



2024 BUYER'S GUIDE

INDUSTRIAL DATA OPERATIONS



The Blueprint for Industrial DataOps Success:
From Vision to Value

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While IT/OT convergence has been discussed and gradually implemented over the last decade, recent technology developments, most notably rapid AI advances, are finally accelerating the transformation. We expect that adoption of converged technologies for greenfield projects will pick up speed—from ~10% today to ~50% within the next five years.

~ According to a BCG study.

Industrial DataOps represents a fundamental shift in how industries manage data in Industry 4.0 at scale. It goes beyond the conventional practices of the third industrial revolution, offering a comprehensive approach from data acquisition to enterprise integration, to enhance operational efficiency and strategic decision-making. Recent breakthroughs in Artificial Intelligence, Machine Learning, and Cloud technologies are further accelerating the pace at which industrial companies are investing in these technologies and solutions that can enable them to leverage data as a strategic asset across the enterprise.

Whether you are a strategic leader shaping organizational policy, a technical professional driving digital transformation, or a frontline worker leveraging the power of data in real-time, this guide has something for you. From unlocking siloed data to activating real-time insights and scaling data operations across diverse manufacturing operations, we will explore the core principles when benchmarking an Industrial DataOps solution, as well as practical applications of the technology.

Enterprise Focus

With the burgeoning market of Industrial DataOps, vendors are quick to label their offerings as comprehensive solutions, even though the concept of Industrial DataOps remains subject to ongoing discussion and refinement. While these tactical solutions can suffice for initial proof of concepts or might scale to accommodate a single facility or a pair of plants, they often lack the robustness and holistic design required for broader enterprise-wide deployment. To truly harness the full potential of Industrial DataOps, enterprises must scrutinize these offerings, discerning between those that merely provide short-term fixes and those designed with the foresight for extensive scalability. This endeavor calls for a strategic approach that addresses not just the immediate problem but also anticipates integration complexities, data coherence, and system interoperability across the entire organizational network.

RISK MANAGEMENT

Enterprises face the challenge of choosing between custom in-house solutions and proven Industrial DataOps platforms. Custom solutions, despite the promise of being tailored to specific needs, pose risks such as high maintenance costs, scaling security at scale challenges, and potential to detract from strategic goals due to their complex integrations. On the other hand, opting for established Industrial DataOps solutions safeguards operational continuity and aligns with the dynamic technology landscape. These solutions offer the advantage of being tested and refined through extensive use by peer enterprises, eliminating common pitfalls through learned experience. By leveraging such vetted systems, organizations can avoid the trial and error associated with custom solutions, significantly reducing risk, and preventing costly operational or financial setbacks. This strategic choice accelerates strategic initiatives by building on proven frameworks and technologies.

TOTAL COST OF OWNERSHIP

The Total Cost of Ownership (TCO) for custom-built DataOps solutions encompasses not only initial setup but also significant ongoing expenses. These include staffing costs for specialized personnel responsible for maintenance and continual upgrades, financial outlays for diverse tools and software, each requiring compatibility checks and frequent updates, and the opportunity costs linked to diverting resources from primary business objectives, potentially stalling productivity, and innovation. In contrast, adopting a comprehensive, integrated Industrial DataOps solution offers substantial TCO savings by reducing the need for excessive customization and facilitating seamless system integration. Such solutions provide scalability and simple upgrade paths, presenting not only immediate cost reductions but also sustained economic benefits, thereby boosting the financial health and operational efficiency of the enterprise.

PACE OF INNOVATION

A complete Industrial DataOps solution provides a strategic advantage by being future-ready, featuring scalable architectures and advanced capabilities to adapt quickly to new market demands and technological trends. This enables continuous innovation without significant disruptions. These platforms are continually updated with the latest advancements and industry standards, allowing enterprises to concentrate on core competencies, knowing their infrastructure is prepared for future challenges. Additionally, the integration of various enterprise functions ensures seamless data flow and real-time decision-making, enhancing operational agility. This alignment helps businesses respond swiftly to marketplace changes and operational challenges, maintaining competitiveness and operational efficiency.

6 COMMON INDUSTRIAL DATAOPS USE CASES

Industrial DataOps is revolutionizing the way data is harnessed from industrial environments, driving efficiency, and enabling informed decision-making. In addition to traditional practices, as AI and MLOps mature, they are set to redefine industrial processes, transcending the limitations of conventional approaches, and establishing new frontiers of operational excellence. While currently limited, the drive is toward scaling AI and MLOps-driven insights across entire organizations for transformative results. Here's a snapshot of specific use cases poised for expansion.

