EDGEIQ

DeviceOps and the Connected Product Economy

A guide to what it is and how to get started

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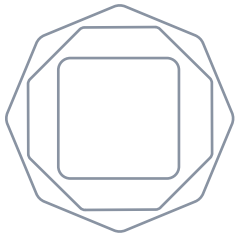
Executive summary

The Connected Product Economy is a $1 Trillion market phenomenon forcing existential decisions for tens of thousands of businesses. Business transformation in these companies is no longer an option - it's imperative.

A company's ability to create digital-first experiences, world-class customer service, new revenue streams, and monetization models will determine if they are in the headlines or footnotes of the story being written today.

Connected Product Companies are entirely reinventing their businesses, the customer experience, and shareholder value. In many companies, these decisions are forcing the fundamental question,
"What business am I in?

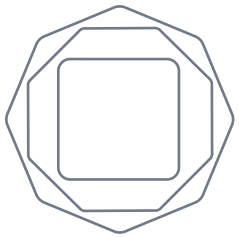


At its launch in 2010, Nest wasn't the first network-enabled thermostat. But the combination of transformational design, intelligence, and connectivity, along with integration into so many external services, changed everything. As a result, the new product unlocked billions of dollars of opportunity throughout the value chain.

The same opportunity exists for thousands of other companies, from medical devices to digital signs and drones. The connected element of connected products is as much about what it enables internally as it impacts externally. But that's also part of the challenge - using this once-in-a-lifetime opportunity to break down organizational silos and reconsider entirely new business and customer engagement models. Businesses that execute successfully in the next three to five years will see massive impacts on cost savings, time-to-market, competitive differentiation, and a new valuation calculus for all shareholders and stakeholders.

What types of new services can be created?

Biotronik, a medical device company, initially manufactured stand-alone pacemakers, insulin pumps, and other devices. Now it offers smart, connected devices, such as a home health-monitoring system with a data processing center that allows physicians to remotely monitor their patients' devices and clinical status.

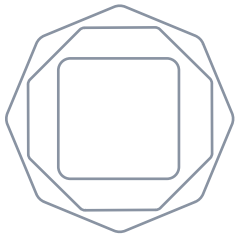


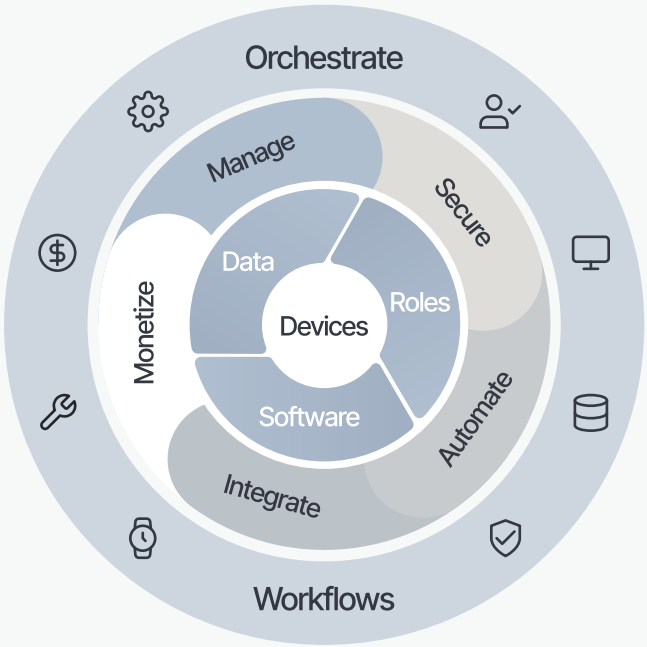
But anyone who thinks creating a connected product is as simple as embedding a wireless modem in their product, connecting to a cloud service, and turning on the "as a service" meter is destined to fail. This is not about digitally enabling a product or even just about digital transformation. The connected product economy is about business transformation. Business transformation requires new organizational frameworks and architectures that marry process and technology.

Just as DevOps forever changed how software is developed, tested, deployed, secured, and managed, the Connected Product Economy and its value chain need a framework and set of technologies to accelerate and scale the journey - enter DeviceOps.

What is DeviceOps?

DeviceOps is an operational framework, reference architecture, and new technology stack that empowers connected product businesses to achieve their business transformation goals. It touches on device lifecycle management, customer management, data management and analytics, process automation, software management, cloud and application integration, workflow orchestration, and ultimately monetization of devices, services, and data. Cutting across all the layers is an identity and security structure, a gateway for accessing data, and tools that connect the data from smart, connected products bidirectionally to multiple interfaces and business systems.





Building and supporting the technology stack for smart, connected products requires substantial investment and a range of new skills. These skills include true full-stack software development, systems engineering, data analytics, cloud infrastructure management, and online security expertise rarely found in manufacturing companies.

If DeviceOps sounds boring, it's because it is. It handles all the device lifecycle and data management, user and account administration, secure access, multi-directional integration, and workflow orchestration. And it's not something you should be doing yourself. DIY DeviceOps leads you into a quagmire of technical debt, bugs, and workarounds. What's more, it robs resources from strategic priorities.

Why Does DeviceOps Matter?

Without DeviceOps, connected products are just a patchwork of components with some form of connectivity thrown in.

Yes, they provide the underlying infrastructure but lack the necessary deep integration and orchestration to transform the business and its processes.

Connected products and the data they produce should create and compel collaboration and innovation among all participants in the value chain:

executive leadership, product management, product development, customer support, customers, and partners.

Getting DeviceOps wrong will set connected product companies back while the competition accelerates value creation.

