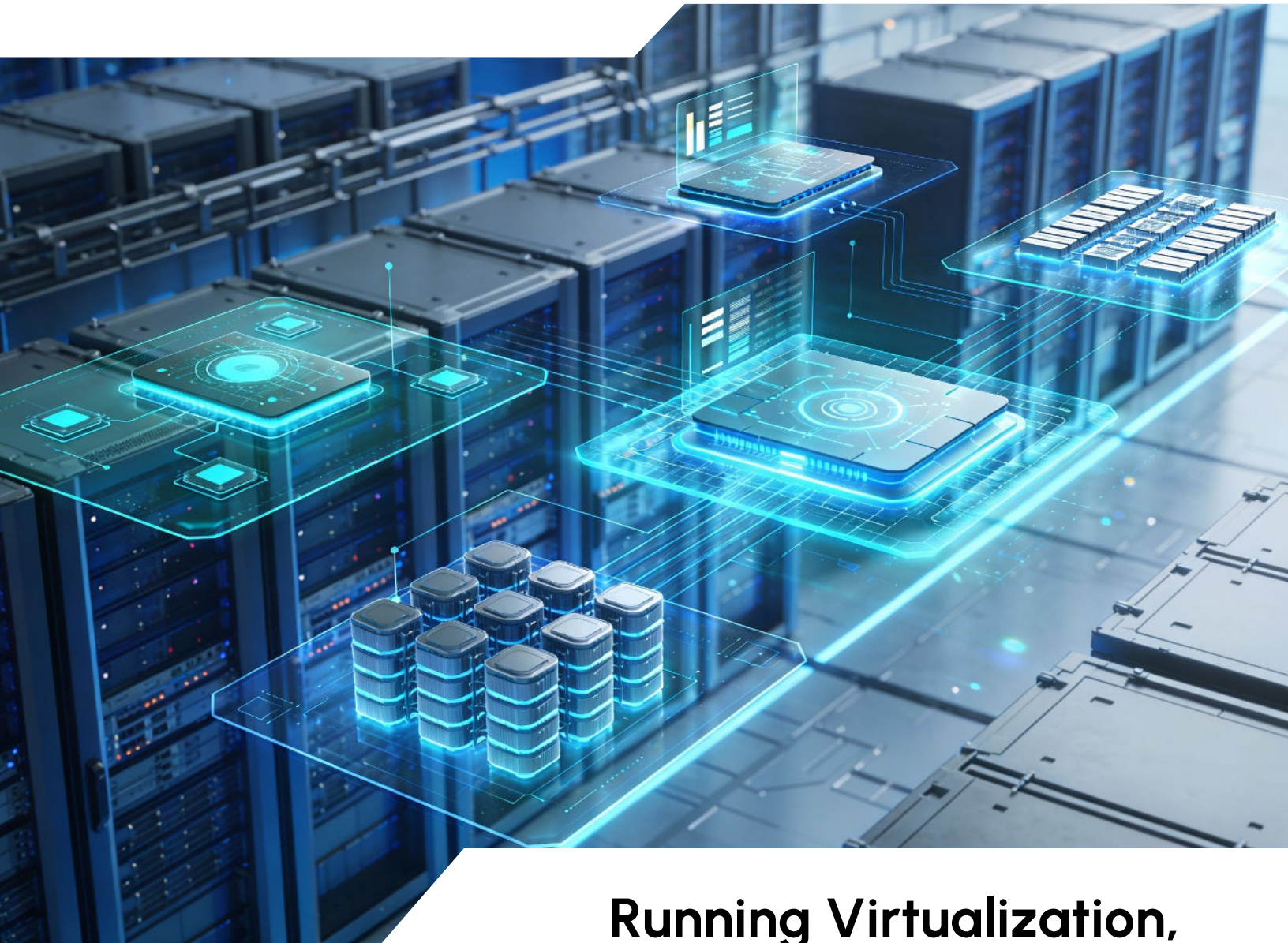




Running Virtualization, Kubernetes, and AI at Scale



1. Executive Summary

Enterprise private cloud strategies are evolving as organizations move from single-ecosystem virtualization toward operating multiple platforms in parallel. VMware, Kubernetes-based platforms such as Red Hat OpenShift, and cloud native application runtimes are now treated as durable components of the same operating environment, running on modern x86 infrastructure.