Enterprise Use Cases

MLOps Efficiency Optimization

ML Operations (MLOps) focus on the lifecycle management of machine learning models to ensure they remain efficient and effective over time. Implementing MLOps within industrial settings helps continuously tune and adapt AI models based on ongoing operational data. This ongoing refinement process helps in optimizing manufacturing processes, reducing energy consumption, and improving production yield, effectively scaling operational intelligence across the enterprise.

Production Gap Mitigation

Through continuous monitoring and data analysis, industrial data operations can help manufacturers to identify inefficiencies and gaps in production processes. This might include bottlenecks, idle times, or suboptimal machine performance. Addressing these gaps promptly leads to smoother workflow and increased production throughput. Data-driven insights help to reconfigure production lines or adjust workflows, which improves overall operational efficiency.

AI-Driven Data Integration

Integrating AI within the OT data OT framework bridges the gap between data collection and actionable insights. AI algorithms, developed and executed in the cloud, can process extensive volumes of OT data from various sources, offering a comprehensive view of operations. These trained AI models can then be deployed and operated at the edge of the network. This seamless integration enhances decision-making capabilities and enables more intricate analyses and predictions, thus providing a deeper insight into operations and fostering opportunities for innovation.

Cross-enterprise Data Synergy

Cross-Enterprise Data Synergy represents a strategic approach to leveraging data across the business, breaking down silos that traditionally impede information flow. By facilitating improved visibility into all aspects of operations, from production floors to supply chain logistics, enterprises gain the ability to track, monitor, analyze, and act in real time. This interconnected data-driven culture allows for rapid pivots and informed strategies that align with the current supply chain realities.

OT Use Cases

Predictive Analytics Prowess

By embedding data-driven edge analytics into operational systems, industries can predict potential failures and maintenance. This proactive approach reduces unexpected machine downtime, thereby maximizing operational availability and productivity. Advanced sensors and data-gathering technologies continually feed data into AI models that analyze and predict wear and tear, optimizing maintenance schedules based on actual equipment condition rather than fixed intervals.

Quality Control Intelligence

Applying machine learning algorithms to analyze operational data in real time allows industries to identify anomalies that could indicate quality issues. This data-powered scrutiny ensures that production anomalies are detected early, minimizing waste and rework. The system learns from every product cycle, continually enhancing its capability to recognize the smallest deviations from quality norms, thus maintaining high standards of product quality.





CORE INDUSTRIAL DATAOPS CAPABILITIES

An Industrial DataOps solution must include **Native Industrial Connectivity** and enable **Data Collection & Normalization**, coupled with insightful **Data Analysis & Visualization at the Edge**. Essential **Data Contextualization** makes insights actionable, while prebuilt **Data Integration** and **MLOps & App Orchestration at the Edge** enable swift execution of data-driven practices. **Digital Twins and Data Modeling** enhance operational foresight and critical to the overall architecture is **Data Governance and Security**. **Centralized Management** is a core design principle—not an afterthought—to ensure scalability and agility. Any vendor evaluation for Industrial DataOps should begin with these essential components to establish foundational capabilities. Following this, we will take a closer look at these requirements needed for a comprehensive, enterprise-grade Industrial DataOps deployment.



Native Industrial Connectivity

Device Connectivity acts as the first step towards a connected ecosystem. It involves establishing reliable, secure communications between various industrial devices across the operational landscape, ensuring data can be seamlessly collected from heterogeneous sources. This connectivity must support diverse protocols and standards to cater to the wide range of equipment found in industrial environments. Robust device connectivity solutions are designed to be scalable and flexible, enabling the integration of new technologies and devices as operations evolve.



Data Collection & Normalization

Data Collection & Normalization are critical processes that ensure data from various sources can be aggregated and converted into a standardized format for further analysis. This involves collecting data across different devices, sensors, and systems, often involving various data types and formats. Normalization adjusts this disparate data into a unified format, making it easier to analyze and interpret across systems. This step is essential for maintaining data integrity and consistency, which are key for accurate analysis and decision-making.