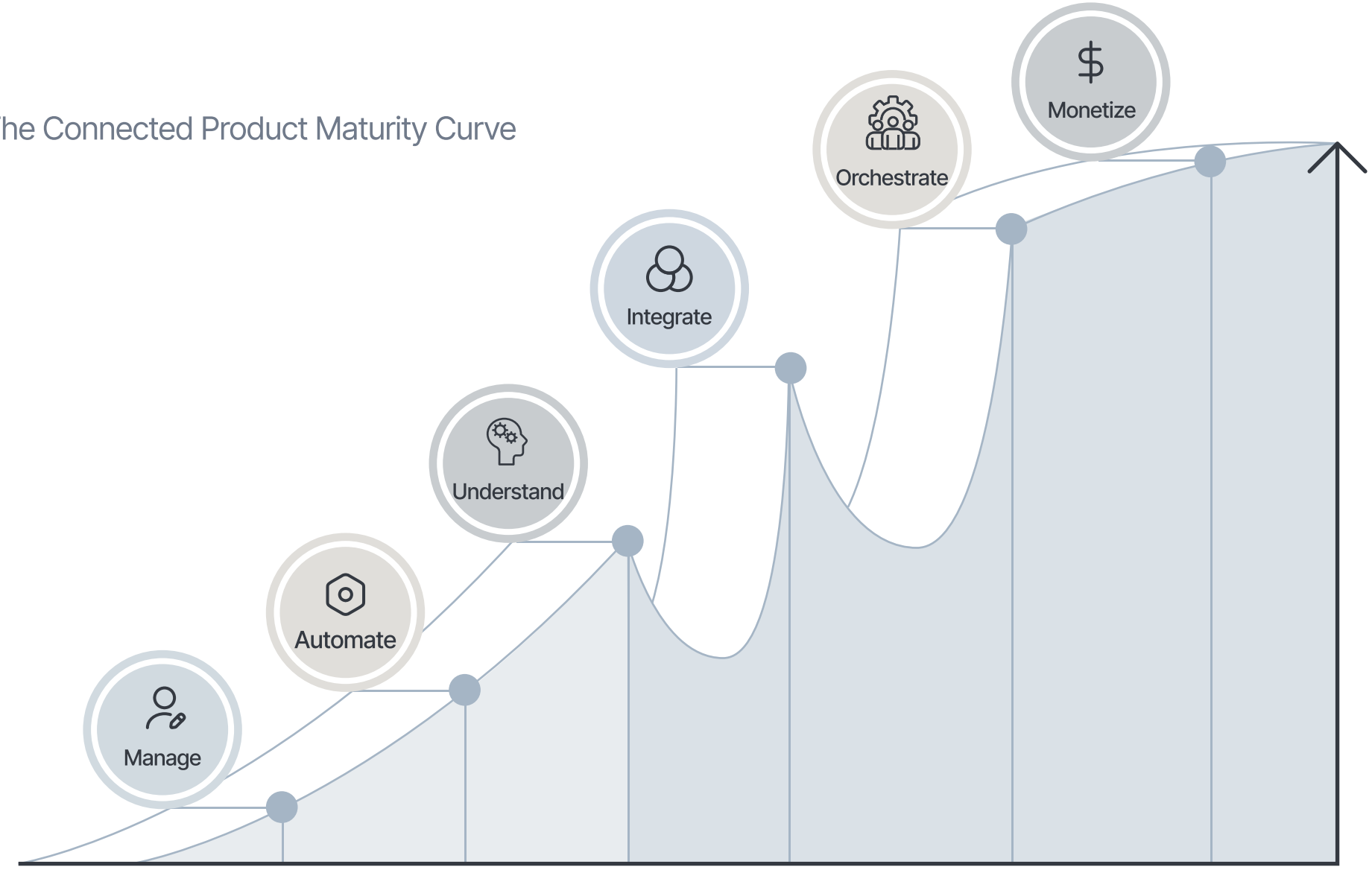
On the other hand, the proper DeviceOps framework and technologies allow organizations to focus internal resources on the most strategic and differentiated products and services, not the underlying infrastructure.

The Connected Product Maturity Curve

Digital and business transformation is imperative but difficult. The journey is never short, linear, smooth, or painless. In the Connected Product Economy, business transformation is the most complex undertaking in any market segment. Software-as-a-Service evolved over time and required the wizardry of companies like Salesforce. Hardware-as-a-Service requires downright alchemy and it will require companies to completely reinvent their business models.

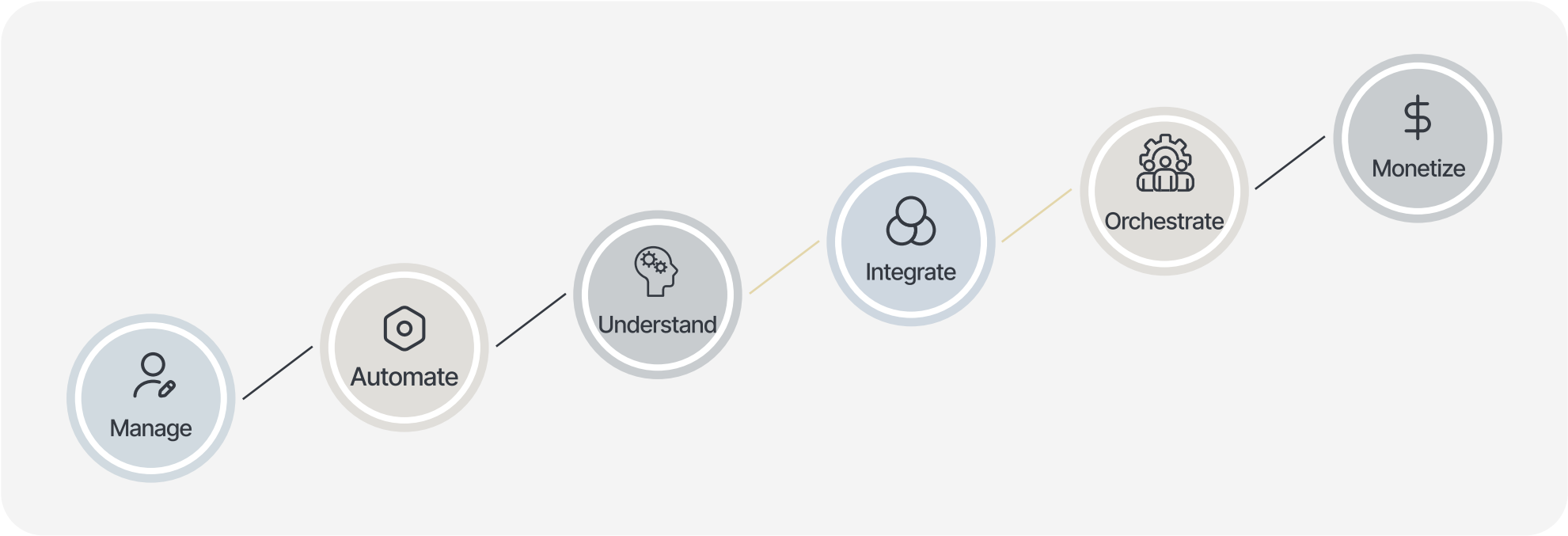
To win at Hardware-as-a-Service, companies must climb the Connected Product Maturity Curve. For connected product companies, it is a steeper summit than imagined, and there are at least two chasms into which many companies fall. That is why organizations must embrace both a DeviceOps framework to drive decisions and processes and a supporting DeviceOps software platform.

