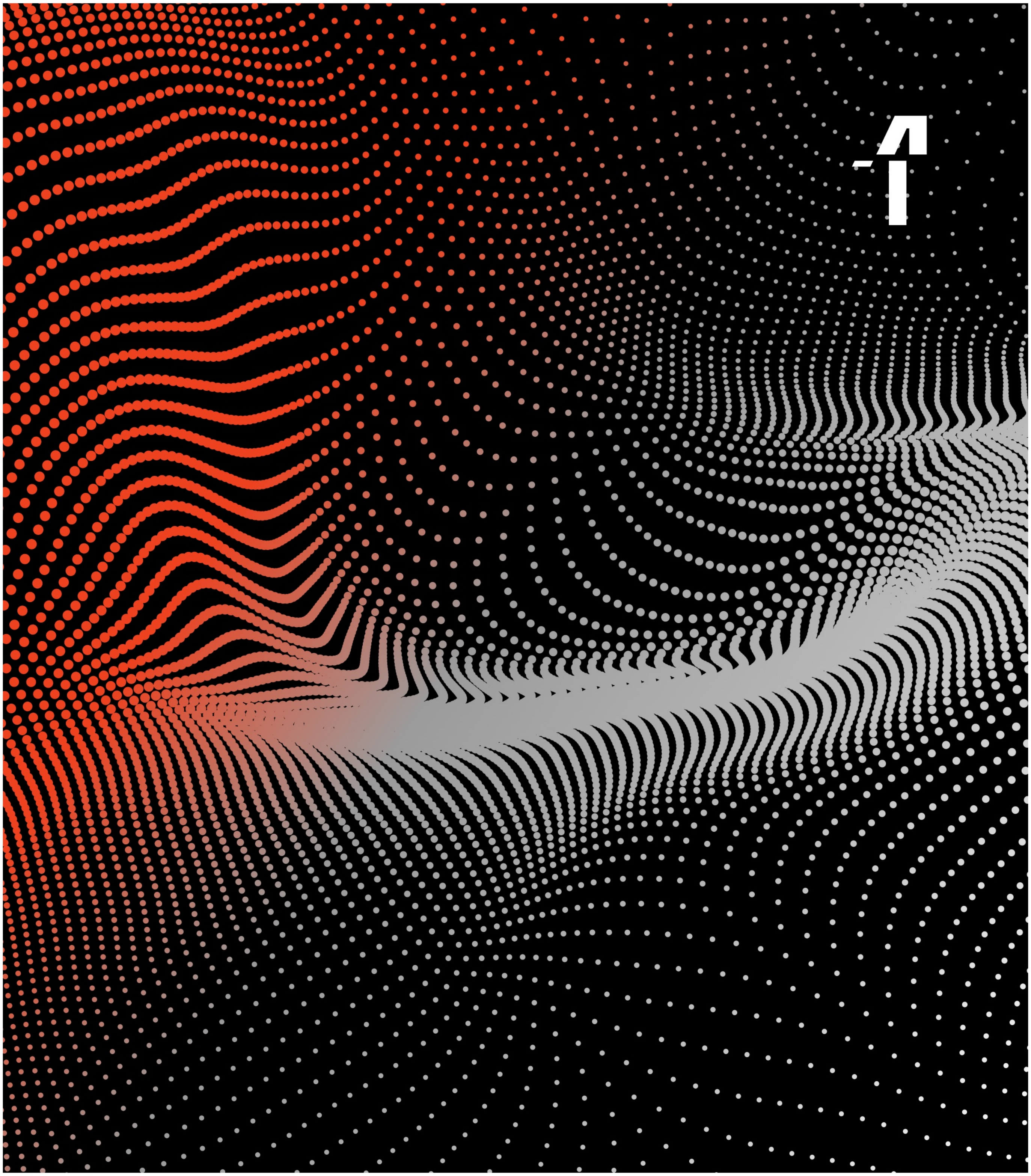
MACHINE WITHOUT LIMITS

Manifesto



The Era of Complex Machines

Machine Without Limits

Simplify Telemetry.
Scale Your Mission.

We are living through an unprecedented revolution in machine sophistication. From satellite constellations providing high-speed internet to experimental fusion reactors harnessing the power of stars, modern machines achieve feats once thought impossible. These breakthroughs echo humanity's history of exploration, where each leap forward—from Marco Polo's voyages to Neil Armstrong's steps on the Moon—pushed the boundaries of what we could achieve.

These are not merely incremental advances in capability; they represent a fundamental transformation in how machines perceive, decide, and act in the world.

What makes this transformation possible is the seamless convergence of physical engineering with advanced software. Modern machines are as much digital as they are physical, generating vast streams of data orchestrated by sophisticated software. A single test flight of a new aircraft produces terabytes of telemetry data, while a modern satellite monitors thousands of parameters in real time just to maintain its orbit.

Yet, as machines grow more capable, their complexity also creates a paradox. Progress often stalls as engineers face unprecedented challenges in managing intricate networks of subsystems—each with unique behaviors, failure modes, and performance characteristics. A spacecraft may contain over a million parts, many with embedded sensors, while an autonomous vehicle must process inputs from hundreds of sensors in split seconds. This complexity is essential to their capabilities but makes understanding and controlling them extraordinarily difficult.

This growing intricacy also exposes a bottleneck:

engineers are developing 21st-century machines with 20th-century tools.

Failures like Boeing's Starliner spacecraft, caused not by mechanical faults but by software errors buried in telemetry data, underscore the risks of relying on ad-hoc systems for understanding machine behavior. The tools meant to support progress often hinder it, leaving engineers struggling to piece together insights from disconnected data streams.