Edge Analytics & Visualization

Edge Analytics & Visualization transform raw data into actionable insights through sophisticated analytical techniques and intuitive presentation. This process involves applying statistical models, machine learning algorithms, and other analytical methods to interpret data patterns, trends, and anomalies. Visualization tools then present these findings in an easily digestible format, such as dashboards and reports, making it simpler for decision-makers to understand complex data.



Data Models, Asset Models, and Digital Twins

Data Models and Digital Twins involve creating digital representations of physical assets, processes, or systems to simulate real-world conditions and predict outcomes. This capability allows organizations to test scenarios, optimize operations, and foresee potential issues before they occur. By integrating real-time data with these models, businesses can achieve a deeper understanding of their operations, leading to improved design, maintenance, and innovation. Digital twins serve as a critical tool for bridging the physical and digital worlds, enabling a proactive and predictive approach to management.



Data Integration

With the rising adoption of cloud technologies, Data Integration has become a critical element in ensuring seamless data accessibility and utility. Prebuilt integrations with cloud services, BI tools, and various enterprise systems are essential for facilitating real-time data flow and providing businesses with the agility to make swift, data-driven decisions. These integrations allow organizations to instantly tap into the power of scalable cloud resources, simplify complex analytics processes, and achieve a harmonious interconnectedness of data and applications. Prebuilt integrations minimize the potential for silos, maximize the relevance and timeliness of business insights, and enable a more cohesive and responsive IT infrastructure.



Data Contextualization

Data Contextualization adds layers of meaning to raw data by integrating it with contextual information, such as metadata, historical data, or data from other sources. This process enables users to understand not just what is happening, but why and how it's happening, by providing a clearer picture of the operational environment. It's crucial for uncovering deeper insights, improved MTTx KPIs, and facilitating more accurate predictions and better decision-making.



MLOps at the Edge

MLOps at the Edge focuses on deploying and managing machine learning models directly on edge devices, enabling real-time data processing and decision-making. This approach reduces latency, decreases bandwidth requirements, and enhances operational efficiency by allowing immediate actions based on data analysis. Implementing MLOps at the edge requires careful coordination between data scientists and operational teams to ensure models are accurate and effective in live environments. It represents a shift towards more autonomous and intelligent systems capable of adapting to changing conditions without central oversight.



Data Governance and Security

Data Governance and Security are critical in ensuring data integrity, compliance, and protection against breaches and leaks. Governance policies outline how data is managed, stored, and used, establishing clear guidelines for data handling and quality. Security measures, on the other hand, protect data from unauthorized access and cyber threats, incorporating encryption, access controls, and regular audits. Together, they create a safe and reliable data environment, building trust and supporting regulatory compliance.



Centralized Management for Scale

Centralized management is crucial for streamlining data integration, enabling seamless OTA software updates and the prompt application of software updates and security patches across all platforms. This approach ensures a holistic view of the entire enterprise, crucial for optimizing data accessibility and strategic decision-making. It establishes repeatable and scalable data practices, enabling organizations to maintain consistency and efficiency as they grow.

