

The software-defined factory from Red Hat and German Edge Cloud

The operational risk and modernization dilemma

To protect operating margins and support long-term efficiency, global manufacturing leaders face a data modernization dilemma. The traditional architecture of managing factory operations through separate, fragmented systems has become a direct threat to continuous production. Today, the urgency to transform is driven by 4 converging structural forces that are actively reshaping the competitive boundaries of industrial production.

First is the persistent operational disconnect between operational technology (OT) on the shop floor and enterprise IT systems. Historically, these domains have functioned in isolation from each other, forcing manufacturers to rely on custom middleware and proprietary hardware bridges that are inherently brittle, expensive to maintain, and vendor-locked.

Secondly, severe geopolitical pressures have made data sovereignty an immediate regulatory and compliance risk. Relying blindly on centralized cloud networks exposes sensitive process specifications and proprietary intellectual property to compliance vulnerabilities, creating an urgent requirement for flexible infrastructure that can run with a focus on security in fully air-gapped, on-premise environments.

Thirdly, discrete manufacturers face a steep complexity barrier as global automotive supply chains rapidly migrate to ecosystems such as Catena-X and Factory-X. Suppliers who lack the specialized software infrastructure to digitally map a product's full lifecycle face immediate commercial challenges, including exclusion from next-generation original equipment manufacturer (OEM) tenders.

Lastly, operationalizing industrial AI is key to defending plant margins against escalating operational variability and an accelerating workforce crisis as senior engineers retire. Beyond capturing and scaling expert institutional knowledge, advanced AI represents an immediate opportunity to automate real-time quality assurance, optimize asset usage, and execute split-second process corrections. However, AI cannot fulfill its potential as an isolated pilot project. It requires data, compute power, and applications to work in a continuous loop from the shop floor to the cloud.

Without a security-focused, standardized architecture to address these 4 factors, digital transformation remains an unscalable, manually-intensive, and costly endeavor.

A unified platform for the software-defined factory

To help organizations overcome the operational disconnects that can stall digital transformation, German Edge Cloud (GEC) has partnered with Red Hat to deliver a jointly engineered, platform-first architecture. This joint solution modernizes the rigid network stratifications traditionally mandated by the Purdue Model (ISA-95). By establishing a security-focused, cloud-native data highway between isolated shop-floor machinery and corporate IT enterprise standards, the architecture maintains immediate access to production-scale capabilities for the shop floor. Natively embedding GEC's ONCITE Digital Production System (DPS) into Red Hat® OpenShift® establishes a standardized, horizontal data-and-application layer across an entire operational footprint without compromising strict local network segmentations or security boundaries.

Another strategic benefit for executive leadership is that this joint architecture mitigates the risk and capital expense of replacing entrenched Manufacturing Execution Systems (MES) or traditional software assets. Recognizing that traditional MES environments represent highly customized capital investments, ONCITE DPS on Red Hat OpenShift is engineered for nondisruptive, side-by-side coexistence. The resulting unified platform helps unlock hidden factory data and accelerates modern AI capabilities without risking production downtime or destabilizing proven operations.

German Edge Cloud: The industrial intelligence layer

GEC delivers the vertical application intelligence of this joint solution through the ONCITE DPS. Purpose-built to handle the chaotic realities of the factory floor, ONCITE DPS serves as the platform's nondisruptive data engine. Instead of forcing engineers into invasive, high-risk reprogramming of traditional machinery, ONCITE DPS sits directly above physical assets as an intelligent translation mesh. It captures and normalizes fragmented machine communications in near real-time, transforming raw shop-floor data into a structured, unified, and AI-ready database.

GEC's sovereign-by-design approach helps organizations retain ownership and control over its sensitive process specifications and intellectual property. This allows for security-focused data exchange across global supply chain networks, such as Catena-X, without introducing geopolitical exposure or vendor lock-in.

