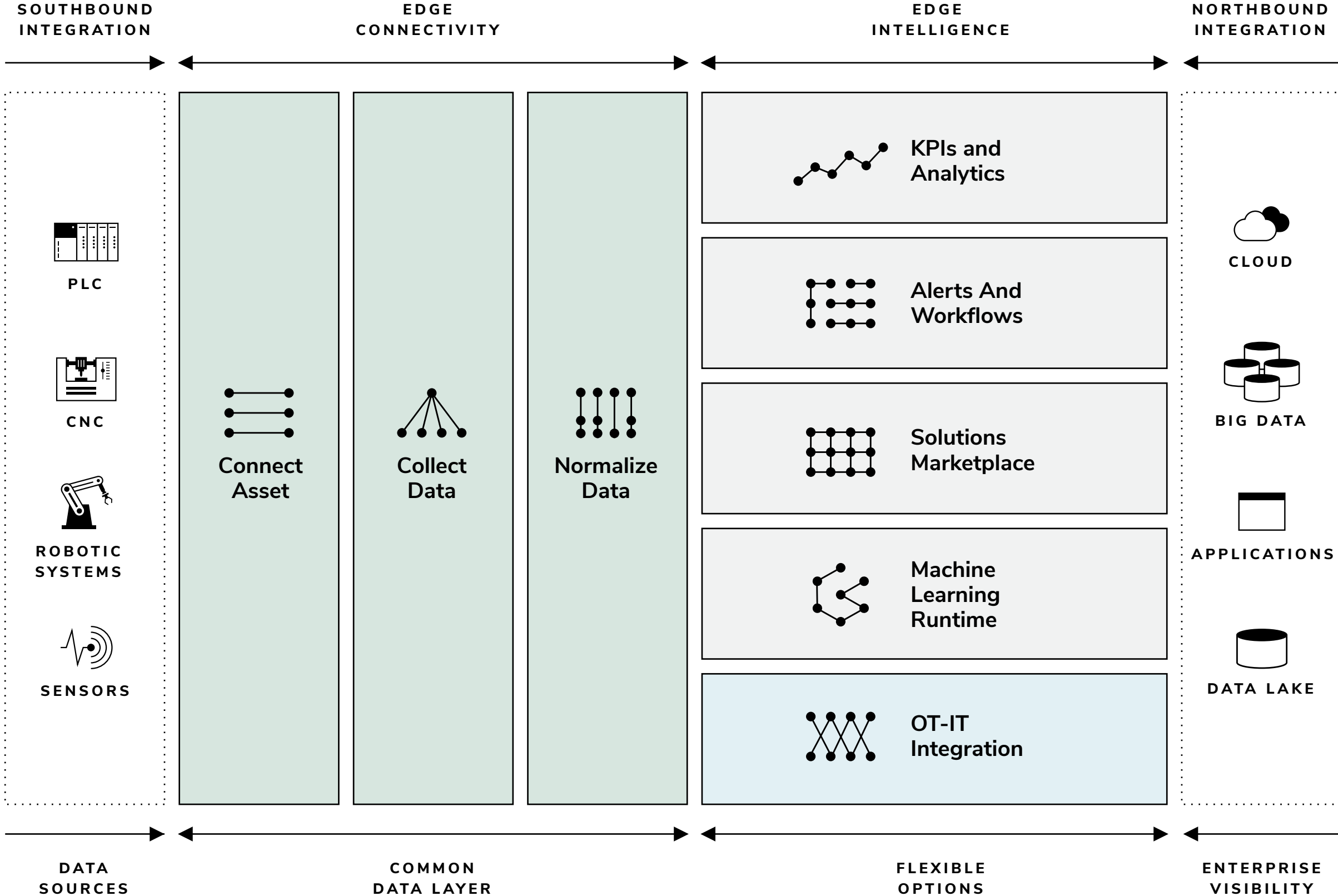
LITMUS

Litmus has a competitive advantage in every category with unmatched features and time-to-value over competitors. Many alternative IIoT platforms require additional products in order to function as a complete IIoT solution from edge-to-cloud, while Litmus can do it all.