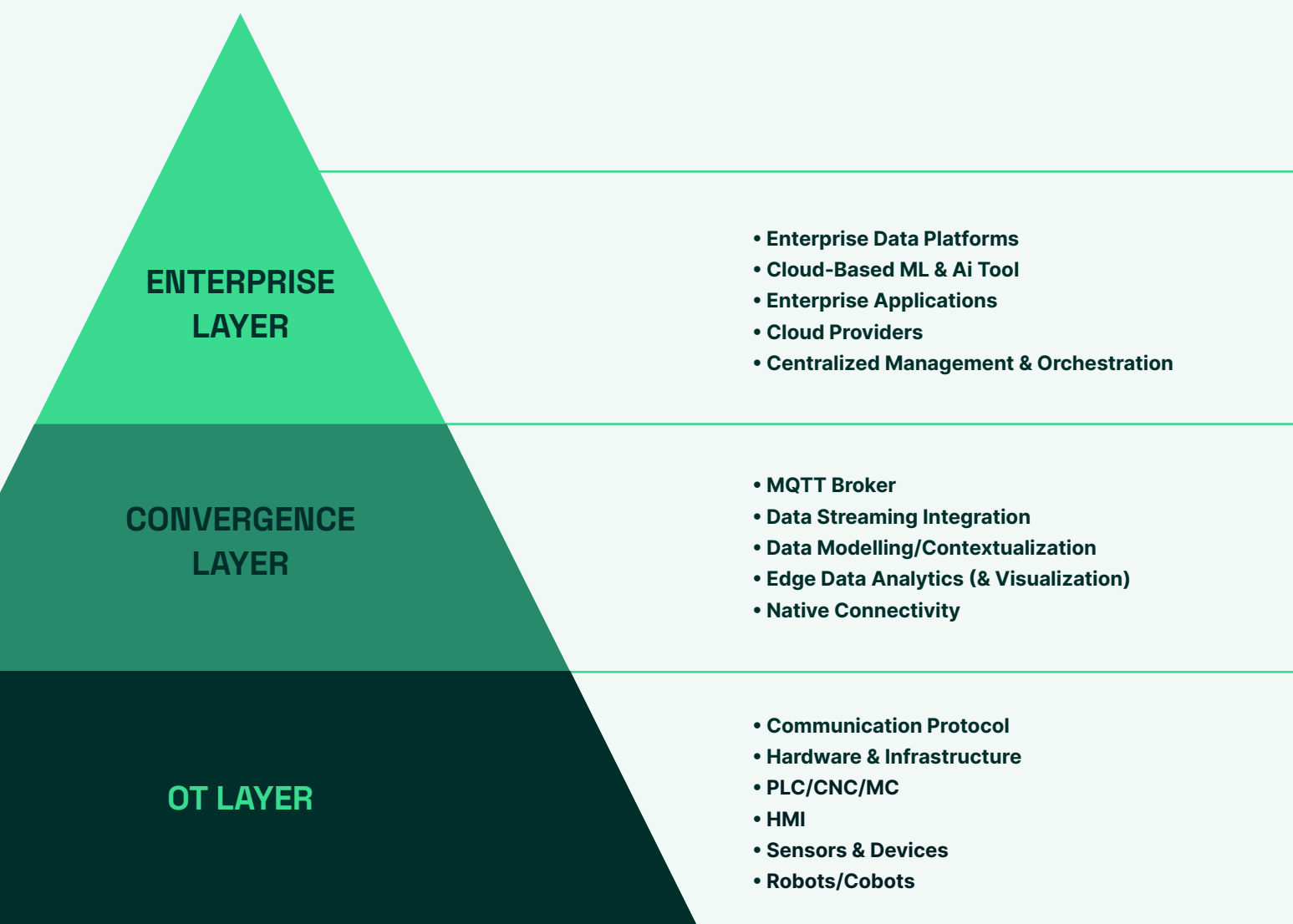


Application/ML model orchestration for enterprise-wide launches

The ability to orchestrate applications and ML models effectively is emerging as a critical need in scaling Industrial DataOps, as it ensures that complex data workflows can be managed with precision and agility. The centralization of a global application library can enable tailored deployment of applications and ML models to specific sites based on their unique operational requirements, enhancing efficiency and alignment with strategic objectives. These capabilities ensure that updates and improvements to machine learning algorithms and data processing tools can be rolled out swiftly and without disruption, keeping production lines, monitoring systems, and predictive maintenance services running at peak performance.