Red Hat: The enterprise infrastructure foundation

Complementing GEC's specialized industrial applications is the advanced compute platform (ACP) from Red Hat, built on the global enterprise standard of Red Hat OpenShift. The ACP offered by Red Hat provides the standardized foundation required to run, manage, and scale these modern, data-driven applications reliably across an organization's entire manufacturing footprint. By abstracting the complexity of diverse hardware vendors, the platform establishes a single, security-focused, and automated operating standard across all sites.

This infrastructure allows organizations to manage rugged shop-floor software with the exact same rigor, automated security patching, and strict lifecycle governance used in corporate datacenters. By extending enterprise hybrid cloud capabilities directly to the furthest edge of an organization's network, Red Hat delivers the operational confidence required to scale GEC's industrial software and AI workloads across multiple plants simultaneously.



The value of the unified platform from Red Hat and GEC

By integrating GEC's ONCITE DPS application layer with the ACP from Red Hat, this partnership delivers a validated solution that unites the factory floor with enterprise IT standards. The collaboration between these technologies provides 4 strategic advantages tailored to the economic realities of modern manufacturing:

- ▶ **Nondisruptive modernization and workload coexistence.** Manufacturing leaders cannot afford operational downtime or high-risk infrastructure overhauls. The joint GEC and Red Hat platform provides a risk-mitigated modernization path by supporting side-by-side coexistence with existing traditional virtualized environments (such as legacy VMware setups). Rather than forcing a costly and invasive overhaul, the architecture isolates past software investments while allowing modern, containerized applications and AI services to run simultaneously. This provides OT architects with a predictable, step-by-step evolution that updates plant capabilities at their own pace.
- ▶ **Location agility and disconnected resilience.** The unified platform eliminates the rigid debate between edge and cloud deployment models. GEC's software footprint runs identically whether deployed locally on the factory floor or in a centralized corporate cloud. To offer maximum operational continuity, the architecture natively supports disconnected operations. If a factory edge node loses its network connection to the cloud, local production sequences, quality tracking, and closed-loop AI inference continue to execute locally without interruption, eliminating a single point of network failure.
- ▶ **Deterministic performance for closed-loop AI.** While GEC provides the advanced closed-loop AI algorithms and machine learning (ML) models required for automated shop-floor interventions, Red Hat provides the high-performance computing foundation. Configured with an optimized real-time kernel, the platform achieves the deterministic, sub-millisecond latency required for high-speed industrial control. This allows operations to execute split-second automated quality corrections right on the line, where waiting for a delayed cloud-processing response is not an option.
- ▶ **Interoperability through supply chain sovereignty.** The unified platform provides an out-of-the-box path from physical shop-floor assets to a security-focused application programming interface (API) layer, where GEC automatically structures and maps raw data into standardized formats required for global supply chain ecosystems, including Catena-X and Factory-X. This structural capability allows manufacturers to share tracking, quality, and carbon footprint data across the supply chain to obtain lucrative OEM contracts, while maintaining sovereignty and control over their underlying intellectual property.

Moving from static data collection to real-time action with industrial AI

The integration of industrial AI is the centerpiece of this partnership, transforming the factory floor from a reactive state to a decision-based, autonomous environment. Using the high-performance compute and orchestration capabilities of the advanced compute platform from Red Hat, including Red Hat OpenShift, ONCITE DPS runs complex, contextualized AI models directly on the shop floor where split-second decisions impact the bottom line, including:

- ▶ **End-to-end parts traceability.** A primary focus of the platform is automated, near-real-time traceability across the assembly lifecycle. The system automatically captures and logs strict digital genealogy—including serial numbers, exact bills of material (BOM), component origins, and specific work instructions. Running locally on edge systems, this provides unalterable documentation for safety compliance, near-instant quality assurance isolation, and comprehensive legal protection in high-stakes discrete and automotive manufacturing.