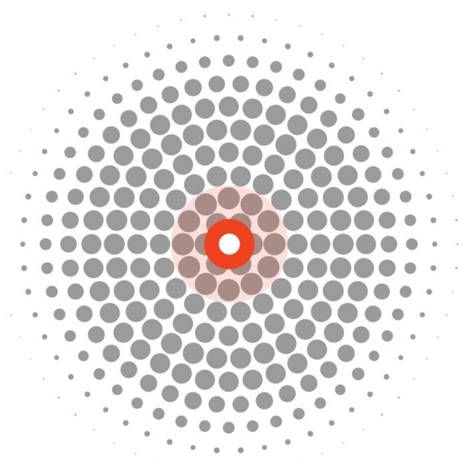
The stakes have never been higher. These machines are critical to solving the greatest challenges of the 21st century—from decarbonizing our energy systems to transforming transportation and manufacturing. The difference between success and failure often comes down to our ability to manage their complexity, yet the tools available to engineers have failed to keep pace. This disconnect between the sophistication of machines and the tools used to create them underscores an urgent need for a full-stack engineering platform, akin to what SpaceX pioneered in its modern, software-driven approach.

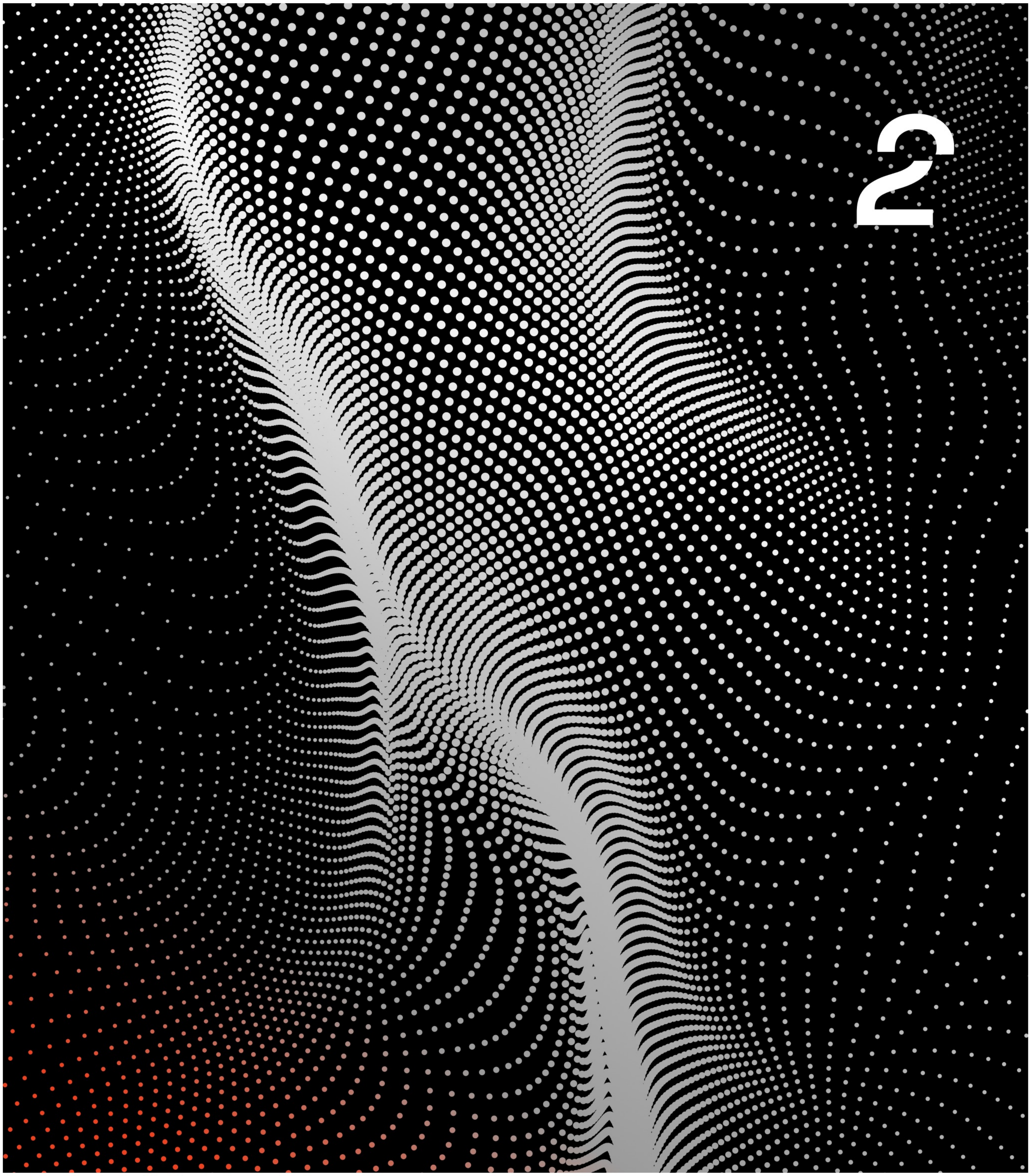
Every hour spent staring at dashboards and manually reviewing telemetry data is an hour not spent innovating. **Every preventable failure due to poor system observability is a setback in humanity's drive toward a better future.** Every insight lost in the noise of overwhelming complexity is a missed opportunity to make these advanced machines better, safer, and more capable.

The era of software-rich machines requires a fundamentally new approach to how we develop, test, manufacture, and operate these systems. We need tools that can handle the torrent of data these machines generate, that can automatically surface critical insights, that can help engineers understand and manage complexity at scale.

Sift's vision is to further humanity by modernizing how machines are built, tested, and operated in the 21st century. This is not just about building better software — it is about enabling the next great leap in human achievement. The engineers building tomorrow's machines deserve tools that match their ambitions and amplify their capabilities. The future of human progress depends on our ability to master complexity, at any scale.

This is why we built Sift.





THE COMPLEXITY CRISIS

Simplify Telemetry.
Scale Your Mission.

Teams building today's most advanced machines face a paradox: **As systems grow more sophisticated, they become harder to understand and control.** This isn't simply a matter of data volume but a mismatch between the complexity of modern machines and the tools available to develop, test, manufacture, and operate them.

Consider the reality of developing an autonomous aircraft. Each test flight generates terabytes of data across hundreds of sensors—control surfaces, engine parameters, navigation states. Insights lie not in isolated streams but in the intricate interactions between subsystems. Yet engineers are left to piece together these interactions using siloed tools, manual analysis, and fragmented workflows that weren't designed for hardware at scale.