FUNCTIONAL SEGMENTATION

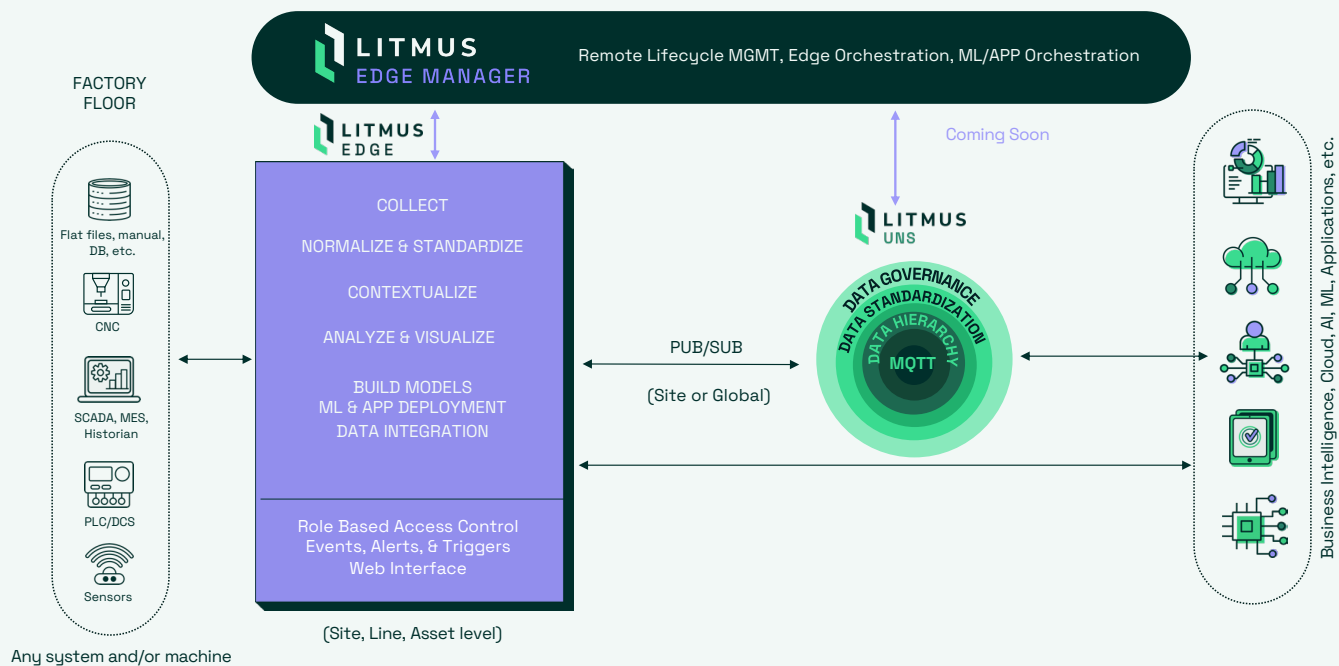
Selecting the right offering for Industrial DataOps is daunting, given the market's complexity and limited comprehensive solutions. The convergence layer is especially critical because it must facilitate effective communication between the OT and IT world, provide strong edge capabilities, and robust cloud integrations. This triad enables effective data collection, analysis & processing, MLOps & application deployment at the edge, and data integration for enhanced operational efficiency. Success hinges on platforms and solutions that seamlessly merge these elements, enhancing industrial operations.



WHY LITMUS?

Unlocking trapped operational technology (OT) data from legacy fragmented sources and activating it for actionable insights remain challenging. Industrial DataOps is critical to activate your data through the process of data acquisition and transformation of raw data, into a clean and aggregated format for data consumers to drive better informed decisions. Hence, the Litmus Industrial DataOps Suite – the only complete offering that empowers manufacturers to establish a robust, secure, and scalable approach to managing OT data at scale, unlocking its full potential for continuous improvement and optimization.

LITMUS INDUSTRIAL DATAOPS SUITE



BENEFITS

CONVERGE IT/OT

Litmus Edge, the backbone of the Litmus Industrial DataOps Suite connects to PLCs, CNCs, DCS, sensors, and every system on the plant floor in minutes with native connectors. It builds a robust data pipeline with rich contextualized data for meaningful analysis, before securely sending it to the cloud and other desired endpoints like business systems.