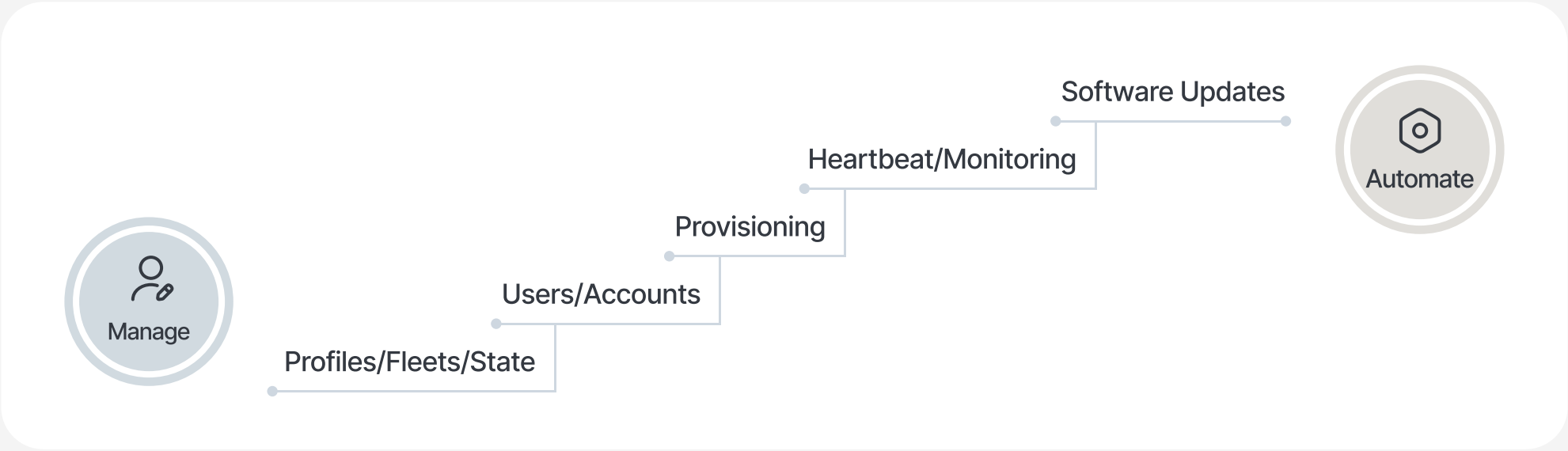
The Connected Product Maturity Curve



Phase 0: Connect

The starting point is the set of technology decisions around physically connecting device fleets to a network and eventually, to the Internet. This is the simplest set of decisions that need to be made and work to be done.



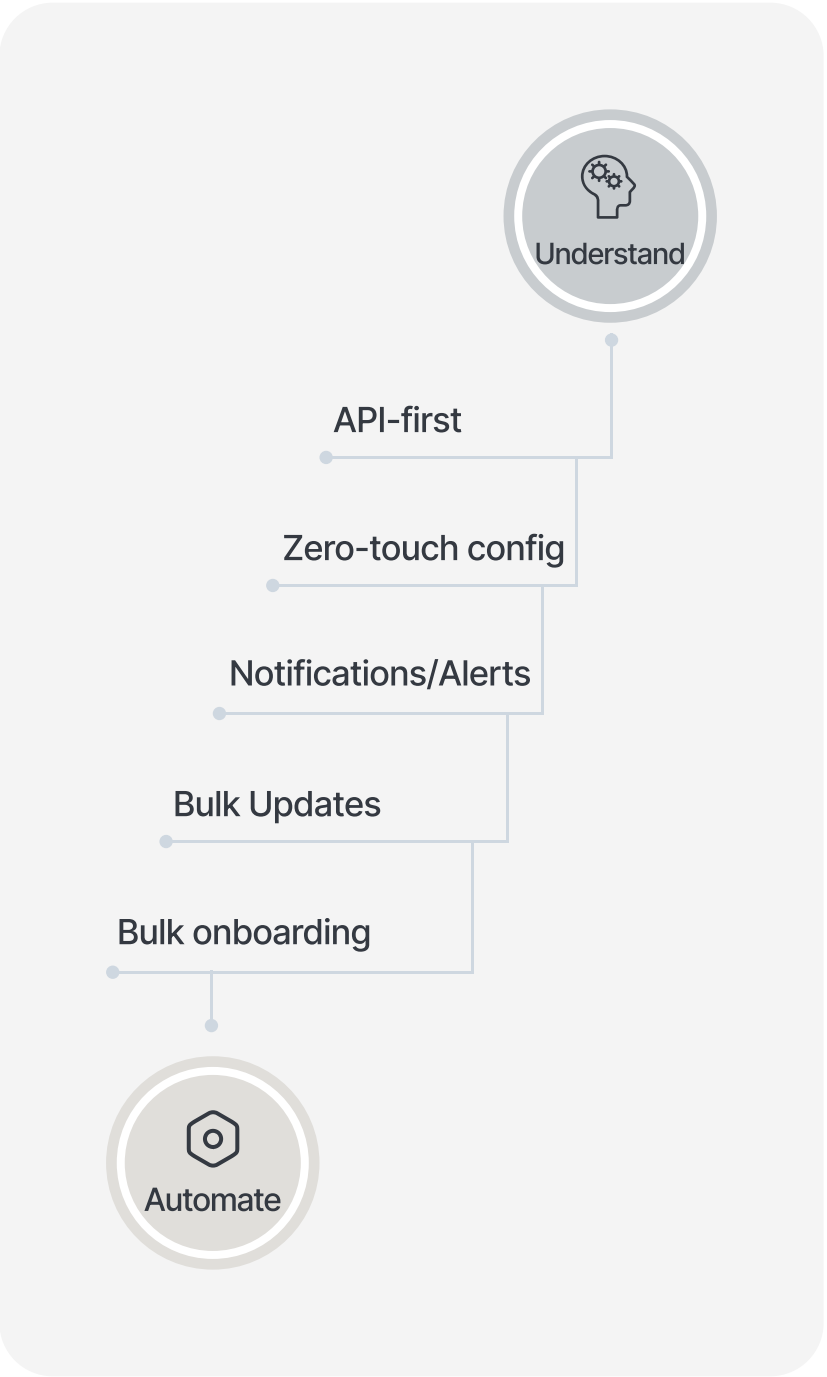


Phase 1: Manage

First phase is where the real work begins. Organizations must now build and maintain software for remote provisioning, monitoring, software updates, commands, and other requirements for cradle-to-grave device fleet management. With a small number of internal users interacting with devices, the interfaces can be functionally simple and even programmatic.