This challenge intensifies when human safety is at stake. In fields like aerospace and autonomous transportation, engineers must provide proof of reliability through extensive certification processes, generating vast amounts of data that require rigorous validation. The countless hours spent on manual analysis could be better utilized for continuous system optimization, automation, and accelerating time-to-certification.

Traditional approaches to engineering workflows—spreadsheets, dashboards, and disconnected monitoring tools—are breaking down. Oscilloscopes, data loggers, and custom scripts provide isolated snapshots of system behavior but fail to deliver a cohesive understanding. Engineers spend hours wrangling data, debugging scripts, and trying to collaborate across teams with incompatible tools that don't scale.

As systems move into operation, the problem compounds. Modern machines are no longer standalone—they are interconnected fleets. Satellite constellations adjust orbits based on real-time data, autonomous vehicles update software in response to new conditions, and manufacturing systems continuously optimize efficiency through automation. Without a unified observability and data infrastructure, engineering teams are flying blind.

Yet the tools for operational monitoring are, if anything, even more fragmented and inadequate than those used during development.

Companies resort to building in-house tools—custom dashboards, monitoring systems, and analysis pipelines—that become brittle, expensive to maintain, and unable to adapt as systems scale. These homegrown solutions work for a while, but they rarely scale.

They break under increasing data volumes, struggle to integrate across teams, and ultimately become a burden that limits innovation.

This fragmentation creates technical debt that slows development, undermines reliability, and increases risk. Teams grow cautious, hesitant to make changes they cannot fully validate. The very complexity that enables intelligence, automation, and adaptability becomes a barrier to progress.

The shift toward high-volume, low-cost machines-such as drone swarms, satellite mega-constellations, and autonomous fleets-introduces a new challenge: managing observability at scale. The tools engineers use must not only provide deep insight into individual machines but also enable fleet-wide intelligence across distributed networks.

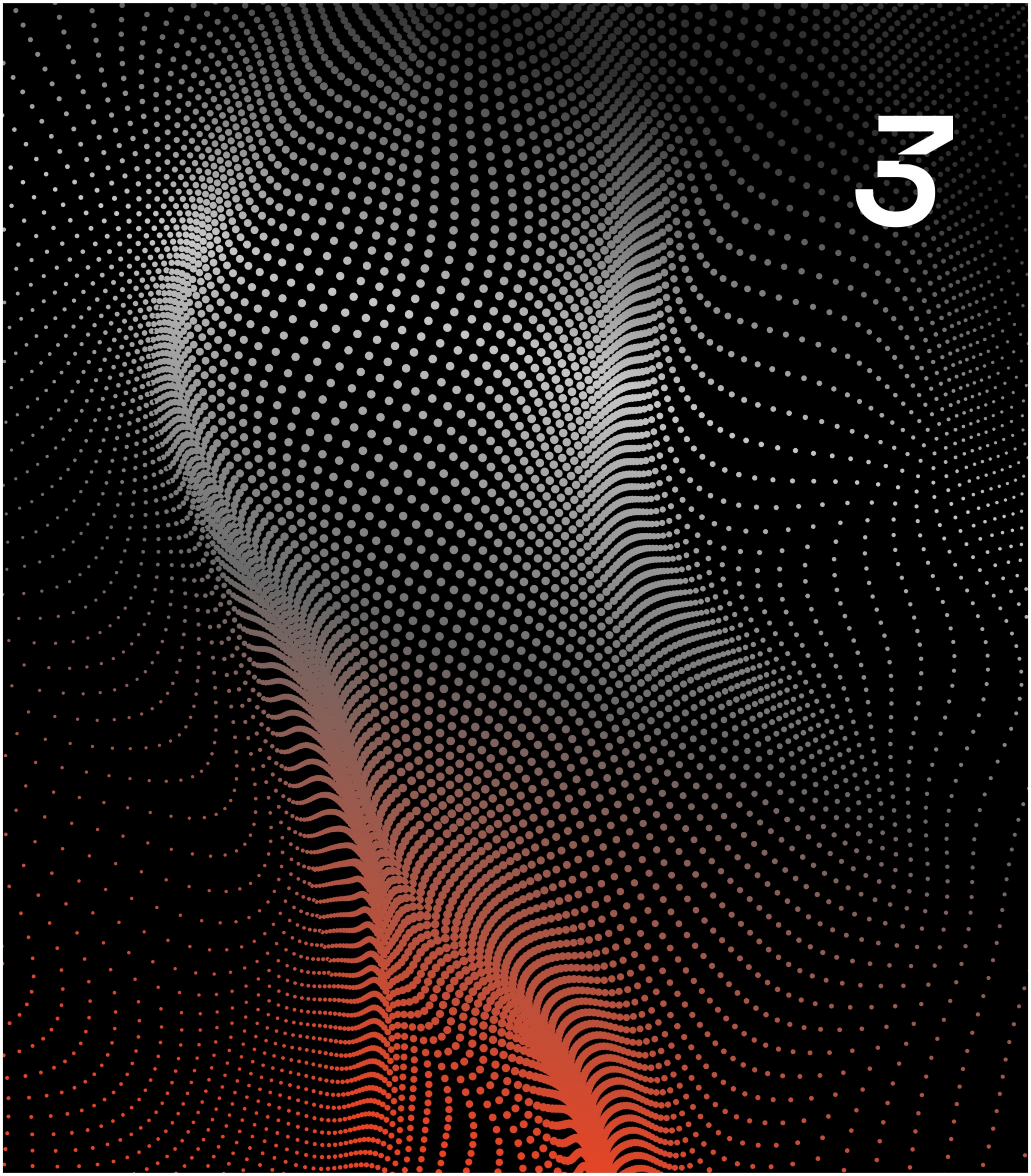
What's needed is not just new versions of old tools, but a full-stack engineering platform that unifies development, testing, manufacturing, and operations into a single, scalable workflow.

We must move beyond fragmented, tool-specific views to a unified understanding of system behavior—where institutional knowledge is embedded directly into engineering workflows rather than trapped in the minds of individual experts.