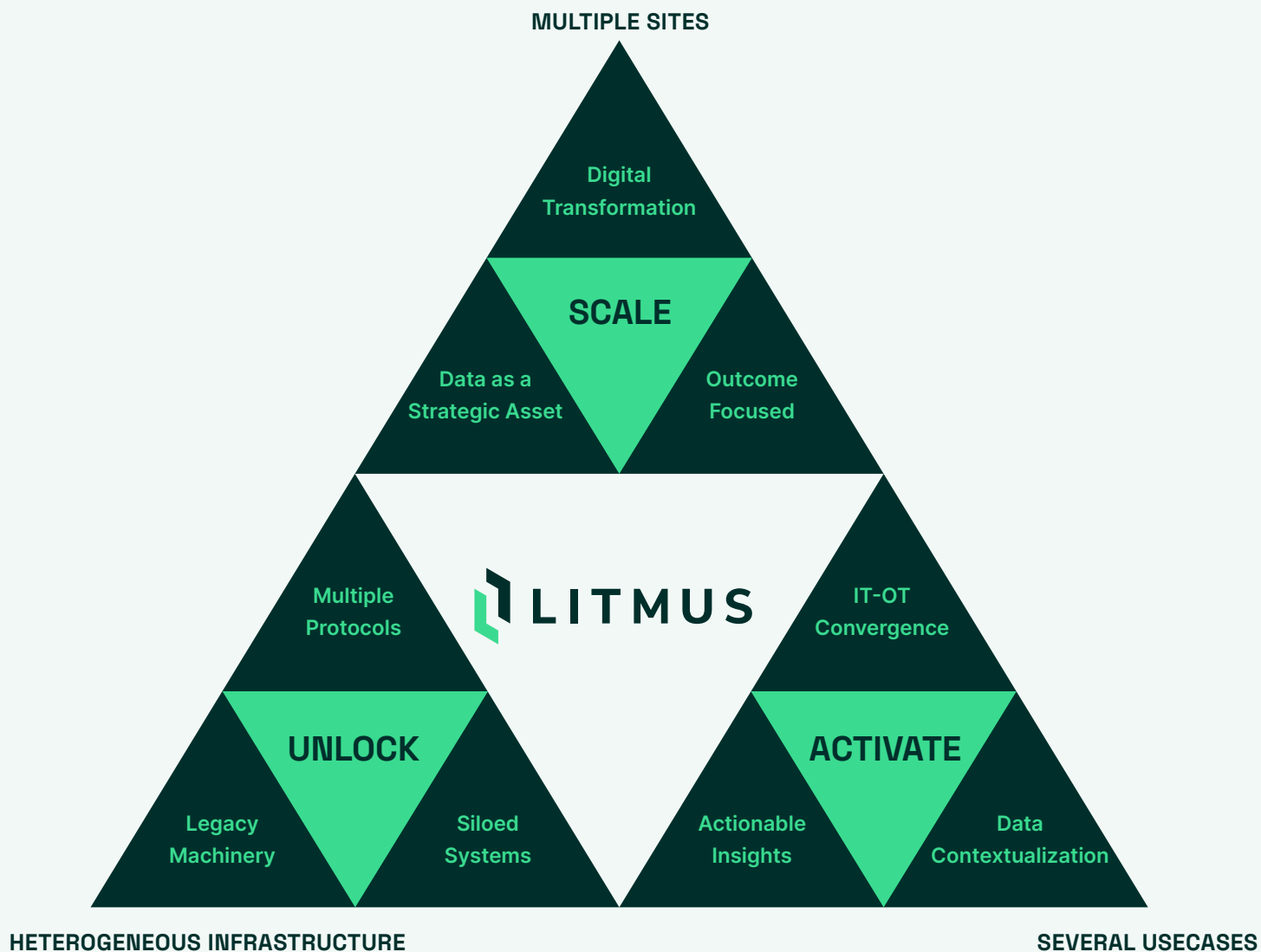
SCALE FAST

Litmus Edge Manager provides a single pane of glass to your complete edge deployment across multiple sites. Templates enable simple, repeatable way to replicate successful use cases for an enterprise-wide data strategy solving complexities and ensuring consistent data management practices.

ACCESS AND GOVERN DATA

Litmus UNS guarantees data accessibility for everyone within the organization by ensuring robust data security and governance. It is built to manage the demands of even the largest industrial environments. Make informed decisions with complete transparency.

WHEN IS LITMUS THE RIGHT CHOICE?