Futurum Research shows that nearly three-quarters of large enterprises had formal modernization programs in place during 2025¹. These efforts focus on increasing infrastructure flexibility, improving cost efficiency, and enhancing deployment velocity. Hybrid and multicloud deployment models are now the default, with most organizations running critical workloads across multiple environments while relying on on-premises infrastructure for performance, regulatory, and architectural reasons.

This report examines Dell's private cloud approach through the lens of operational execution. It focuses on how blueprint driven automation supports multi-platform environments, how integration with Red Hat® OpenShift® and Red Hat OpenShift Virtualization simplifies lifecycle management, and how Intel-based PowerEdge systems combined with Dell storage provide a consistent foundation for virtualized, containerized, and AI workloads.

As platform diversity increases, operational consistency has become a primary constraint. Infrastructure and platform teams manage different lifecycle processes, tooling stacks, and upgrade paths across virtualization and container platforms.

Dell's private cloud strategy is built around this operational reality. Dell Private Cloud, enabled by the Dell Automation Platform, focuses on improving deployment speed, lifecycle consistency, and platform flexibility across heterogeneous environments. Disaggregated infrastructure combined with blueprint-driven automation establishes a shared operating model across the diversity of VMware, OpenShift, Nutanix, and emerging operating environments.

Dell Private Cloud addresses this requirement by extending automation below the platform layer. Infrastructure provisioning, node lifecycle operations, storage configuration, and hardware governance are treated as shared services rather than platform-specific tasks. This model reduces duplication of effort, improves operational reliability, and enables incremental modernization aligned to business readiness.

¹ Futurum Research. Software Lifecycle Engineering Practices Survey, June 2025.



2. Market Context: Virtualization, Containers, and Platform Engineering

Enterprise infrastructure strategy is no longer anchored to a single virtualization or operating platform. Virtualization platforms, Kubernetes-based environments, and cloud-native application runtimes now coexist as long-lived components of the same operating environment, shaped by demanding business requirements, application innovation, modern development practices, and expanding workload diversity.

As platform diversity increases, operational complexity follows. Platform engineering, SRE, AIOps, and IT operations teams must manage multiple platforms with distinct lifecycle models, tooling stacks, and upgrade cadences, often resulting in fragmented processes that are difficult to standardize and costly to operate at scale.

Futurum Research shows that 61% of organizations² identify manual provisioning and infrastructure upgrades as one of the top three sources of delay and risk in new application delivery and environment refresh cycles.

These challenges are amplified by the growing demand for AI-enabled workloads. Organizations are under pressure to deploy AI-capable hardware, including GPU- and accelerator-enabled systems, alongside existing virtualization and container platforms. Bringing this infrastructure online quickly without introducing new operational silos has become a pragmatic constraint.

Infrastructure architecture choices further shape these outcomes. Traditional three-tier architectures offer flexibility but require specialized operational expertise. Hyperconverged approaches simplify deployment but introduce trade-offs in scaling models, hardware reuse, and ecosystem choice.

As a result, private cloud evaluation criteria are shifting. Organizations are placing greater emphasis on operational consistency, automation, and lifecycle governance, with platform consolidation as an underlying concern. The ability to apply common processes across virtualization and container environments, reuse infrastructure investments, and adopt new platforms incrementally is increasingly viewed as foundational. In this context, private cloud success is increasingly defined by the quality of the operating model that supports platform diversity.

² Futurum Research, Software Lifecycle Engineering Practices Survey, June 2025.



3. Dell's Approach: Disaggregated Infrastructure and the Dell Automation Platform

3.1 What is Dell Private Cloud

Dell Private Cloud is designed to simplify how private cloud environments are deployed, operated, and evolved across multiple platforms. Rather than positioning private cloud as a single stack or prescribed platform, Dell approaches it as an operating model that spans infrastructure, automation, and lifecycle control.

