stromasys

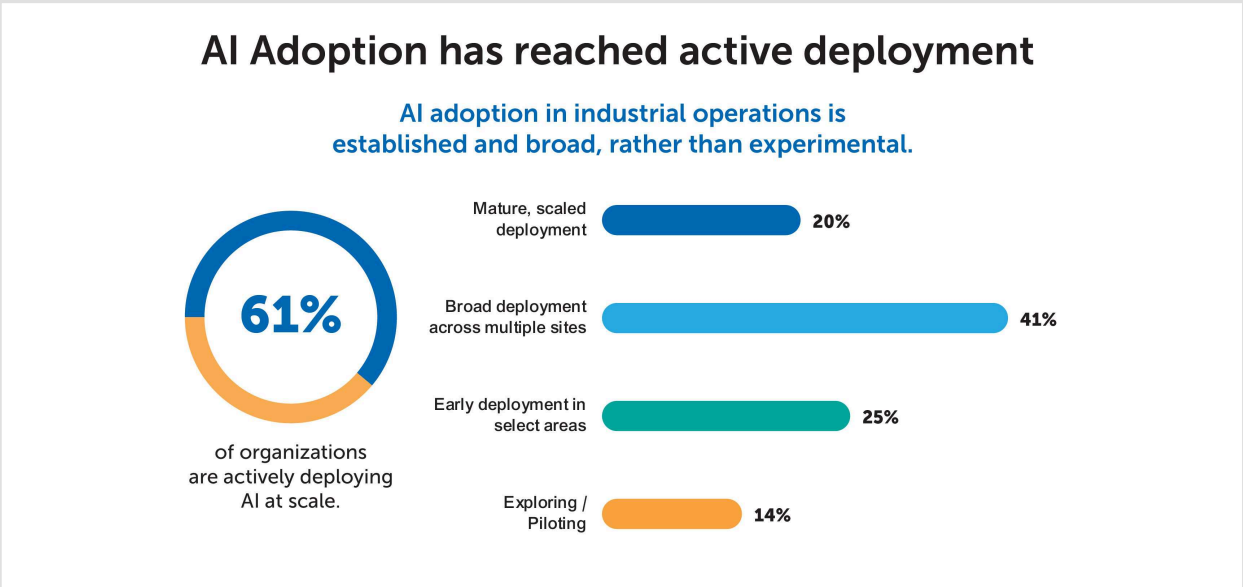
WHITEPAPER

When the Grid and SCADA Meet AI: Transforming Utilities for Business Continuity

Table of Contents

Introduction

AI is not just optimizing industrial operations but rewriting the rules. With AI integration, machines can predict failures before they happen, supply chains can self-heal, and factories can learn and adapt in real time. The Cisco 2026 State of Industrial AI Report has shown that 61% of organizations are actively deploying AI in industrial operations.



The path to AI does not start with new software, but it begins with optimizing the existing software in such a way that it works alongside it. Today, enterprises are heavily investing in AI, yet many of them are hitting an invisible wall.
Why?

The answer is simple: their legacy systems cannot support the data flows, real-time processing, and integration demands of modern AI pipelines. According to Cognizant research, **85% of senior leaders at Global 2000 companies** are very concerned that their existing technology estate will be limiting AI adoption.

Legacy systems in the utility industry are mostly built on outdated hardware, but they hold decades of valuable operational data and business logic for various critical workloads like SCADA, energy/distribution management systems, meter data management, and core control systems for generation, transmission, and distribution. As time passes, they struggle with data silos, lack APIs, and operate in batch modes that are incompatible with AI.

While full replacement is an option, it's rarely the safest path to choose from. Legacy system emulation is one of the quickest routes for AI-readiness. It uses the lift-and-shift migration approach to move the critical workloads to modern x86 or cloud infrastructure without code changes or operational disruptions. This allows seamless integration with AI while preserving existing stability.