Device Connectivity



Data Collection & Normalization



Data Analysis and Visualization



Data Contextualization



Data Integration



MLOps at the Edge



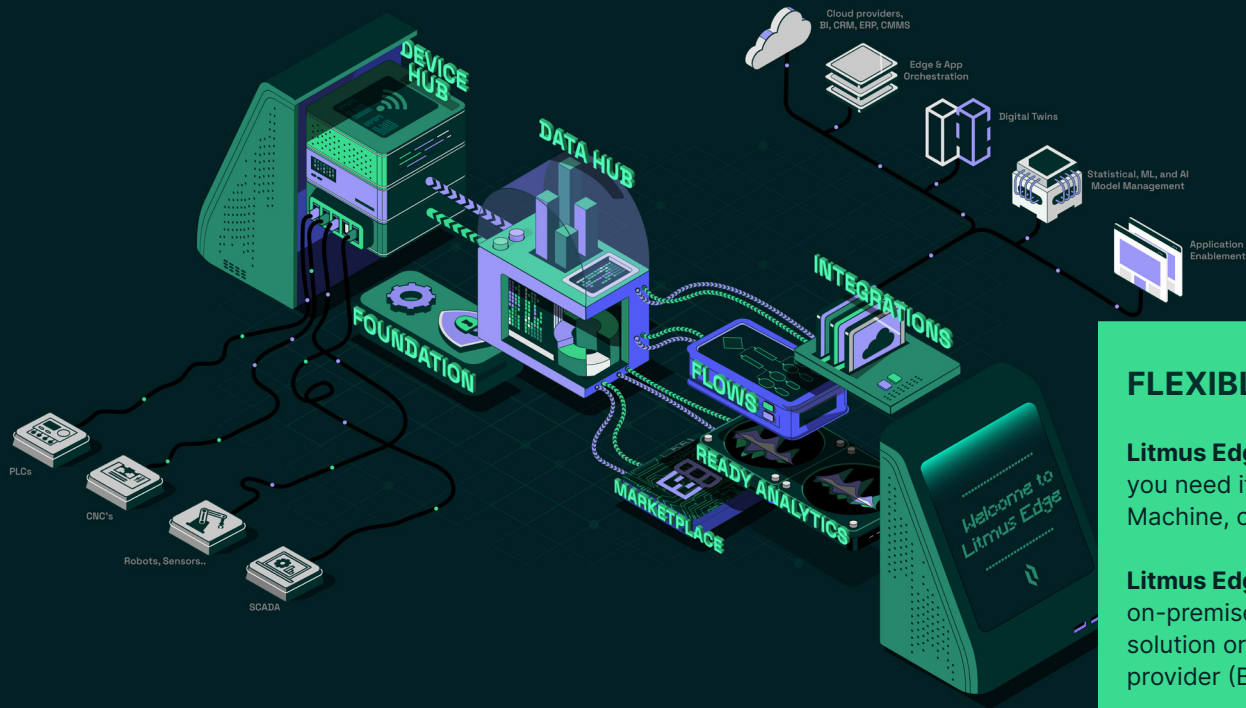
Data Governance & Security



Digital Twin Modeling



Management at Scale



FLEXIBLE DEPLOYMENT

Litmus Edge – Deploy anywhere you need it – bare metal, Virtual Machine, or as a Container.

Litmus Edge Manager – Deploy on-premise for a fully private solution or preferred cloud provider (BYOS).

Litmus UNS – Deploy on your own terms – VM, Docker, Kubernetes Operator, and all cloud images available.

LITMUS EDGE FEATURES

Effortless Industrial Connectivity

Connect to Anything: PLCs, DCS, SCADA, Historians (Siemens, Allen-Bradley, Hitachi, etc.) in minutes. Pre-built drivers simplify setup at no extra cost.

Unifying Data Hub

Collect & Contextualize: Gather data from industrial systems, model it for easy analysis. Store & access historical data (time-series) for the entire organization.

Actionable Operational Analytics

Analyze at the Edge: Get insights before sending data to the cloud. Build custom analytics. Configure KPIs (OEE, uptime) with no coding. Perform live data analysis.

Built-in Applications Marketplace

Pre-loaded Apps: 50+ applications including the Docker Registry. Create & deploy containerized applications. Bootstrap Industry 4.0 with Solutions templates.

Seamless Data Integration

Connect to Everything: Send pre-processed data to BI tools, cloud storage, enterprise apps. Subscribe to services for a continuous feedback loop. Use REST APIs as you need.

LITMUS EDGE MANAGER FEATURES

- **Centralized Edge Management**
- **License Management**
- **Over-the-air Updates**
- **Configuration Management**
- **Backup and Restore**
- **Template Blueprints Management**

LITMUS UNS FEATURES

Pub/Sub Communication

Enable effortless data exchange with a built-in enterprise-grade MQTT broker.

Data Hierarchy

Forget rigid, vendor-specific data structures. Define and manage your data hierarchy exactly the way you need it.

Data Standardization

Define precise data schemas, enforce validation rules, and ensure every data point adheres to your defined standards.

FEATURES CHECKLIST

Below is the checklist that can serve as a guide for validating that an Industrial DataOps solution is equipped with the essential features to support high-value industrial use cases and drive meaningful outcomes at scale.