The primary challenge is no longer platform adoption, but the ability to deploy and manage multiple platforms consistently without increasing operational burden.

Dell Private Cloud addresses this challenge by standardizing deployment, automation, and operations below the platform layer. Platform teams retain choice, while infrastructure and lifecycle processes become repeatable, predictable, and easier to scale.

3.2 Disaggregated Infrastructure Model

Dell's private cloud strategy is built on a disaggregated infrastructure model. Compute, storage, and networking are treated as composable resources rather than tightly coupled appliances. This preserves architectural flexibility while avoiding the operational sprawl associated with highly customized environments.

Disaggregation allows organizations to scale infrastructure components independently, align hardware investments to workload needs, and reuse infrastructure across platforms. It also reduces dependency on rigid scaling models that can constrain how virtualization and container environments evolve over time.

This foundation is especially important as enterprises introduce AI-enabled workloads alongside existing applications. GPU- and accelerator-capable systems can be added without redesigning the environment or creating parallel infrastructure stacks, allowing infrastructure to adapt as requirements change.

3.3 Automation Platform and Blueprint-Driven Deployment

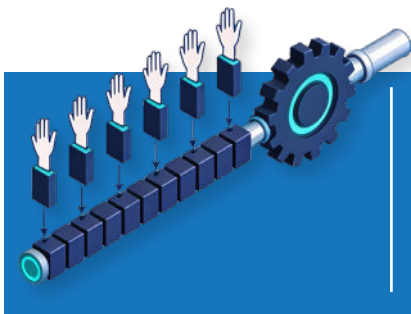
Automation functions as a control layer that makes Dell's private cloud model operational at scale. The Dell Automation Platform provides a blueprint-driven approach to deploying and operating private cloud environments across platforms.

Blueprints define how infrastructure and platforms are configured, deployed, and updated. They capture best practices for hardware configuration, networking, storage integration, and platform setup, reducing reliance on manual processes and individual expertise.

Automation also establishes consistency across environments. Virtualization platforms and Kubernetes clusters follow the same operational patterns, improving reliability and simplifying day-to-day operations for platform and infrastructure teams.

The operational impact of this approach is most visible in the reduction of manual effort and the predictability of deployment outcomes. To illustrate the scale of automation Dell is applying below the platform layer, the following metrics are drawn from Dell-provided testing and internal validation.

Illustrative Automation Outcomes (Dell-provided Testing, May 2025)



Over **90%** reduction in provisioning steps compared to manual deployment, achieved by automating manual tasks through a single Dell Private Cloud blueprint



Workload-ready clusters deployed in approximately **2.5** hours with no manual intervention, measured from post-hardware installation through configuration and platform onboarding



More than **400** manual steps automated, resulting in an estimated **90%** reduction in manual deployment processes

Note: Results are based on internal Dell testing. Actual outcomes may vary by environment.

These results are not presented as guarantees, but as indicators of what becomes possible when lifecycle operations are designed for automation rather than adapted to it.

3.4 Subscription Model and Licensing Flexibility

Dell Private Cloud is delivered through a subscription model that aligns infrastructure consumption with ongoing operational needs. Rather than treating infrastructure as a rigid asset, the subscription model supports lifecycle management, expansion, and technology refresh over time.

This model reflects the practical reality of private cloud environments. Platforms evolve, workloads change, and infrastructure must be updated without disruption. Subscription-based delivery enables organizations to plan capacity, incorporate new technologies, and maintain alignment between infrastructure and platform roadmaps.

From an operational perspective, this reduces friction between procurement, infrastructure teams, and platform owners. Lifecycle events become part of a managed process rather than isolated projects or painful rip-and-replace events.

3.5 Operating Across Platforms Without Forcing Consolidation

Most private cloud strategies implicitly assume consolidation as the end state. Virtual machines give way to containers, platforms are rationalized, and operating models are rebuilt around a preferred stack. In practice, this assumption rarely holds. Application constraints, organizational boundaries, and regulatory requirements make full consolidation slow, uneven, and often impractical.