We need to shift from manual, human-intensive analysis to automated, intelligence-driven insight generation. We need to transform hardware development from a process of periodic testing and validation to one of continuous, real-time understanding.

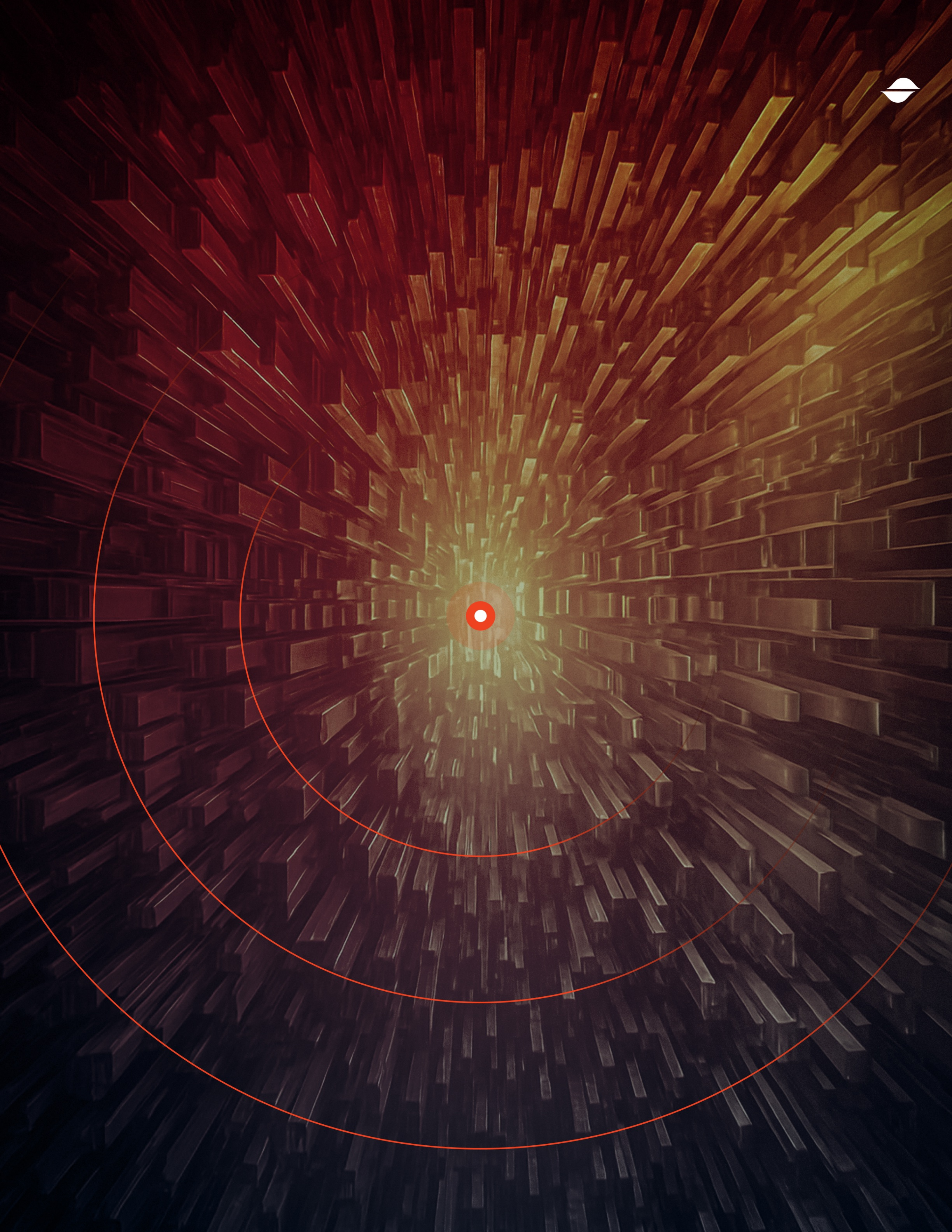
This transformation must happen across every phase of the machine lifecycle-from initial development to manufacturing, field deployment, and long-term operations. It requires breaking down the silos between software and hardware, development and operations, engineering and production. It demands new ways of validating and verifying complex systems, capturing and sharing knowledge, and making critical engineering decisions with real-time insights.

The solution to this challenge will define the pace of progress in hardware engineering for decades to come. The teams that solve the observability problem will be able to build more sophisticated systems, accelerate development, and deliver more reliable products. Those that don't will find themselves increasingly constrained by their inability to manage complexity at scale.



DROWNING IN DATA, BUT STARVING FOR INSIGHTS

Simplify Telemetry.
Scale Your Mission.



In 2019, Boeing's Starliner spacecraft was poised to make history as one of the first privately developed vehicles attempting an autonomous docking with the International Space Station, marking a crucial step in NASA's Commercial Crew Program. Instead, it became a multi-hundred-million-dollar failure due to a preventable software issue. The failure wasn't due to hardware defects but a lack of system-wide observability—an issue that could have been caught with better data infrastructure, automated analysis, and real-time validation.

This contrasts sharply with how leading engineering organizations approach testing, operations, and telemetry. SpaceX, for example, doesn't just collect telemetry—it employs CI/CD principles to integrate real-time data analysis into every aspect of its development cycle. By comparing Falcon 9 launches against a vast history of prior missions, SpaceX identifies subtle anomalies invisible to traditional methods. Similarly, companies in fields like autonomous vehicles, eVTOL, and hypersonics leverage continuous testing pipelines, coupling hardware-in-the-loop (HIL) simulations with advanced data platforms to validate systems at scale.

These organizations understand that testing hardware like software is no longer optional—the complexity of modern machines demands it. Advanced algorithms, autonomous systems, and safety-critical designs generate data at unprecedented scales—far exceeding what manual processes can handle. CI/CD-like methodologies are now essential to ensure reliability, safety, and performance across the entire product lifecycle.

Yet many hardware companies face a dual challenge when it comes to data:

- **Underutilized data:** Some organizations generate terabytes of telemetry but lack the tools or processes to extract meaningful insights. This leaves valuable information untapped, stalling efforts to improve performance or detect critical issues.