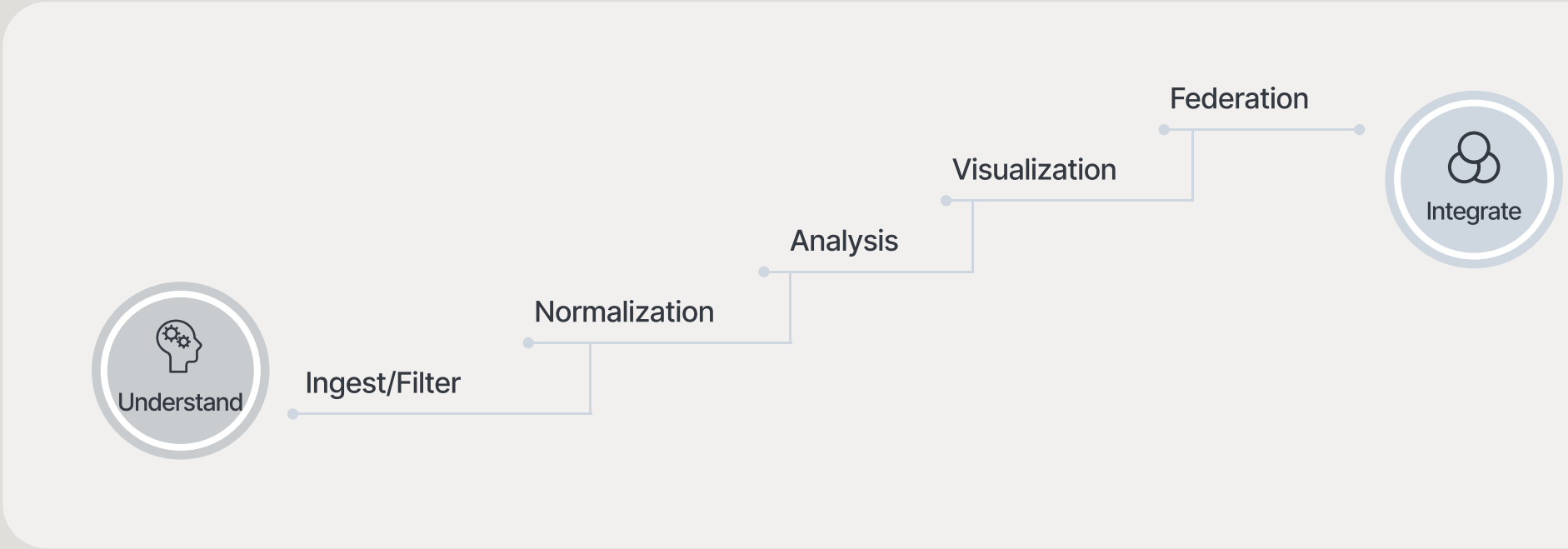
Phase 2: Automate

Once the system starts to scale and customers and non-technical stakeholders begin using it, basic management tasks must be automated. Bulk onboarding, zero-touch provisioning, configurable heartbeats, bulk updates for specific event-based alerting, and notifications become table stakes at this stage.

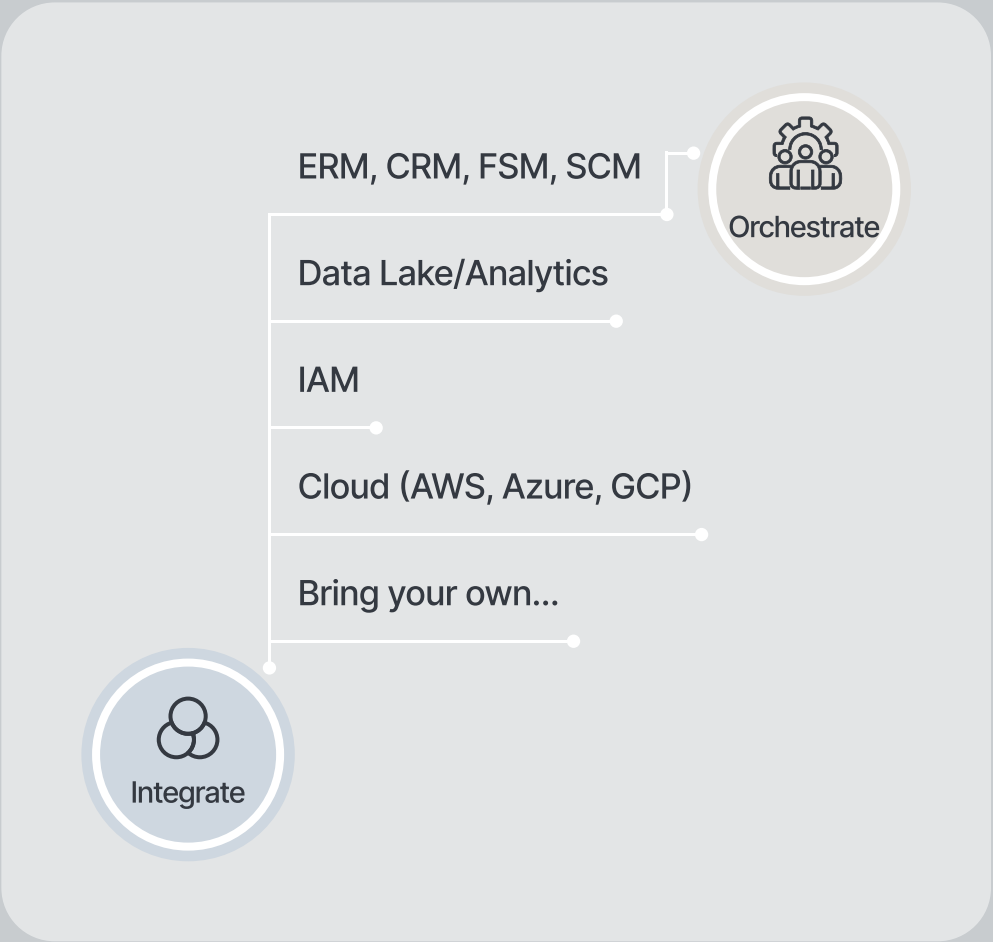


Phase 3: Understand

What product manufacturers want and customers expect is both operational data and device performance data. At this stage, organizations must be able to consume, filter, federate, analyze, visualize, and act on both types of data. Only at the end of this stage do organizations move from product transformation to digital transformation.