Dell's approach starts from a different premise. VMware, Red Hat OpenShift, Nutanix, and other platforms are treated as durable operating environments rather than transitional technologies. The goal is not to accelerate convergence, but to make long-term coexistence operationally viable.

This distinction matters operationally. When consolidation is treated as mandatory, teams absorb additional risk through forced migrations, duplicated tooling during transition periods, and parallel lifecycle processes that persist longer than planned. Dell avoids this trap by standardizing deployment, lifecycle management, and governance below the platform layer. Existing environments continue to operate without disruption, new platforms can be introduced incrementally, and infrastructure teams avoid maintaining separate operating models for each ecosystem.

The result is modernization without artificial deadlines. Platform evolution aligns to application readiness and business priority, not infrastructure constraint.





4. Architecture and Operational Experience with Red Hat OpenShift

Red Hat OpenShift is a comprehensive hybrid-cloud application platform that empowers organizations to develop, deploy, and modernize applications anywhere. Built upon a reliable and secure core container engine through Kubernetes, OpenShift delivers the tools needed to accelerate application development and delivery. Futurum Research data shows that 68% of large enterprises now run Kubernetes in production for some or most workloads³, reinforcing that Kubernetes is a primary operating platform, not an experimental technology. While OpenShift can be deployed alongside existing virtualization platforms, its embedded OpenShift Virtualization feature offers the ability to run virtual machines (VMs) and containers side-by-side, offering a consistent set of cloud-native tooling and modern frameworks.

Dell Private Cloud applies its operating model directly to OpenShift environments. The focus is operational execution. Automation and lifecycle control extend below the platform layer, reducing friction in how OpenShift clusters are deployed, scaled, and maintained as part of a broader private cloud footprint.

4.1 Filling the Gap Below the OpenShift Layer

Reliable OpenShift operations depend on consistent infrastructure behavior. Node configuration, storage integration, networking, and firmware alignment directly affect cluster stability. When these elements vary across environments, platform teams spend time resolving infrastructure issues instead of supporting application delivery.

Dell Private Cloud standardizes infrastructure preparation through automation and validated configurations. Infrastructure is readied and verified before clusters are deployed, which reduces variability and shortens time to deployment. Intel-based PowerEdge systems provide a consistent hardware foundation, simplifying capacity planning and expansion as OpenShift environments grow.

4.2 Cluster Lifecycle Automation

Management of disparate platforms can require frequent lifecycle actions, including cluster creation, upgrades, and refresh cycles. Managing these events consistently is one of the most common operational challenges for platform teams.

Dell's blueprint-driven approach applies to OpenShift cluster deployment and lifecycle operations. Blueprints define how clusters are built, configured, and updated, reducing reliance on manual steps and individual expertise. This improves repeatability and lowers risk during upgrades and environment refreshes.

³ Futurum Research. Software Lifecycle Engineering Practices Survey, June 2025.

Consistent lifecycle patterns across development, test, and production environments also reduce configuration drift and simplify support. Platform teams can focus on reliability and developer enablement rather than maintaining environment specific exceptions.

4.3 Storage Integration with PowerStore and Other Dell Arrays

Persistent storage is a critical dependency for many OpenShift workloads, particularly as enterprises modernize stateful applications and data-intensive services. Inconsistent storage integration remains a common source of deployment delays, performance issues, and operational friction across Kubernetes environments. Red Hat OpenShift Virtualization has an extensive partner ecosystem for users to choose the storage vendor they need without vendor lock-in.

Dell Private Cloud integrates storage as a core part of the operating model rather than a separate concern. PowerStore is used to provide a consistent, scalable storage foundation for OpenShift environments, with integration handled through standardized configurations and automation. Storage provisioning, connectivity, and lifecycle operations are aligned with cluster deployment processes, reducing manual intervention and configuration drift.

This integration simplifies how platform teams support stateful workloads. Storage services are made available predictably across environments, performance characteristics are consistent, and lifecycle actions such as expansion and updates follow established operational patterns. With Dell Private Cloud OpenShift environments can scale without introducing separate storage management workflows or increasing operational risk.