A Comprehensive, Intelligent IIoT Platform

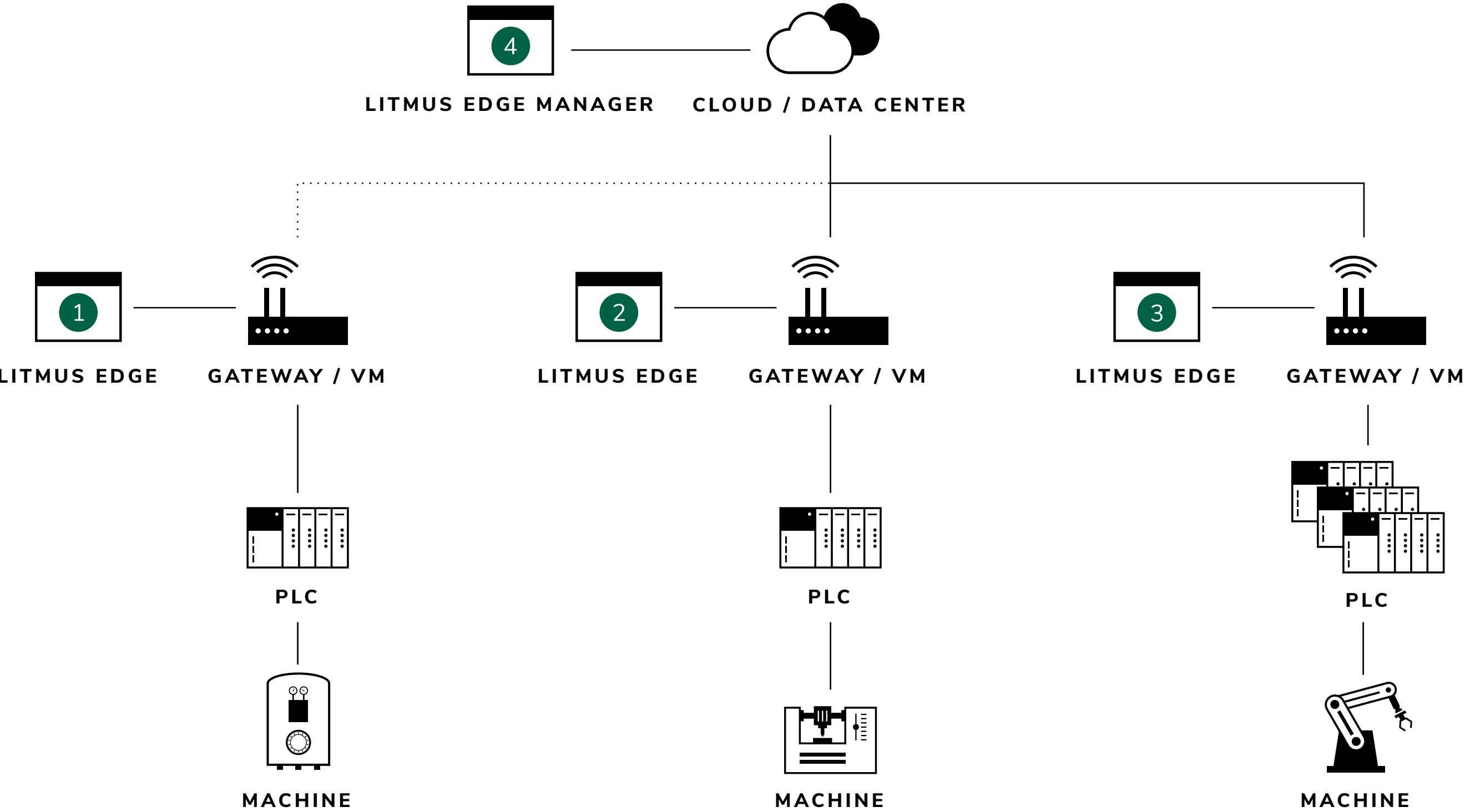
Litmus leads edge connectivity with more than 250 pre-built drivers, the most in the industry. The platform handles data processing and normalization so the data can be easily integrated and used with edge and enterprise applications. Litmus Edge offers real-time data visualization and analytics, pre-built KPIs, video processing, event processing, notifications and alerts, all configured with a drag and drop workflow editor. Litmus easily integrates with more than 20 cloud, big data or enterprise applications to bridge the OT-IT gap. Normalized and structured data can be used to develop machine learning models and provides the ability to rapidly deploy and run those models at the edge. Litmus also offers edge computing lifecycle management to handle device provisioning, remote configurations, over-the-air-updates, edge device templates, and the ability to deploy purpose-built applications to all edge computing devices. Litmus is a secure offline-first platform that complies with enterprise security policies including LDAP, SSO, endpoint authentication and authorization, security tokens and keys, as well as user-level roles and permissions. Litmus offers flexible deployment as an OS or VM on any gateway or local server.

- One platform to collect, normalize and analyze data at the edge
- Deployed offline next to the machines at the data source
- Out-of-the-box connectivity for any device, protocol or controller
- Collects, normalizes and stores data at the edge for use by OT and IT
- Centralized edge computing device lifecycle management
- Works nicely with existing solutions to protect previous investment



FLEXIBLE DEPLOYMENT ARCHITECTURE

Industrial manufacturers are looking for a reference architecture to visualize how they can implement an IIoT solution before making any purchase decisions. The Litmus deployment architecture is simple – customers start with an offline deployment to develop a risk-free pilot, then they connect the solution to the Intranet to share that data across OT and IT teams, and lastly, they scale the solution across the plant. No matter how many devices are connected to the OT network, Litmus Edge is a software layer that sits on top and Litmus Edge Manager is available for centralized management. Additional sites can be added with no pain in scaling whatsoever, so the solution grows with the customer.