Source:
https://www.cisco.com/c/dam/en/us/solutions/networking/industrial-iot/2026-state-of-industrial-ai-report.pdf
2026 State of Industrial AI Report
https://www.cognizant.com/us/en/insights/insights-blog/legacy-modernization-mandate-ai-timeline

Full Replacement Is Not Your Only Answer (It May Be an Option, but Not the Right One)

In such scenarios, the default responses for most enterprises dealing with legacy systems are either doing nothing or opting for a full rip-and-replace. Both the legacy infrastructure modernizing option and the full rip-and-replace option have their own challenges.

Doing nothing about the outdated infrastructure will escalate the security exposure and compliance risks while increasing the maintenance costs and blocking AI progress. Full system rewrites often exceed budgets and timelines. Various survey reports have suggested that **70% of modernization programs exceed their budget by 30% or more.**

Another cost-effective alternative is legacy emulation. It uses a lift-and-shift migration approach to move the critical workloads and applications running on the existing platform to the new environment (x86 server or cloud ecosystems). No code rewrites, no recertification, and no end-user disruption. The OS, applications, and data run exactly as before on a new infrastructure that supports modern security, disaster recovery, and API connectivity.

This approach is not about keeping the old alive indefinitely but about unlocking what the old already knows, like the decades of refined business logic and data, while creating a stable foundation for AI technologies.

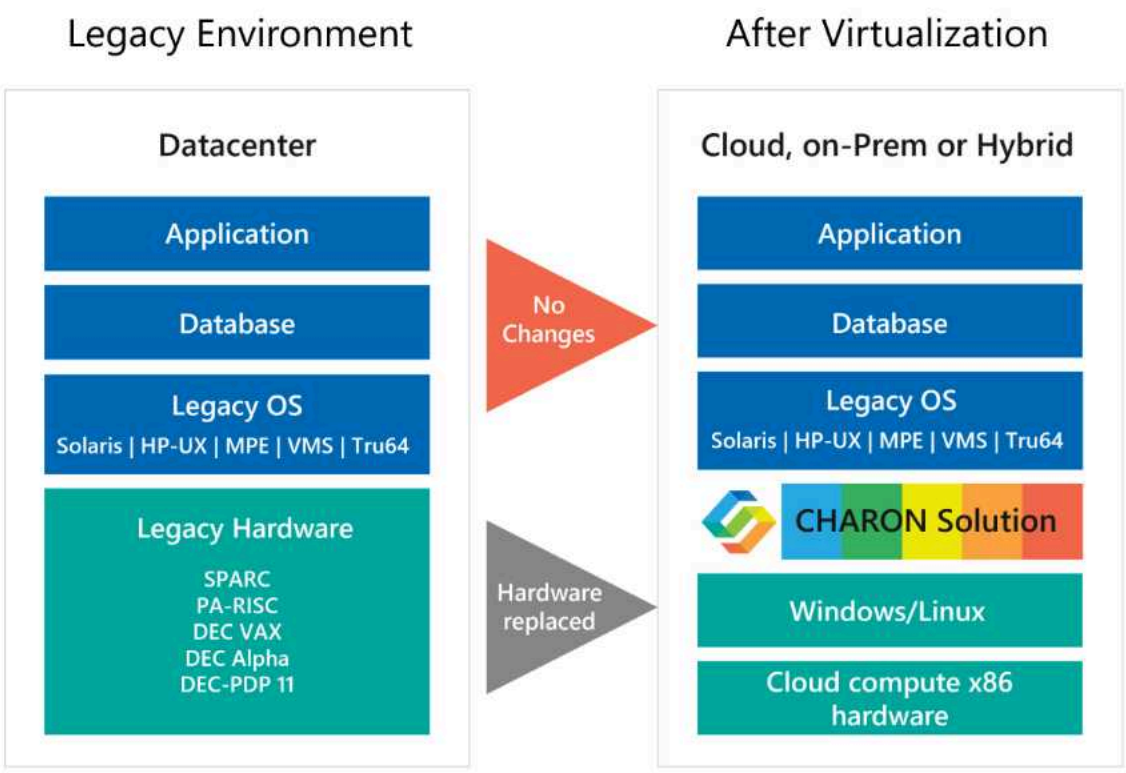
Source:
https://medium.com/@hashbyt/legacy-modernization-failures-2026-enterprise-transformation-mistakes-46d79f36b6f0

Describing Legacy Emulation in Detail

Legacy system emulation keeps the lights on for mission-critical applications. It is a legacy modernization method that uses a rehosting or lift-and-shift migration approach to eliminate the dependency on aging hardware. It lifts the critical workloads operating on the aging hardware and moves them to the new hardware, cost-effectively.