4.4 Virtualization as a Transitional and Long-Term Option

Red Hat OpenShift Virtualization, built on the Kernel-based Virtual Machine (KVM) hypervisor and Kubernetes, allows organizations to migrate, modernize, and manage their virtual machines alongside containers and serverless functions on a unified platform. Organizations can apply a consistent set of cloud-native tooling including CI/CD pipelines, GitOps workflows, and service mesh to all workloads and choose to gradually modernize VMs at their own pace through container adoption, microservices, or AI integration.

Dell Private Cloud supports OpenShift Virtualization within the same operating framework. Infrastructure preparation, lifecycle automation, and governance apply consistently, regardless of workload type. This allows teams to modernize applications over time, without introducing parallel operating models.

4.5 Operational Consistency Across Ecosystems

Deployment, lifecycle management, and governance are applied using common operational patterns, even as platforms differ. This consistency reduces tool sprawl and operational fragmentation. Platform engineering and operations teams work within a unified framework, gaining flexibility without sacrificing control. In this model, OpenShift is operated as part of a broader private cloud strategy rather than as a standalone platform..





5. Flexibility Without Vendor Lock-In

Enterprise private cloud strategies must support sustained platform diversity and continuous change. Virtualization, Kubernetes, AI workloads, and emerging application models evolve at different speeds, often within the same environment. Flexibility is defined by the ability to operate and modernize without being constrained by platform dependencies or forced transitions.

Dell Private Cloud is designed for this reality. It enables customers to run multiple platforms on shared infrastructure, migrate workloads at their own pace, and adjust platform strategies over time. Dell's approach is explicitly neutral in the virtualization ecosystem, supporting coexistence rather than replacement.

5.1 Multi-Ecosystem Support as a First Principle

Dell's private cloud strategy begins with support for multiple platform ecosystems as a foundational requirement. VMware, Red Hat OpenShift, Nutanix, and Microsoft Azure environments are all supported within the same private cloud footprint.

Platform choices can align to application needs, organizational structure, or regulatory requirements without requiring separate infrastructure stacks or operating models.

By avoiding dependence on a single platform, Dell preserves customer control while maintaining consistent infrastructure and lifecycle operations.

5.2 Coexistence and Gradual Migration Scenarios

Most enterprises modernize incrementally. Virtualized workloads continue to run while container platforms expand, and migration timelines vary by application and business priority.

Dell Private Cloud supports VMware and OpenShift running side by side on the same hardware. Infrastructure capacity can be reassigned as needs change rather than permanently bound to a single platform.

Node restore and redeploy capabilities allow hardware to be repurposed across platforms without full reinstallation⁴. This reduces migration effort, improves hardware reuse, and allows modernization to proceed on customer-defined timelines.

5.3 Intel Platform Flexibility

Dell Private Cloud currently supports Intel-based PowerEdge 17G systems built on Xeon 6 processors, enabling customers to optimize infrastructure for performance, efficiency, or workload-specific requirements.

For customers operating PowerEdge 14G systems, transitioning to 17G creates a clear opportunity for server consolidation. Higher core densities, improved performance per watt, and increased virtualization throughput allow fewer servers to support the same or greater workload capacity.

Intel technologies such as QAT accelerators improve system efficiency for security-intensive workloads, while Intel TDX enables Confidential Computing through isolation and encryption of VMs, to meet stricter regulatory and data protection requirements. Refreshing to Intel-based PowerEdge 17G systems alongside adoption of the Dell Automation Platform enables consolidation, improved efficiency, and confidential computing as part of a broader private cloud modernization strategy.



⁴ Source: [Explore Dell Private Cloud Lifecycle Management](#)



6. Security, Governance, and API Integration

Dell Private Cloud addresses the complexity of securing and governing modern private cloud environments by applying consistent security and governance practices across infrastructure and lifecycle operations. Rather than relying solely on platform-specific controls, Dell applies common processes for provisioning, configuration, and change management. This creates a more predictable and governable operating posture as environments evolve.