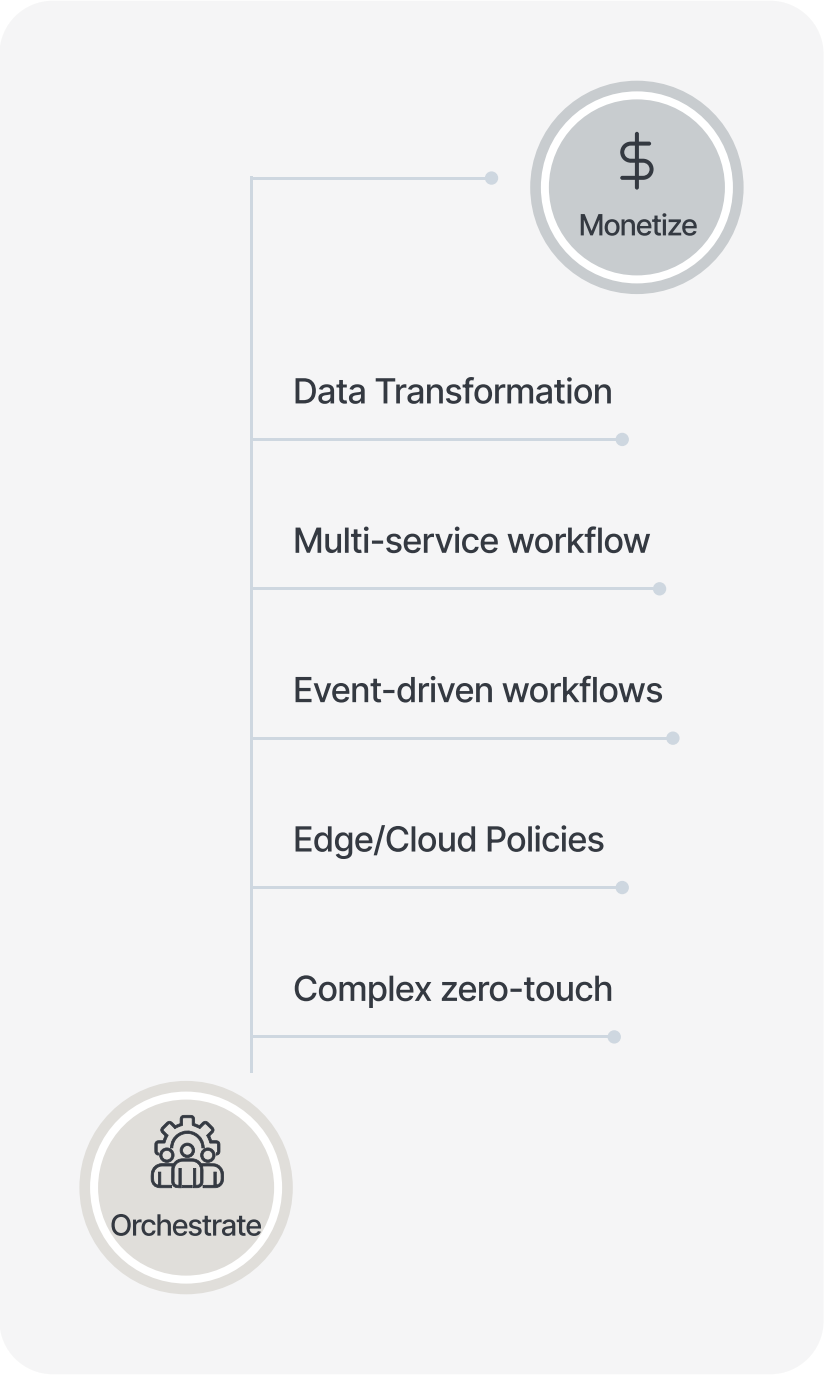
Phase 4: Integrate



Getting to this phase requires crossing the first chasm of the Connected Product Maturity Curve. To realize meaningful digital transformation, organizations must deal with the complexity of integrating their devices and data with specific cloud services, IAM services, homegrown custom applications, customer and partner systems, and third-party enterprise applications. In addition, managing the interfaces, authentications, and permissions alone is daunting.

Phase 5: Orchestrate

The steepest climb up the Connected Product Maturity curve also comes with a second chasm. Moving from multi-service Integration to workflow orchestration is the journey's hardest and most crucial phase. Orchestration is about automating workflows or triggering events via two-way communication between devices and homegrown or commercial applications, in-house and potentially across supply chains.



Phase 6: Monetize

Monetizing the implementation of DeviceOps is the goal of this journey. Digital-first connected product businesses will see the financial value in three primary ways.

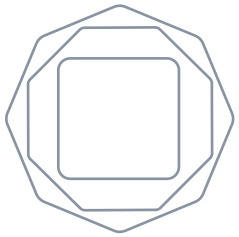
- The first is cost savings from not building software that can be bought off the shelf. Similarly, there are dramatic cost savings through the automation of tasks from deployment to remote service and auto-healing.