Various migration services providers like Stromasys offer solutions for transforming the legacy infrastructure. Their flagship product, the Charon solution, is a commercial-grade legacy emulation software that mimics the behavior of legacy hardware like SPARC, PA-RISC, VAX, PDP-11, or AlphaServer on a modern x86 platform or cloud environments and ensures that the operating system, the application layer, and the data behave exactly as they did on the original hardware.

Legacy System Emulation with Stromasys Charon Solution (Rehosting/Lift-and-Shift Strategy) "



How AI Helps in Building the API Bridge

How Emulation Enables AI-Readiness

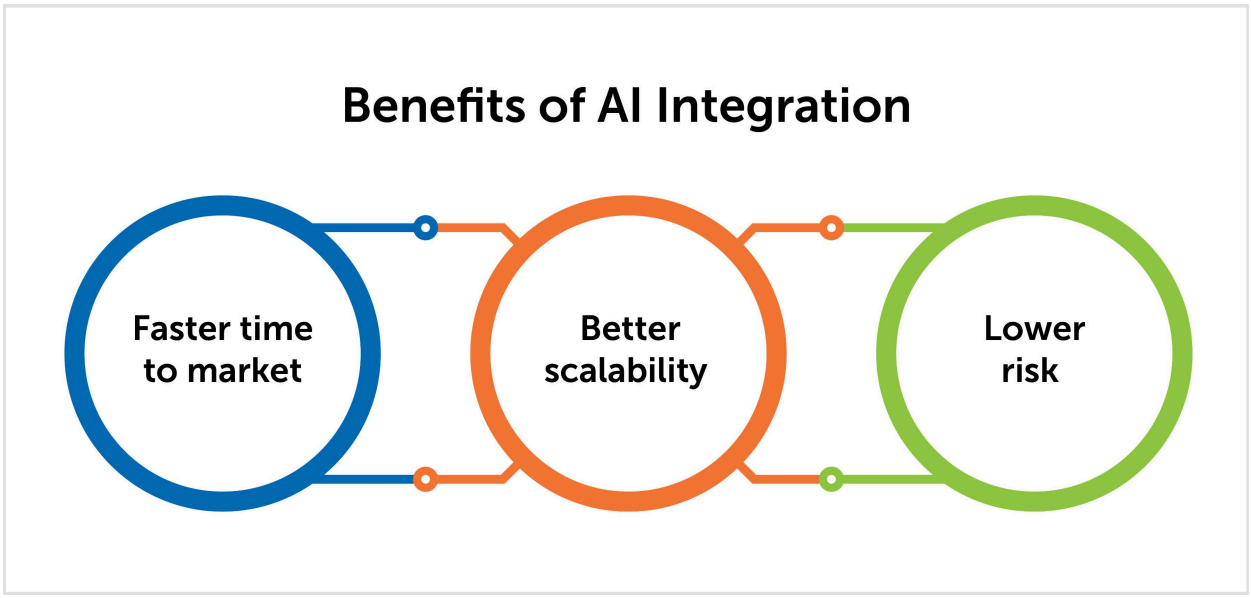
Emulation alone does not connect a legacy system to an AI pipeline. How it actually works is creating a platform that is AI-friendly. It transforms the outdated platform and ensures all the critical workload is moved onto it and running without any disruptions.

Then the next step is about data replication and extraction, as the newly emulated environment supports standard modern tooling instead of proprietary, end-of-life interfaces. Now, the API layering can be added without touching the underlying application, since the operating system beneath it is now running on a platform built for exactly that kind of integration.

Hybrid architectures are now becoming viable as they allow legacy core to keep running while newer services are built around it. And technical debt stops compounding, because the platform underneath is no longer an obsolete system.