6.1 Secure Onboarding with FDO

Governance is most effective when it is embedded into deployment and lifecycle workflows. Manual controls and post deployment validation struggle to keep pace with the rate of change in modern private cloud environments.

Dell's blueprint-driven automation embeds governance directly into how infrastructure and platforms are provisioned and updated. Infrastructure configurations, platform prerequisites, and operational standards are defined once and applied consistently. This reduces configuration drift and ensures environments align with organizational policies from the start.

This approach extends to secure hardware onboarding. Support for standards such as FIDO Device Onboard (FDO) enables automated, cryptographically verified device onboarding into managed environments. Establishing device identity and trust during provisioning reduces the risk associated with manual configuration and unauthorized systems entering the environment.

By standardizing deployment and onboarding, Dell simplifies compliance and reduces the ongoing effort required to audit, validate, and govern private cloud environments.

6.2 Identity and Access Control

As private cloud environments span multiple platforms and operational teams, identity and access control become foundational to effective governance. Inconsistent identity models across environments increase risk and complicate compliance.

Dell Private Cloud integrates with enterprise identity providers such as Microsoft Entra ID, allowing organizations to apply existing identity and authentication policies across private cloud environments. This integration enables centralized user management and reduces the need for platform-specific identity silos.

Role-based access control (RBAC) ensures that infrastructure, platform, and operations teams have access aligned to their responsibilities. Administrative privileges can be scoped appropriately across environments, reducing the risk of over permissioning while maintaining operational efficiency.

By aligning identity and access controls across platforms, Dell Private Cloud helps unify governance in environments that include virtualization, Kubernetes, and emerging workloads.

6.3 API Access and Integration

Automation in modern private cloud environments extends beyond initial provisioning. Ongoing operations, governance, and lifecycle management increasingly depend on integration with external systems.

Dell Private Cloud exposes portal and orchestrator APIs that enable integration with CI/CD pipelines, infrastructure-as-code frameworks, and IT service management systems. These APIs allow organizations to incorporate private cloud operations into existing workflows rather than introducing parallel tooling.

Secure, token-based authentication supports automated interactions while maintaining control and auditability. This approach allows automation to scale safely across environments.

By enabling API-driven integration, Dell extends automation beyond deployment into governance and day-to-day operations, supporting more consistent and repeatable private cloud management.

6.4 Security Posture Summary

Dell Private Cloud uses automated updates and validated builds to reduce this risk. Standardized deployment and lifecycle processes help ensure that environments remain aligned with defined security and operational baselines over time.

Centralized monitoring and telemetry can support AIOps-driven troubleshooting, improving visibility and accelerating troubleshooting across environments. This operational insight supports faster detection of issues and a more effective response.

At the infrastructure level, Dell Private Cloud supports Intel TDX to enable confidential computing for virtual machines, including Red Hat OpenShift based on Confidential Containers (CoCo) environments. This strengthens workload isolation and data protection for organizations with heightened security and regulatory requirements.

Together, these capabilities reinforce a consistent security posture across heterogeneous private cloud environments.



7. Analyst View

After evaluating Dell, Red Hat, and Intel together, the most important framing takeaway is operational. Enterprises are no longer struggling to adopt virtualization, Kubernetes, or AI-capable infrastructure independently. They are struggling to operate all of them at the same time across environments without a fragmented operating model.

This is where Dell's private cloud approach is materially differentiated. Rather than positioning private cloud as a destination or a consolidation strategy, Dell treats platform diversity as a steady-state condition. VMware, OpenShift, Nutanix, and emerging environments are assumed to coexist longer than most roadmaps predict. The value is not in accelerating convergence, but in removing the operational penalty that usually accompanies it.

Red Hat OpenShift plays a critical role in this operating model as a primary platform for enterprise Kubernetes, one that must deliver the same predictability and operational discipline expected across environments. When automation and lifecycle discipline extend below the platform layer, OpenShift clusters behave consistently with the rest of the environment across various platforms. Dell's approach too enables this alignment by removing infrastructure variability from the platform equation. That alignment is what turns platform coexistence into a sustainable operating state rather than an ongoing source of friction.