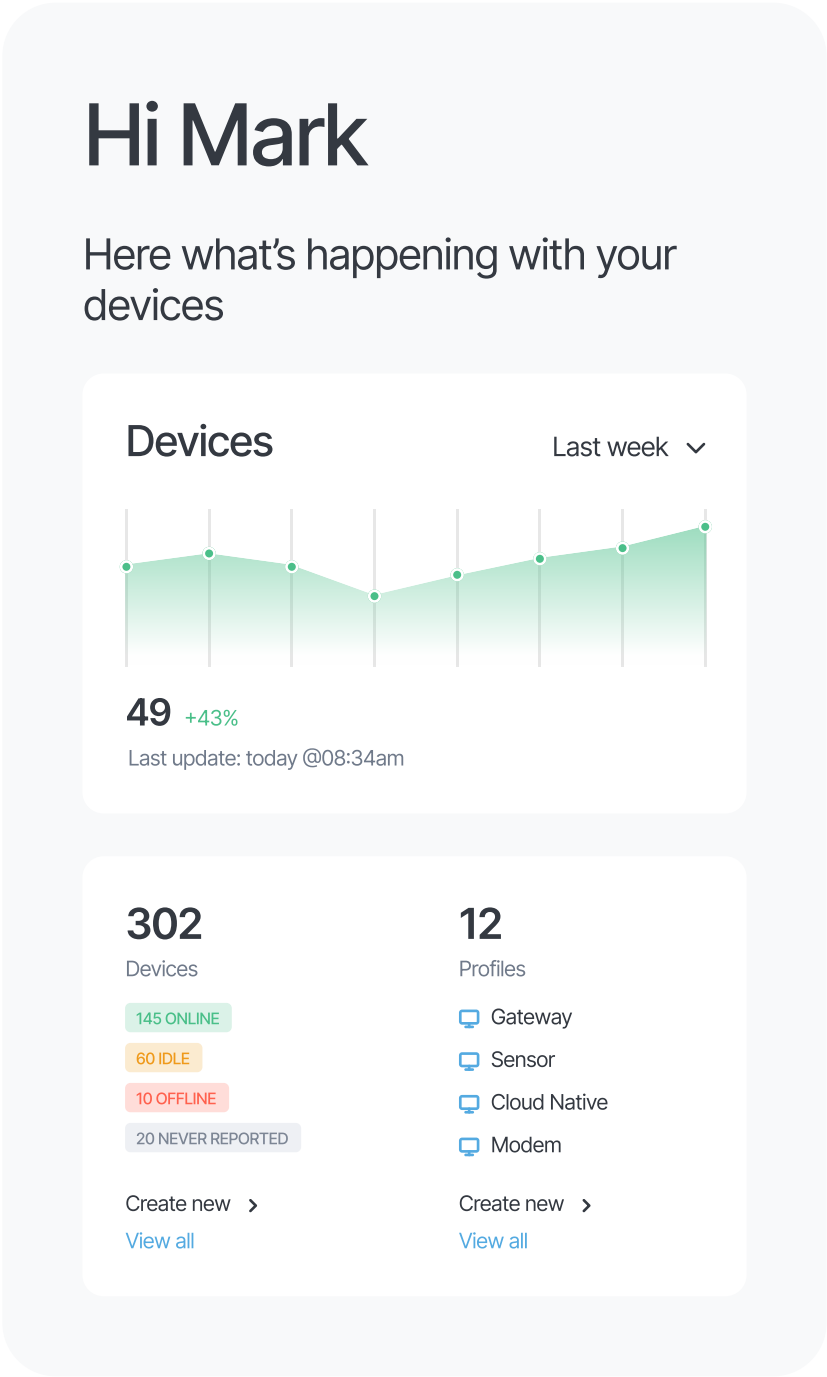
- The second monetization impact is customer retention and new customer acquisition through market-leading, digital-first offerings.What will quickly become table stakes is still a competitive advantage.

- The third way connected product companies will monetize DeviceOps strategies is in their market valuation calculus. It is not just more revenue, it is a better mix of higher-margin revenue. Increased market share is also realized due to innovating better than the competition.

On the cost side, savings are achieved across the board - design, development, more strategic resource allocation, and lower support cost and churn. The combination of these factors is what creates a digital-first business and an entirely new way that shareholders will value your company.

DeviceOps: Digging in Functionally





Once the decision is made to become a connected product business, there are seven key functional categories of the DeviceOps framework. Each addresses specific problems or “jobs to be done.” However, DeviceOps is also about business processes and workflows.

The categories are Device Lifecycle Management, User and Account Administration and Security, Data Management and Analytics, Software Management, Cloud Service and Application Integration, Workflow Orchestration, and Monetization.

Let’s look at what functional jobs can be achieved within each area.

Device Lifecycle Management

This foundational pillar of DeviceOps is about managing the entire lifecycle of a device or fleet of devices from its earliest point in the supply chain to the day it is decommissioned. This includes defining device states, provisioning and configuration, monitoring, diagnostics, and updates.

- Profile Definition
- Device Onboarding and Fleet Management
- State Management
- Provisioning
- Wellness Monitoring
- Alerting and Notifications
- Command and Configuration Management

User and Account Administration and Security

This area focuses on providing granular control over features, commands, data visibility, and systems management. Control is extended not just to individuals but also to accounts and organizations.

- Internal user roles and permissions management
- External user role and permissions management
- Multi-tier account and organizational hierarchy support
- Integration with third party access management
- General Security, Visibility and Control bound to roles and organization

Data Management and Analytics

This category is about the ability to ingest, normalize, filter, federate, store, analyze, and visualize data about the device or network. It also extends the same capabilities to device payload data.

- Protocol agnostic data consumption
- Data Normalization (JSON)
- Data Filtering
- Data Federation Management
- Data visualization
- Analytics infrastructure
- Data driven Event triggers
- Data analysis