Emulation & AI Can Transform Business

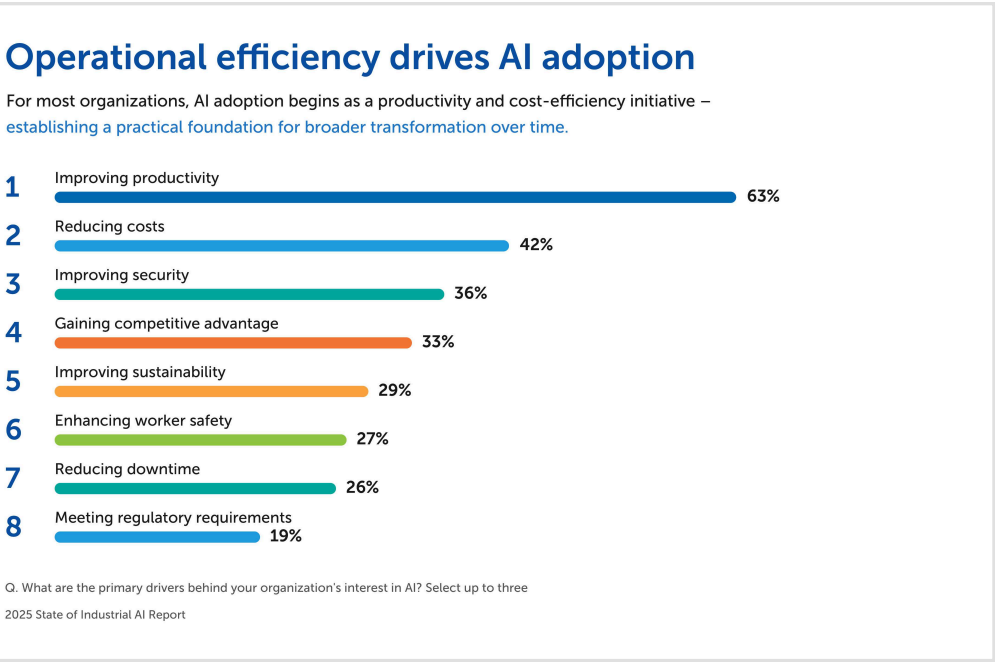
Running emulated workloads on modern infrastructure means legacy output can be wrapped in APIs and fed to AI models. It is possible even without full migration. It is as if the critical applications can continue running as they were, and the AI layer will sit in parallel alongside them. This process will consume clean, structured data instead of fighting to extract it. This will eliminate any complexity.



Benefits include:

- Faster time-to-market
- Better scalability
- Lower risk

It can be said that emulation doesn't retire your legacy, but liberates it. It enables organizations to feed structured data from production systems into AI models for predictive maintenance and optimization without full system migration.



Stromasys Success Story: Risk-Free Utility Modernization

Utility companies operate some of the longest-lived mission-critical infrastructure. SCADA systems, grid management platforms (EMS/DMS), outage management systems, and billing/metering backends frequently run on legacy hardware that are several decades old.

In such an environment, downtime is not merely a productivity issue but a public safety and regulatory compliance problem as well. Unplanned outages can lead to grid instability, delayed fault response, safety risks for field crews, and regulatory penalties. Emulation moves the workload to cloud infrastructure without modifying the application logic or certified interfaces. As the original operating system and binaries remain unchanged, then regulatory certifications and validated control logic remain intact.

Stromasys had assisted the Racine Water & Wastewater with their legacy infrastructure challenge. They were operating on an aging HP 3000 (PA-RISC) platform, and after migration to the new platform, only four years of data had been carried forward. With Charon, a solution to restore and sustain more than 25 years of legally required billing history, preserving compliance without application changes or staff retraining.