- **Limited testing pipelines:** Others avoid implementing thorough CI/CD pipelines because they lack the infrastructure to handle the resulting data volumes effectively. These companies miss opportunities to uncover deeper insights that could enhance safety and reliability.

Without addressing these gaps, organizations risk drowning in information while failing to turn it into actionable intelligence.

The companies succeeding in this paradigm share a common approach:

1 **They treat hardware as a data platform.** Sensors and subsystems are designed not just to function but to generate structured, queryable, and actionable insights.

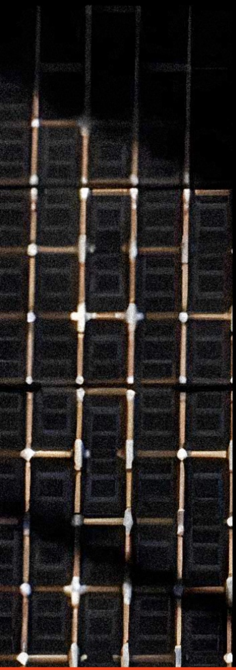
2 **They implement unified, scalable data architectures.** These platforms ingest, analyze, and contextualize system-wide telemetry in real time—across development, testing, and operations.

3 **They democratize access to data.** Insights aren't confined to individual engineers or isolated teams; they inform every decision, from design to fleet-wide optimization, creating continuous feedback loops.

This approach enables organizations like Astranis, K2 Space, Impulse Space, and True Anomaly to operate at unmatched speeds. They validate and refine designs using data from simulations, ground tests, and live operations—ensuring reliability and performance at every stage.

However, the shift to automated observability and CI/CD-like workflows doesn't just increase efficiency—it produces orders of magnitude more data. A single autonomous vehicle generates terabytes of telemetry in hours.

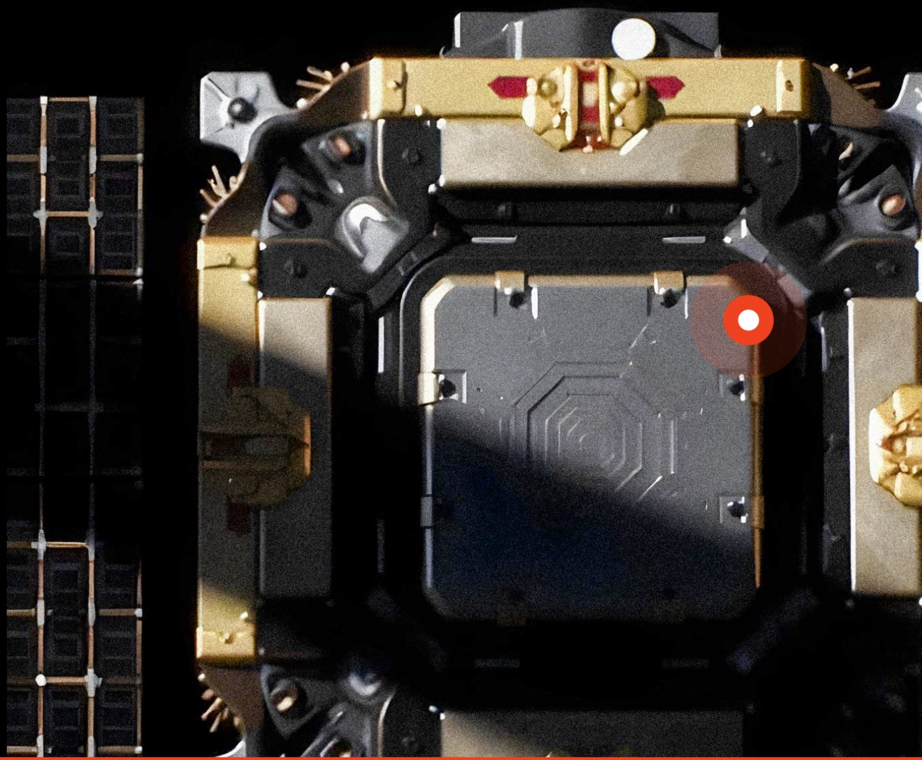
Without robust, scalable infrastructure to process, analyze, and act on this data, organizations risk drowning in information while starving for insights.



Modern hardware platforms are addressing this challenge by embedding automated analysis, anomaly detection, and machine learning-driven insight generation directly into CI/CD pipelines. This integration allows engineers to:

- **Pinpoint failures earlier** before they propagate into mission risks.
- **Simulate real-world conditions at scale**, reducing reliance on expensive live tests.
- **Identify trends across millions of data points**, turning raw telemetry into predictive intelligence.

This transformation is not just about faster testing—it's about rethinking how machines are developed, monitored, and optimized in the field.



Data as a Tool for Insight – Instead of relying on intuition or limited test cases, teams can make design and operational decisions based on structured, real-world telemetry from thousands of tests.

Speed as a Competitive Advantage – Design changes and optimizations can be validated in hours, not weeks, enabling rapid iteration cycles.

Visibility as a Core Capability – Modern systems are no longer black boxes; they provide complete traceability into behaviors, anomalies, and performance limits.

This shift is democratizing hardware development. Just as cloud computing made it possible for small software companies to compete with tech giants, modern data tools are enabling hardware companies—regardless of size—to achieve capabilities that would have required massive infrastructure just a decade ago.

But perhaps most importantly, data is changing our fundamental relationship with complex machines. Instead of being opaque systems we diagnose after failures, modern machines can now reveal their inner workings in real time. We can see not just what they're doing, but why. We can understand not just when they fail, but the sequence of events that led to that failure. We can optimize not just individual parameters but entire systems of interacting variables.

The implications of this transformation are only beginning to be understood. As machines become more intelligent, autonomous, and interconnected, our ability to process and act on real-time telemetry becomes a necessity.

The companies that master this paradigm—those that can effectively collect, analyze, and act on the torrents of data their systems generate—will not just lead their industries. They will redefine them.