- 1 PILOT**
Get started quickly by adding Litmus Edge to one machine, offline. This no-network needed, standalone solution allows the customer to quickly derive value with instant KPIs, dashboards and visualizations. Develop a pilot without disrupting the current process.
- 2 SMALL DEPLOYMENT**
With a proven pilot, the deployment can be connected to the plant Intranet to share data across OT and IT teams. Now anyone in the plant can see the value of IIoT to perform centralized data collection, advanced analytics, and integration with third party applications.
- 3 SITE DEPLOYMENT**
Add more assets to collect more data on the plant floor. Analyze larger data sets, create more dashboards, and optimize production by sharing data across the plant. Add additional Litmus Edge deployments to scale the solution quickly and easily to any number of lines or facilities.
- 4 CENTRALIZED MANAGEMENT**
A centralized management platform for devices, data and applications enables customers to scale edge deployments quickly and easily across multiple facilities. The entire project runs smoothly with a single point of control from bootstrap to replacement.

GETTING STARTED

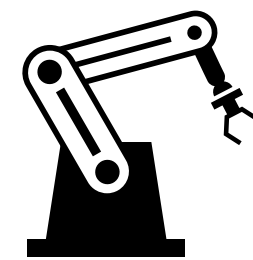
Choosing an IIoT platform is based on a number of customer requirements. In addition to features, ease-of-use and time-to-value is an essential consideration. Many manufacturers have delayed embracing an IIoT platform because they are under the impression it will cause some growing pains and come at a high price in both time and hard costs. The beauty of the Litmus IIoT platform is it will tap into existing technology on the shop floor, add a very important layer of intelligence, and then send that data across the enterprise for fast results. The Litmus platform can be implemented in just a matter of days, providing instant value across the enterprise for both OT and IT teams.



POC - Day 1

Litmus works closely with customers to understand goals and objectives, and can deploy a live POC (proof of concept) in one day. Litmus Edge connects to devices in just minutes with support for 250+ pre-built drivers with no programming required while other solutions take months to get to a POC. Because our solutions are purpose-built for industry, they work from day one. Connect an asset to Litmus Edge, see data immediately and start building dashboards.

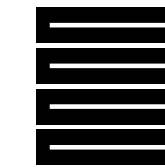
- On or offline deployment with simple setup and no programming
- Start collecting data from one or several assets
- Develop a proof of concept to solve a business problem



Implementation - Day 30

Just one month in, customers are better understanding the data, seeing trends and taking action on new insights. They are beginning to think about what other data points they want to collect to expand use cases. With ready analytics and KPIs they can run analytics at the edge to achieve metrics like OEE and Asset Condition Monitoring. Built-in data integration to AWS, Azure, Splunk, SAP and other data intelligence platforms enable advanced analytics and insights.

- Calculate uptime/downtime, OEE and set up alerts
- Act on data at the source, where it has the greatest value
- Fuel big data and applications with valuable machine data



Production - Day 60

By day 60, customers can realize the true value of IIoT by sharing information across the enterprise. The data engine is fed, and the continuous feedback loop can begin. Plant managers can integrate their data scientists and orchestrate new applications. Just two months in, customers gain a very strong understanding of the data and share it with teams across the organization to solve problems like unplanned downtime, bottlenecks, energy usage and more.

- Develop machine learning models
- Orchestrate new applications for edge and IoT devices
- Bring the org together to share data and break down silos

CAPABILITIES CHECK LIST

Not all platforms are created equal, but there are certain key capabilities that help customers create successful IIoT use cases. Look for features that enable the customer to implement an IIoT platform without an expert on site. The customer should be able to implement, maintain, and scale the solution with ease, while experiencing time-to-value in weeks, not years.

	Litmus	Vendor #1	Vendor #2	Vendor #3
Out-of-the-box support for hundreds of devices and protocols	✓			
Zero-programming device setup and configuration	✓			
Common normalized data layer	✓			
Bi-directional data integration between all industrial automation systems	✓			
IIoT device management from a single point of control	✓			
Large marketplace of public applications and custom application support	✓			
Pre-built edge analytics and alerts at the data source	✓			
Integration with leading third party big data, cloud providers and enterprise applications	✓			



INTELLIGENT EDGE COMPUTING FOR INDUSTRIAL IOT

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