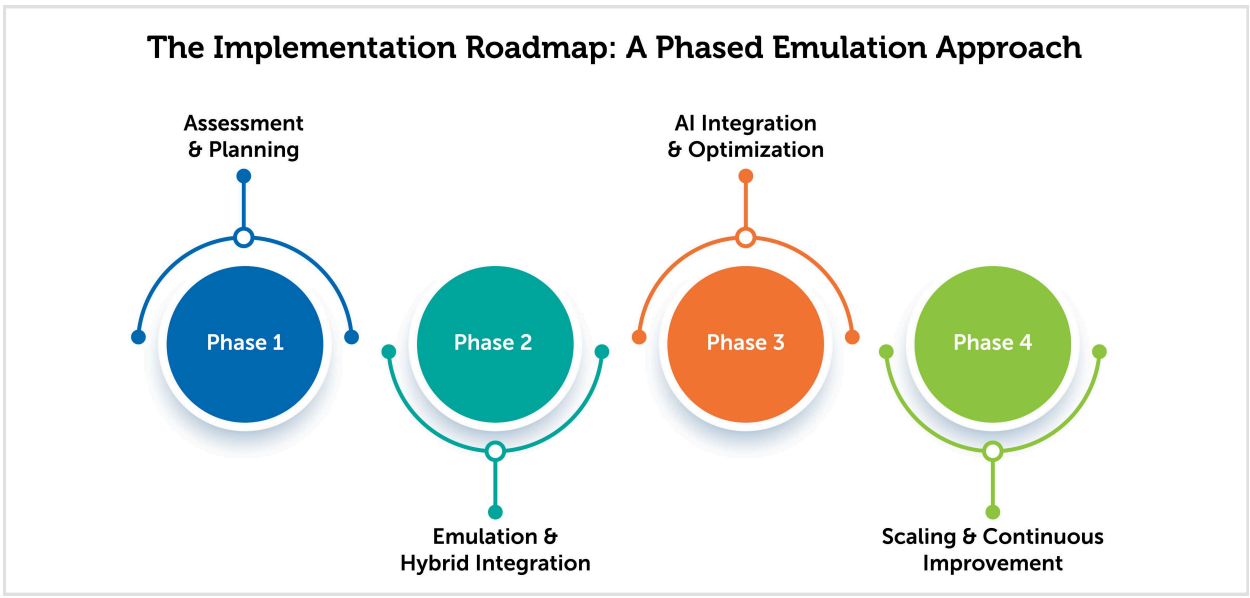
Process of moving twenty years of data running on a PA-RISC machine from a backup tape to running a Windows machine was extremely painless.

Ken Scolaro,
Administrative Manager

Read the Full Case Study

The Implementation Roadmap: A Phased Emulation Approach

Here is a step-by-step, low-risk path tailored for minimal disruption.



Phase 1 – Assessment & Planning

Conducting audits for AI readiness, evaluating infrastructure for dependencies (hardware, data flows, integrations), and building ROI models. Evaluation tools include dependency scanners and emulation compatibility assessments to analyze the system. It is recommended to prioritize high-impact systems in the utility sector such as SCADA, energy and distribution management systems (EMS/DMS), outage management platforms, billing and meter data systems, or core grid control and protection infrastructure, and to quantify technical debt versus AI value.

Phase 2 – Emulation & Hybrid Integration

Selecting migration strategies like emulation/ rehosting the core systems on modern infrastructure. Stromasys brings Charon emulation solutions for seamless transformation of legacy hardware. After emulating the outdated systems, APIs and data pipelines are layered on top of the new stable platform. For example, utility industries still operating on outdated legacy platforms that want to integrate AI can migrate to cloud environments like AWS or Azure to continue operating on critical workloads while leveraging cloud benefits. Then they can seamlessly integrate AI technologies. The smartest way to enable cloud analytics feeds while preserving logic and ensuring AI-readiness.