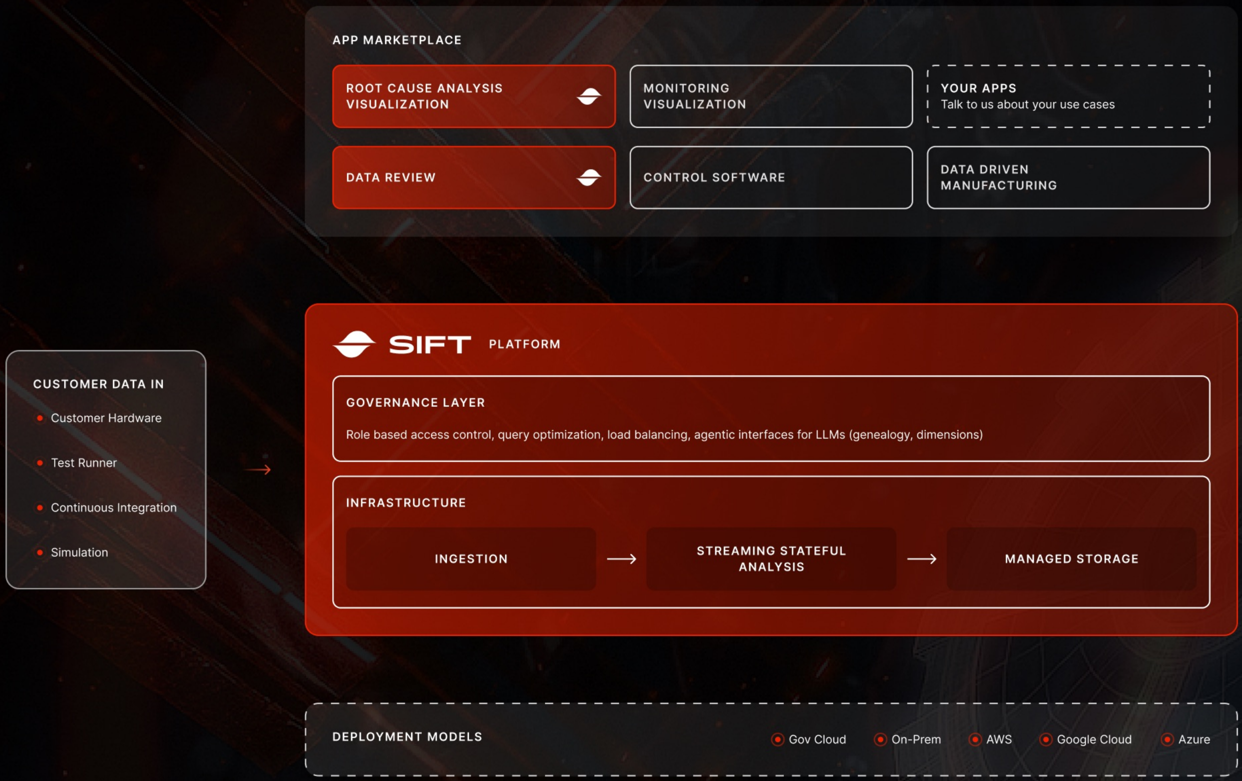
Unified Observability

Simplify Telemetry.
Scale Your Mission.

Understanding complex machines requires a fundamentally new approach to telemetry, monitoring, and observability. **The old paradigm—disconnected tools for separate functions, manual analysis of system behavior, and post-hoc failure investigations—is breaking down under the scale and complexity of modern engineering.** What's needed is not just a better dashboard but a full-stack observability platform that transforms how engineers develop, validate, and operate their systems.

That's why we built Sift, and it began with a radical premise: observability is a primary system requirement, not an afterthought. Just as SpaceX transformed spaceflight by making software the foundation of vehicle design, the next generation of hardware companies must build their systems from the ground up to be observable, analyzable, and fully traceable.

This shift goes beyond simply adding more sensors or collecting more data. True observability requires purpose-built infrastructure that supports hardware-specific data types, handles high-frequency sampling rates, and evolves alongside dynamic system architectures. It enables engineers to focus on solving complex problems rather than being constrained by outdated or fragmented tools.



Scalable Infrastructure

Modern hardware systems generate unprecedented volumes of data—terabytes from a single test flight, petabytes across a distributed fleet of machines. Managing this complexity requires scalable, high-performance infrastructure designed for hardware observability.

Sift's AI-native observability platform is built on a decoupled storage and compute architecture, enabling real-time querying and analysis without performance degradation. Engineers can instantly search, correlate, and extract insights from multi-source telemetry-without the overhead of manual data wrangling.

Sift's infrastructure is optimized for:

- **Real-Time Ingestion & Processing** - Handles high-frequency telemetry ingestion without bottlenecks, structuring data at ingestion for seamless analysis.
- **Scalable Storage & Compute** - Designed for high-throughput processing, ensuring engineers can query petabyte-scale datasets with sub-second latency.
- **Fleet-Wide Observability** - Whether tracking an individual spacecraft or managing thousands of autonomous vehicles, Sift enables real-time, cross-system intelligence.

No Black Boxes

Observability isn't just about speed—it must also be secure, explainable, and fully auditable. Managing real-time machine data at scale requires enterprise-grade security, structured compliance, and AI transparency.

Sift's governance layer ensures that every AI-assisted insight is version-controlled, explainable, and compliant with industry standards.

- **Role-Based Access Control (RBAC)** – Enforces granular permissions at the dataset, query, or field level.
- **AI & LLM Governance** – Ensures AI-generated insights are traceable, structured, and free from black-box risk.
- **Compliance-Ready Audit Logging** – Tamper-proof logs aligned with ITAR, SOC 2 Type II, NIST SP 800-171, and aerospace/defense regulations.

AI-Native From Day One

Sift's deterministic AI enables teams to detect anomalies, accelerate root cause analysis, and automate telemetry review—without sacrificing transparency or control. Unlike black-box AI models, SiftAI compiles every automated analysis into structured, human-inspectable outputs, ensuring traceability, security, and compliance.

Engineers can use AI-assisted search, root cause analysis, and structured rule-based validation to move from raw telemetry to real insights in seconds instead of hours.