FEATURES	LITMUS	OTHER VENDOR
Native Industrial Connectivity, Data Collection & Normalization		
PLC Drivers (Rockwell, Siemens - 250+ more)	✓	
CNC Drivers	✓	
DCS Drivers	✓	
OPCUA Client	✓	
Inbuilt OPCUA Server	✓	
MQTT & SPB Client	✓	
OSI Soft PI connectivity	✓	
Other Historian	✓	
Building Automation Protocols	✓	
Energy and O&G Protocols (DNP3)	✓	
Discover OT Data Sources (PLCs, Historians, OPC, etc.)	✓	
Tags and Data Discovery	✓	
Standardized JSON format for data	✓	

FEATURES	LITMUS	OTHER VENDOR
Edge Analytics & Visualization		
Local Data Storage (Timeseries DB) & Historian Replacements	✓	
Inbuilt low-code Edge Analytics	✓	
Edge Machine Learning and AI inferencing	✓	
Automated Manufacturing KPIs	✓	
Data Contextualization, Data and Asset Modeling, & Digital Twins		
Asset Models and Data Models authoring	✓	
Asset Instances and Runtimes	✓	
Central / Global Asset Model Management	✓	
Native Cloud Integration		
Microsoft Azure (IoT Hub, Event Hub, Event Grid, Blob)	✓	
AWS (IoT Core, S3, Sitewise)	✓	
GCP (Pubsub, MDE)	✓	
Databricks (Warehouse, Unity Catalog, Delta Sharing)	✓	
Snowflake	✓	
Various Brokers (Kafka, AMQP, MQTT etc.)	✓	
Various DBs (SQL, MySQL, Postgres, Influx etc.)	✓	
Edge Applications		
Bring your own docker apps (ML models, AI models, third-party apps, custom scripts & more)	✓	
Unified Namespace (and Governance)		
MQTT Broker (3.x, 5.x Compliant)	✓	
UNS Hierarchy	✓	
Data Structure Management	✓	
GraphQL Interface	✓	

FEATURES	LITMUS	OTHER VENDOR
Central Management, Governance, & APIs		
Published & Open APIs (all products)	✓	
Global provisioning	✓	
Global OTA update	✓	
Global back-up restore	✓	
Global Use case blueprints / Templates	✓	
Global Policies Enforcement & Security Management	✓	
Global Licensing Management	✓	
Global Remote (VPN) Access to Edge Nodes	✓	
Global Certificate Management	✓	
Deployment		
Virtual Machine (ESXI, Hyper-V)	✓	
Docker	✓	
Kubernetes (K8S) Native	✓	
Kubernetes (K8S) Operator	✓	
Microsoft Azure ARC, IoT Edge Module, IoT Operations	✓	
Performance & Resiliency		
1+ Million Tags / Second - Ingress, Analytics and Egress at the Edge	✓	
10000+ Edge Nodes Central Management	✓	
Low Latency Analytics	✓	
HA, Clustering & Fail-over	✓	
Unlimited Licensing		
Unlimited Instances, Devices, Tags, Drivers (all drivers included), Integrations (all included), Analytics, Apps, Projects per site	✓	
Alternative - Limited Tags for Lower Cost for Small Sites	✓	



GETTING STARTED

Choosing the right enterprise-grade Industrial DataOps solution is crucial for projects aiming to address both current and future business needs, ensuring the solution facilitates both multiple use cases and enterprise scale. Delve first into the intrinsic capabilities of the Industrial DataOps platform, but equally important are the broader enterprise requirements.

Selecting a secure, scalable platform that supports rapid deployment and easy replication guarantees long-term validity and functionality of the solution. Many organizations find themselves in “pilot purgatory,” focusing on immediate fixes in a single facility without considering potential scalability and broader application across multiple sites.

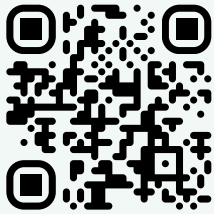
Flexible, enterprise-grade solutions like the Litmus Industrial DataOps Suite excel in unlocking Operational Technology (OT) data, activating the data for meaningful insights, and making that data usable for enterprise scale to help transform operations efficiently and swiftly. To discover more about how Litmus can revolutionize your approach to Industrial DataOps, we invite you to contact us.

**SIGN-UP FOR A FREE LITMUS
CENTRAL PORTAL ACCOUNT TODAY!**

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About Litmus

Litmus is an Industrial Data Ops company that enables Industrial companies to unlock and activate their operations data at scale. Rapid-to-deploy, easy-to-use and built-to scale, Litmus is a fast way to connect to all operational technology (OT) assets and put data to work at the edge and across the enterprise. Litmus technology is trusted by Google Cloud, Parker Hannifin, Dell Technologies, HPE Mitsubishi, and other global Fortune 500 companies.