Phase 3 – AI Integration & Optimization

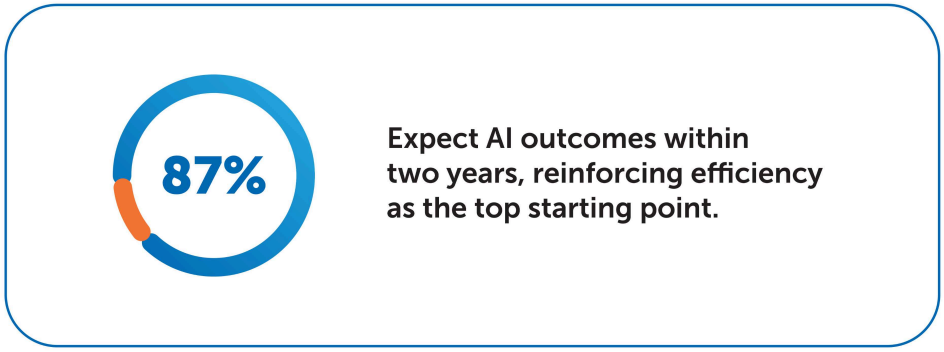
After ensuring the platform is stable and API-accessible so that machine learning models can be layered for real-time data flows and predictive capabilities. There are no specific metrics to measure the success of this stage. It is just the measurement against system uptime, reduced latency for inference, and measurable cost savings. It is also a phase where quick wins matter most; as visible results build the internal case for the scaling that follows.

Phase 4 – Scaling & Continuous Improvement

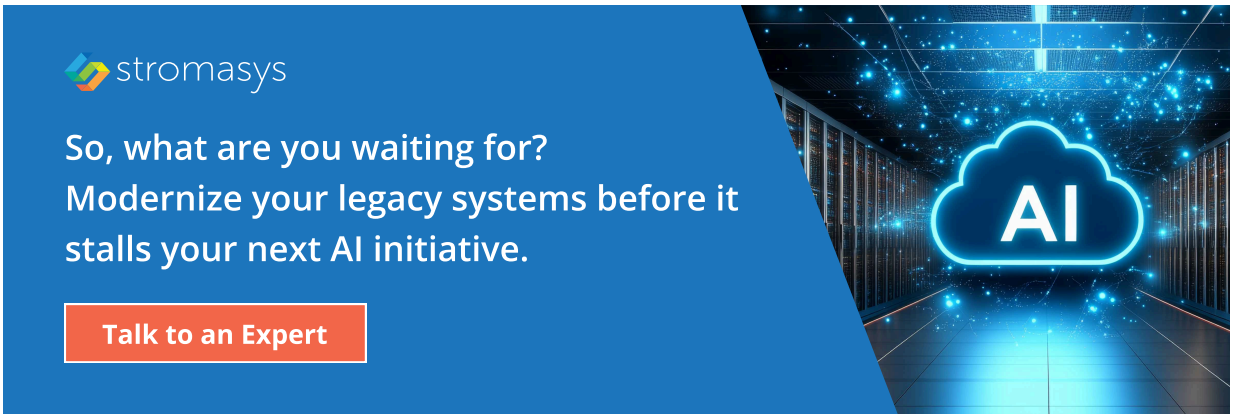
Governance frameworks, security posture, and internal skills all need to mature alongside the technology, or the gains from the first three phases. This includes the migration to the new platform and the integration with the AI. Key risk mitigation steps at this stage include maintaining a documented rollback path for the emulated system, automated monitoring, and incremental API expansions. Focusing especially on change management to ensure easy adoption.

Final Takeaway

When we say AI-readiness, it does not mean legacy-free. It is a misconception that many enterprises have. But the enterprises that win with AI readiness are not the ones who will be replacing everything the fastest. They are the ones who have secured their operational foundation first, unlocked the institutional data already sitting inside their existing systems, and built AI on a platform that was actually stable enough to support it. And legacy system emulation seems like a strategic choice.



It is the quickest, safest, and cost-efficient way to transform the legacy infrastructure without rewriting critical applications. Well, legacy modernization is not routine IT maintenance but an AI-readiness investment; industry leaders value it differently. Then priorities shift, and that shift is what separates the companies still evaluating AI from the ones already running on it.



Reference Links:

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- Legacy Modernization and AI: The Two-Year Timeline to Transformation | CognizantLegacy
- Modernization Failures in 2026: Why Enterprise Transformation Projects Fail & How to Fix Them | Medium
- https://www.bbntimes.com/technology/why-legacy-software-modernization-is-becoming-an-ai-readiness-strategy
- Streamline Disaster Recovery with Charon-SSP (Case Study)