This approach delivers transformative benefits:

- **Agentic Root Cause Analysis** – Copilot for data review investigations and live triaging. Sift's underlying Parquet architecture is the first step in enabling this workflow.
- **Automate Compliance & Certification** – Automatically pull relevant data to generate reports for compliance and certification purposes.
- **Institutional Knowledge Capture** – Codifies engineering expertise into automated workflows, ensuring tribal knowledge doesn't get lost over time.
- **Natural Language Data Exploration** – Engineers can query real-time telemetry using plain language (e.g., "Show me all high-vibration events before engine startup").

Extensible Applications

Observability isn't just about collecting data—it's about making real-time intelligence accessible across engineering workflows. Sift provides a flexible, API-driven application ecosystem that integrates directly with existing engineering stacks, ensuring teams can analyze, visualize, and automate workflows with minimal friction.

- **No-Code Visualization & Diagnostics** – Engineers can instantly pinpoint failure patterns across high-frequency telemetry, logs, and structured data.
- **Automated Compliance & Validation** – Enforces data integrity, anomaly flagging, and cross-mission comparison without manual intervention.
- **Third-Party Integrations** – Syncs seamlessly with tools like Grafana, and LabVIEW, ensuring observability doesn't require new workflows.

Whether accelerating test cycles, optimizing manufacturing processes, or managing operational fleets, Sift ensures observability powers every stage of machine development.

This is the future that Sift is building: a world where hardware engineers have the tools they need to understand and improve even the most complex machines. Where testing and validation aren't bottlenecks but accelerators of progress. Where the insights hidden in system data are automatically surfaced and made actionable.

This isn't just about building better software. It's about enabling machines without limits.

Building Machines Without Limits

Simplify Telemetry.
Scale Your Mission.

The world's most advanced machines—from reusable rockets to autonomous fleets—are pushing the boundaries of engineering. These systems are not just complex; they are evolving, software-driven, and increasingly autonomous. But too often, the process of building, testing, and operating them is constrained by outdated workflows. Engineers are held back by fragmented tooling, siloed data, and the inability to quickly iterate on complex, interdependent systems.

Testing should not be a bottleneck. Validation must be continuous, not gated by slow, manual review cycles. Observability must extend beyond individual tests or dashboards, giving engineers a complete picture of system behavior across the entire product lifecycle—from initial R&D through manufacturing, certification, deployment, and operations. The tools used to develop modern machines shouldn't break down as complexity increases. Whether building a constellation of satellites or a single human-rated spacecraft, engineering teams need an observability platform that scales seamlessly with the machines they create.

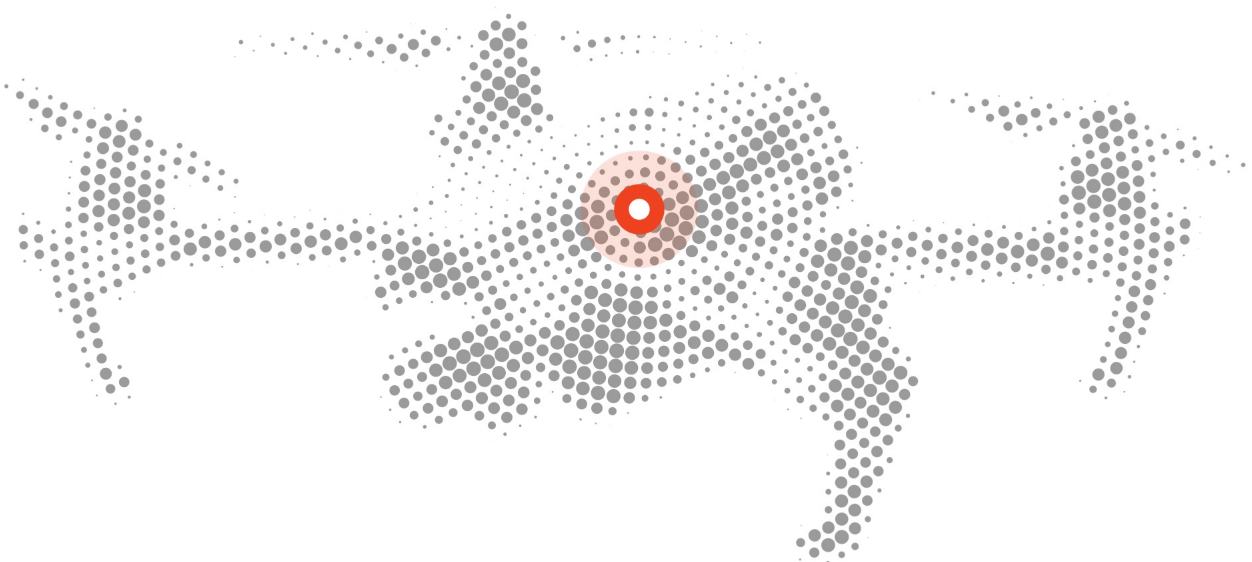
Sift is the unified platform purpose-built for modern hardware teams. It combines high-fidelity telemetry infrastructure, real-time observability, automated data analysis, and AI-driven insights into a single, scalable system. Engineers can seamlessly ingest, store, and analyze data from thousands of sensors and subsystems without performance degradation. Hardware-in-the-loop (HIL) testing, real-time failure detection, and fleet-wide performance analysis become automated, eliminating the delays and blind spots of traditional workflows. With deterministic AI and machine learning, engineers can surface insights faster, accelerate failure investigations, and optimize system performance at every stage. Whether tracking the health of a single spacecraft or managing a distributed network of machines, Sift provides real-time, cross-system intelligence to ensure mission readiness and reliability.