The operating reality creates a different set of questions for leadership.

As platform diversity must be durable rather than transitional, the success of private cloud strategies depends on how consistently those platforms can be governed, secured, and evolved over time. Decisions about AI readiness, deployment speed, lifecycle discipline, and automation depth are not tactical. They shape how infrastructure responds to change without compounding risk or operational drag.

Intel's role is equally pragmatic in this context. AI workloads, confidential computing requirements, and consolidation pressures are converging on the same infrastructure footprint. PowerEdge systems built on Intel Xeon platforms enable organizations to absorb these demands without introducing parallel hardware strategies. Higher core density, accelerator support, and security capabilities such as TDX enable infrastructure teams to modernize capacity and maintain a consistent operational baseline.

Key Questions for Leadership

Operating Model and Complexity

- Can we add or change platforms without adding a new operating model? Or does every platform decision create new tools, processes, and exceptions we carry forward indefinitely?
- Is platform diversity governed by design or tolerated by habit? Do we actively manage coexistence, or are we simply accumulating it?

Automation as a Strategy

- Does automation stop at provisioning, or does it govern how environments evolve? Are lifecycle, security, and compliance enforced continuously or episodically?
- If a new platform emerges, can we adopt it without rewriting how we operate?

AI Readiness and Infrastructure Evolution

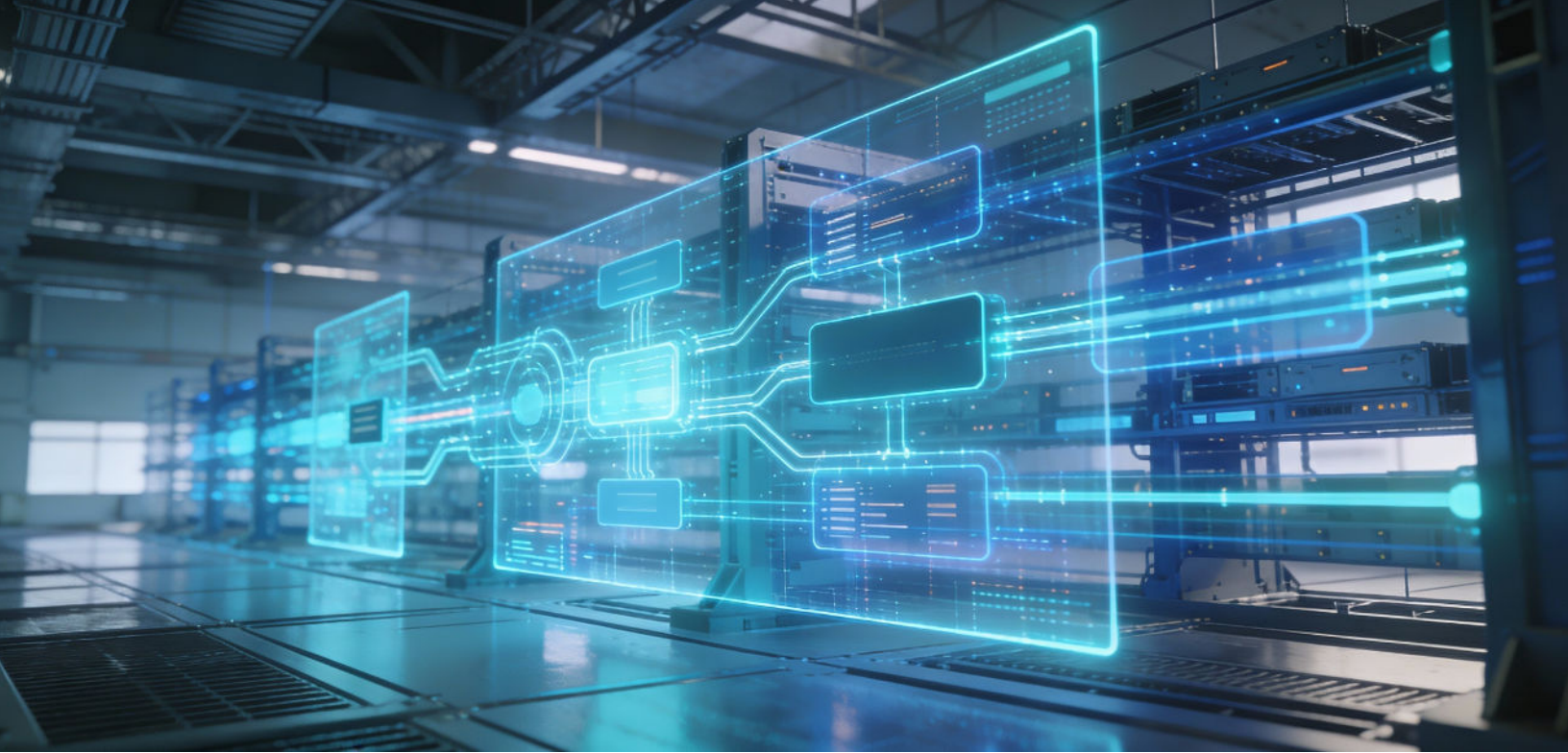
- Can we introduce AI-capable infrastructure without creating a parallel stack? Will GPU- and accelerator-enabled systems follow the same lifecycle, security, and governance standards as everything else?
- If AI demand doubles next year, does our operating model bend or break?