- ▶ **Agentic AI for guided operations.** The ONCITE DPS provides the industrial foundation to build and deploy AI agents that address a wide range of manufacturing scenarios—from change management and variant analysis to disruption response and process optimization. The Digital Industrial Engineer demonstrates what this means in practice. Proven in a live manufacturing environment, it automates product change requests, evaluates downstream impact across roles and workflows, and makes the experiential knowledge of senior engineers permanently available—at scale, independent of individuals. This results in faster change cycles, fewer errors, and production knowledge that does not walk out the door when experts retire.
- ▶ **High-speed visual AI for quality assurance.** This framework deploys advanced computer vision models directly to the assembly line to detect surface defects and component placement errors instantly. Because these models run on standardized container infrastructure, updated ML models can be pushed across thousands of global production lines simultaneously via automated IT workflows—completely eliminating the need to halt or reconfigure physical shop-floor hardware.
- ▶ **A flexible, production-ready edge-to-cloud continuum.** Industrial AI only delivers competitive advantage when the underlying infrastructure can match its demands, in real time, at any scale, and on any infrastructure a business chooses to run. This unified platform is built for exactly that reality. Time-critical AI inference executes directly at the machine edge, where milliseconds matter. Compute-intensive model training, cross-site analytics, and fleet-wide orchestration scale elastically in the cloud. And critically, the same architecture runs consistently across both, without reengineering and without compromise. What makes this genuinely differentiated is the architecture itself. Built on Red Hat OpenShift and the ONCITE DPS industrial AI platform, enterprises can deploy in the model that fits their business: on-premise for maximum control, as a managed cloud service for operational simplicity, or in a hybrid model that combines both. Whether the priority is scalability, cost flexibility, regional data residency or long-term infrastructure independence, the architecture supports it. This allows enterprises to scale AI workloads across a global cloud model while keeping all operations hosted on flexible, security-focused, and sovereign infrastructure governed strictly under German and European Union (EU) laws.

Scalability and plug-and-produce simplicity

Building custom, fragmented infrastructure for every new factory expansion is a massive drain on operational capital. The joint platform approach from Red Hat and GEC introduces standardized, repeatable scaling that abstracts the complexity of the underlying physical layer:

- ▶ **Flexible multinode deployment.** The architecture scales to match the physical footprint of any facility without requiring application changes. It natively supports everything from single, resource-constrained machinery cells running Red Hat Device Edge—a lightweight, small-footprint Kubernetes platform designed specifically for low-power, localized edge hardware—up to expansive multinode on-premise plant clusters, to aggregated cloud deployments for global production networks. This allows leadership to standardize software capabilities globally, rolling out workloads from centralized data centers all the way to the far edge of the factory floor.
- ▶ **Hardened operational reliability.** Because the runtime layer is standardized across all sites via Red Hat OpenShift, factory operations gain maximum predictability. Plant managers benefit from a prevalidated, automated patch and lifecycle rollout strategy that reduces configuration errors, minimizes manual maintenance windows, and protects continuous, 24/7 assembly lines from unexpected technical disruptions.

The blueprint for the software-defined factory

The collaboration between GEC and Red Hat represents a major advancement in manufacturing resilience, bringing together world-class, open hybrid cloud infrastructure and deep industrial domain expertise. By integrating GEC’s ONCITE DPS with the ACP from Red Hat, manufacturing executives no longer have to choose between AI innovation and operational stability.

This unified, platform-first approach effectively connects the shop floor and the corporate cloud. It eliminates the traditional architectural rigidities of the Purdue Model without sacrificing the strict security and network air-gaps that lines require. By transforming fragmented data into a standardized, sovereign, and scalable engine for optimizing production, global operations can deploy high-value use cases—from end-to-end supply chain traceability to agentic worker assistance—across any plant location.

Together, GEC and Red Hat are providing the definitive, low-risk blueprint for the modern, software-defined factory—an environment designed to optimize margins today while remaining fully adaptable for the complexities of tomorrow.

Get started today

Connect with your Red Hat or GEC account executive to schedule a joint executive architecture session, or visit redhat.com/industrial to learn more.



About Red Hat

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