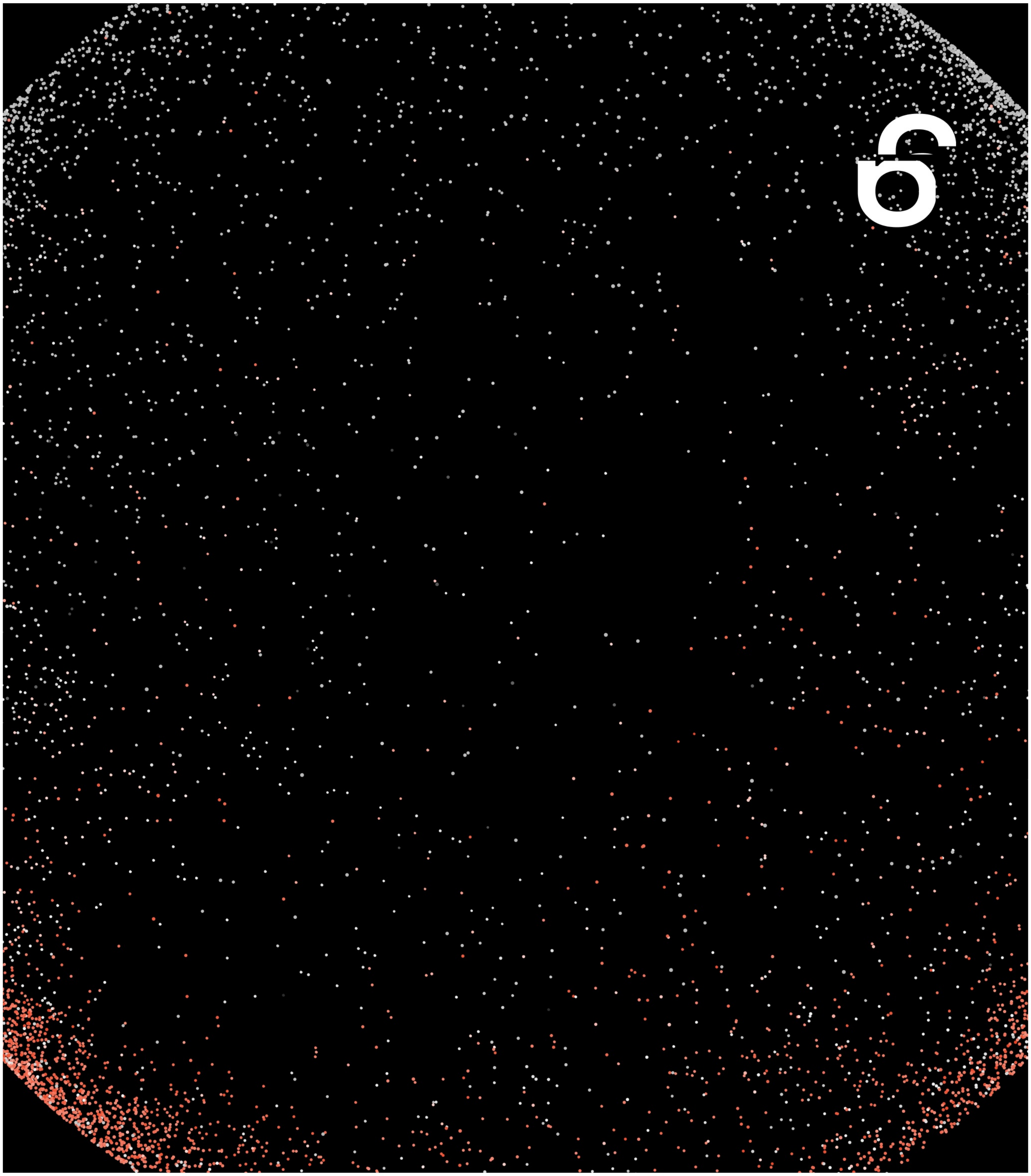
The most important breakthroughs in engineering won't come from isolated innovations in hardware or software alone. They will come from the ability to unify, analyze, and act on complex machine data at scale. This is the new paradigm for hardware engineering—one where teams are no longer constrained by outdated tools, where every decision is informed by real-time insights, and where observability is embedded into the fabric of machine development.

This is engineering without constraints. This is building machines without limits.

Sift is creating the infrastructure that will define the next generation of machine development—where engineering teams can move faster, reduce risk, and operate with complete confidence in the systems they create. The teams that master this approach won't just keep pace with the future of hardware—they will define it.

We are not content to merely imagine this future—we are committed to building it.





The Future is Observable

Simplify Telemetry.
Scale Your Mission.

We stand at an inflection point in the history of engineering. The machines we're building today — and the ones we'll build tomorrow — represent the most sophisticated systems humanity has ever created. But their potential remains constrained by our ability to understand them.

The tools that served us in the past won't carry us into the future. Manual analysis, fragmented toolchains, and post-hoc investigation belong to an era when machines were simpler and failure was less costly.

Today's engineers need more than just better versions of old tools — they require **a complete rethinking of how machines are developed, tested, and monitored in the real world.**

That's what we're building at Sift. Not incrementally better monitoring tools, but a complete reimagining of how engineers interact with their machines. A platform that turns overwhelming complexity into actionable insight. A system that learns and improves alongside the machines it observes. An architecture that scales with your ambitions rather than constrains them.

But we're just getting started. The real transformation in machine development is still ahead of us. It will be driven by teams who can harness the power of their data, who can learn and improve continuously, who can manage complexity through intelligence rather than brute force.

These teams will build the machines that solve humanity's greatest challenges. They will develop the clean energy systems that combat climate change. They will create the autonomous vehicles that transform transportation. They will design the spacecraft that make humanity multiplanetary.

The question isn't whether these machines will be built.

The question is:

Who will build them first?

Which teams will have the tools they need to build them the fastest?

Which organizations will be able to harness complexity rather than be constrained by it?

The future belongs to the observable.

To the teams that can see clearly into their systems' behavior.

To the organizations that can learn and improve continuously.

To the engineers who can turn data into insight, and insight into meaningful progress.

We invite you to join us in bringing that future to pass, whatever your role in shaping the future of machine engineering:

To engineering teams: Join the pioneering organizations already using Sift to build more sophisticated, reliable systems faster than ever before.

To investors: Support our mission to transform how complex machines are built and operated, backing a future where innovation isn't constrained by tooling.

To visionaries: Come build with us. Help us create the foundation for the next generation of machines.

The question isn't whether your systems will become more complex — it's whether you'll have the infrastructure and tools to master that complexity when they do.

The era of flying blind is over. The age of unified observability has begun.

Welcome to Sift.

SIFT