Software Management

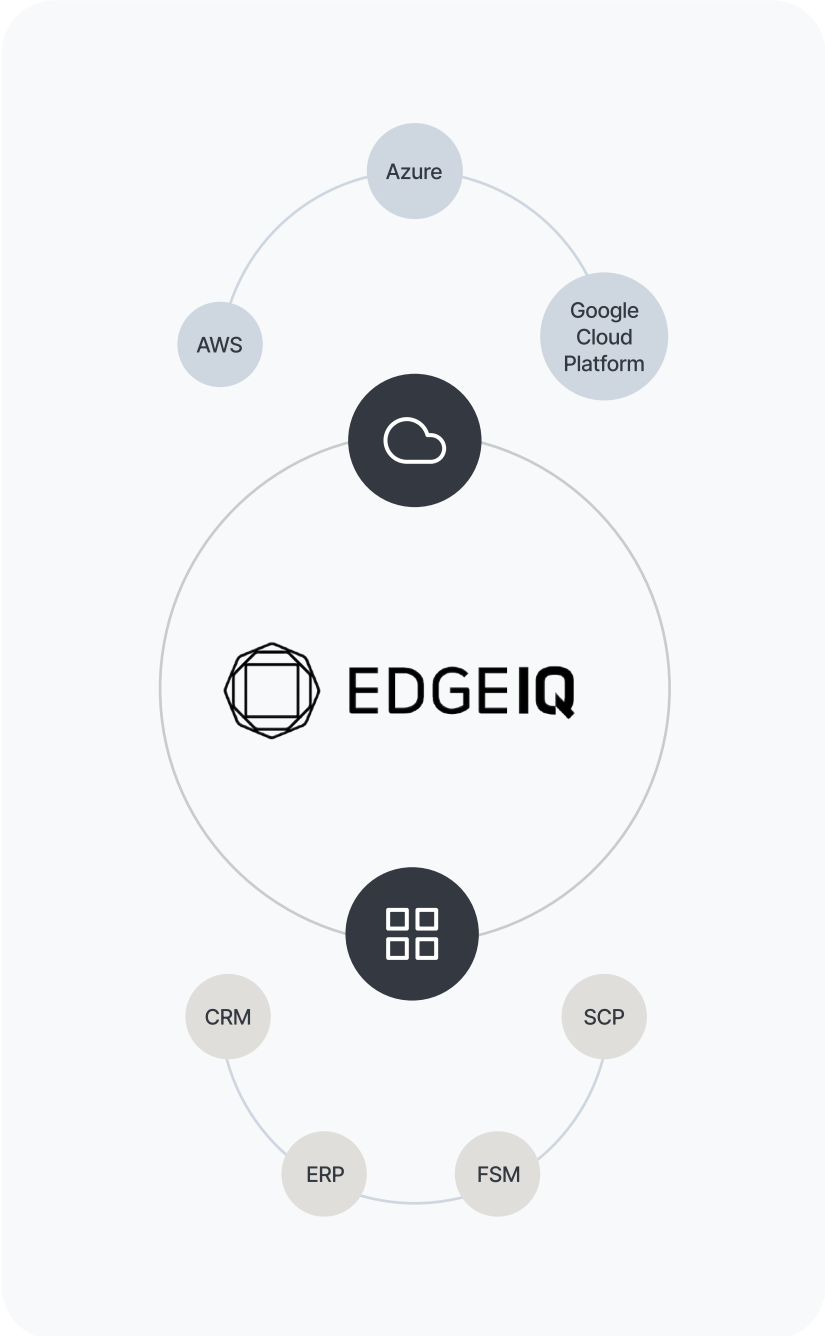
Here, the focus is on enabling the scheduling and execution of a wide range of software updates on a device or fleet of devices.

Software system of record

Firmware updates

Application updates

OS updates



Cloud Service and Application Integration

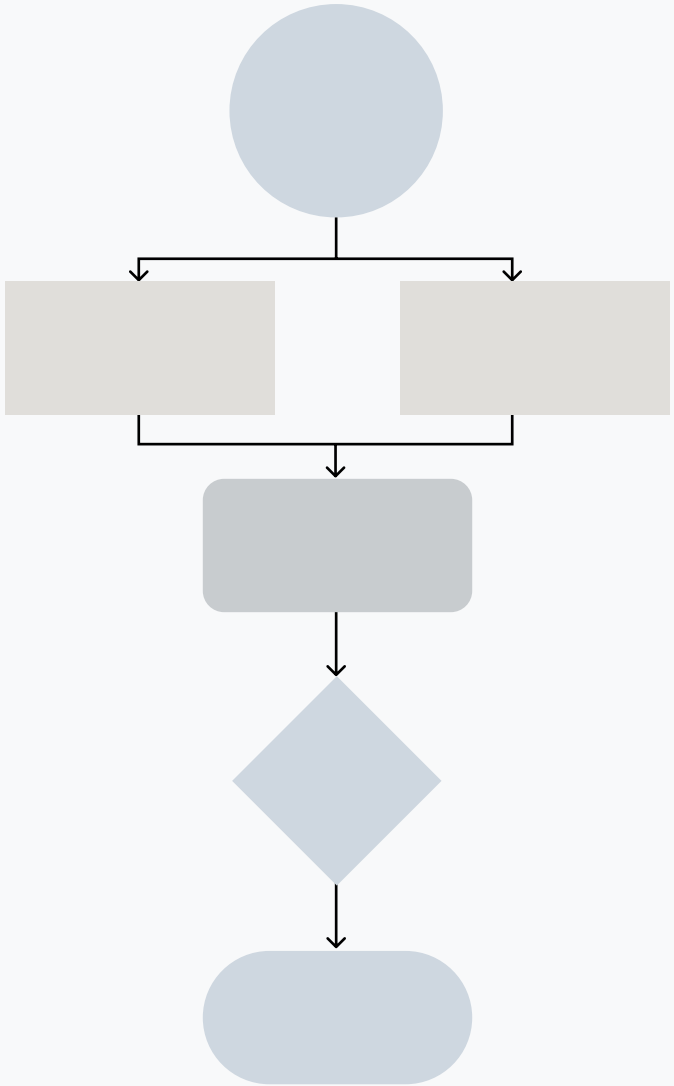
This category enables easy setup and integration with “bring your own account’ capabilities for third-party applications and infrastructure.

- Bring your own cloud infrastructure (AWS, Azure, Google)
- Bring your own enterprise applications (CRM, ERP, FSM, SCP)
- Develop customer applications against standard restful API

Workflow Orchestration

Every software feature is a point solution or silo until it can be incorporated into an automated business process. Therefore, Workflow Orchestration is the pivotal element in the Connected Product Maturity Curve and the DeviceOps framework.

- Create and manage workflows tied to specific customers, their devices, their data, multiple cloud integrations, and conditions
- Build your own workflows
- Leverage pre-packaged workflows

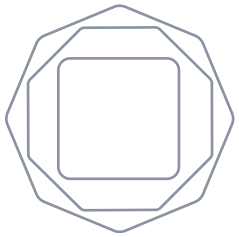


Monetization

Operational efficiency and new features become business value when you can monetize them. New business models, products, and services drive an entirely new valuation calculus for participating businesses.

- Enhanced SLAs driven from real-time device and data visibility
- Enhanced SLAs driven from remote configuration and management capabilities
- Deliver net new features as software updates
- Monetize enhanced operational data and analytics
- Monetize the device as a service
- Monetize integrations to customer enterprise systems
- Monetize packaged or custom workflows

Revisiting the Framework and Non-Functional Issues



Like DevOps, RevOps, PeopleOps, and DataOps, DeviceOps is a mindset and operational framework before it is a technology implementation. When a Connected Product business decides to transform its business with a digital-first approach, it fundamentally changes its Mindset. Moving from the decision to results requires a plan, then tools.

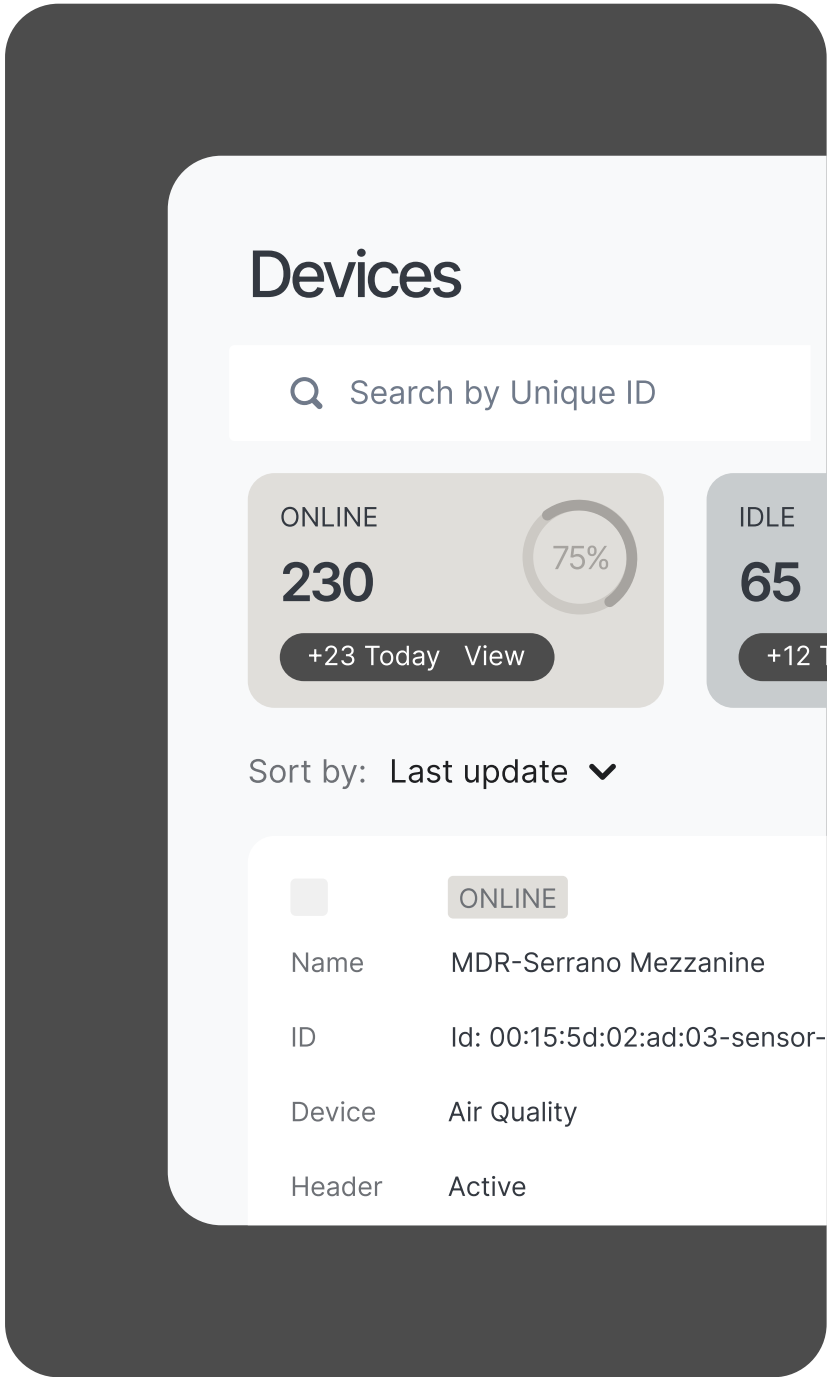
The Plan - Operational Framework

The plan begins with documenting goals, then identifies existing impediments to achieving those goals, whether poor product design, wrong people, or right people/wrong skills. Next, the plan digs into what processes must be added, eliminated, and optimized. It catalogs all stakeholders - internal and external.

It also involves a realistic assessment of the resources necessary to execute and prioritizes the steps and desired outcomes. Mostly, a plan is only a plan if it is documented and has both empowered and accountable owners. We will provide practical steps to develop and implement the plan in a future eBook.

DeviceOps Architecture

Once a business plan is in place - goals, stakeholders, resources, timeline, and owners - organizations can move to the tools for implementation. We have already addressed the functional capabilities and requirements of DeviceOps implementation. Next, it is also essential to highlight the non-functional attributes of a successful DeviceOps implementation.



Abstraction and APIs

The most important consideration in implementing a DeviceOps strategy is committing to abstracting as many of the functional components from each other as possible. For example, the tools for provisioning devices cannot be specific to the devices' firmware. The software update process cannot be hardcoded to a particular OS. Workflows require the ability to interact with various components of the DeviceOps framework in the same way.

Many of these objectives can be achieved through thoughtful architecture. But a big part of that is designing with an API-first mentality. Thinking about APIs first forces organizations to abstract features from devices, data sources, applications, and specific cloud providers. It may require a little more work on the front end, but it will de-risk, accelerate, and future-proof your strategy for years to come.

Expanding the Ecosystem

Breaking down operational silos is one of the most significant benefits of a DeviceOps implementation. DeviceOps invites more internal and external stakeholders into the Connected Product journey. It allows them to enjoy the benefits of simpler deployment processes, more reliable diagnostics, access to real-time data, and to correlate the performance of devices and processes globally.

Part of the original planning process and the blueprint is deciding when and how to expand the inner circle to field service and customer success. It determines when and what customers have access to. Your supply chain and service partners will also benefit from DeviceOps; deciding how and when requires deliberate planning. The right architecture and technology decisions will ensure you can do it securely and at scale.

Workflows, Workflows, Workflows

We've touched on the power of Workflows above, and more than once - and for a good reason. There is a major problem with IoT and Device Management platforms and most homegrown solutions. These are fundamentally point solutions and tools to solve granular problems. While they offer integrations and APIs, they almost always lack a real focus on business problems and business processes.

One of the most essential elements of the DeviceOps blueprint and mindset is visualizing the changes to processes and human interactions that will lead to financial impacts. Workflows are the most complex parts to implement - but the most valuable. Neglect at your own peril.

Conclusion

As an operational framework, DeviceOps establishes a blueprint to guide connected product businesses on their business transformation journey. While DeviceOps can seem overwhelming, seeing it as a journey of steps and stages will make it seem more attainable.

At EdgeIQ, we've created a purpose-built DeviceOps solution to help organizations move along the Connected Product Maturity curve and achieve business transformation goals. The proper framework and enabling technologies preserve an organization's ability to adapt and adopt the right processes and tools at the right time. With EdgeIQ, organizations can focus resources on what makes your connected product business genuinely differentiated. We will take care of the rest. To learn more, visit us at www.edgeiq.ai.