Speed versus Risk

- When the business needs capacity or a new platform quickly, do we rely on automation or heroics? Is speed repeatable, or dependent on manual effort and institutional knowledge?
- Does faster deployment reduce risk, or just move it downstream?

Lifecycle Discipline and Reliability

- Are upgrades routine events or high-risk projects? Can we change infrastructure and platforms predictably, or do we slow down to stay safe?
- Do environments drift over time, or are they actively pulled back to a known baseline?



Conclusion

Private cloud strategies are entering a durable phase defined by coexistence rather than convergence. Virtualization, Kubernetes, and AI-enabled workloads are not collapsing into one architecture or platform. They are operating side by side, often for longer than anticipated, driven by business realities, organizational structure, and regulatory constraints.

In this environment, success is determined by operating discipline. Consistent deployment, lifecycle management, governance, and automation below the platform layer allow organizations to scale diversity without multiplying complexity. When these controls are absent, complexity accumulates quietly and becomes a structural constraint on speed, reliability, and change.

Dell's approach, in combination with Red Hat OpenShift and Intel-based infrastructure, reflects this shift. Infrastructure becomes adaptable, platforms remain flexible, and new workload types can be introduced without rewriting how environments are operated.

Looking ahead, customers should expect continued platform expansion, accelerated AI adoption, and increasing pressure on infrastructure teams to move faster without increasing risk. Private cloud environments that treat operating discipline as a foundational capability will be better positioned to absorb these changes.



Appendix: Project Methodology

This report is based on independent analysis conducted by Futurum Research to evaluate Dell's approach to private cloud operations and its implications for enterprises managing mixed virtualization, container, and AI-enabled environments. The objective of the research was to assess architectural design, operational claims, and lifecycle practices using verifiable inputs rather than marketing assertions.

The analysis focused on how Dell Private Cloud and the Dell Automation Platform address deployment speed, operational consistency, lifecycle governance, and infrastructure flexibility across heterogeneous environments, including VMware, Kubernetes-based platforms, and emerging workload types.

Research Inputs

The findings in this report draw on multiple primary and secondary sources, including:

- Technical briefings with Dell engineering, architecture, and product teams, including detailed walkthroughs of Dell Private Cloud and the Dell Automation Platform
- Structured conversations with Dell, Intel, and Red Hat subject matter experts covering hardware architecture, blueprint-driven workflows, lifecycle automation, and platform integration
- Review of Dell Private Cloud solution briefs, product documentation, blueprint catalogs, demonstrations, and reference architectures
- Review of publicly available documentation related to OpenShift, VMware, and relevant infrastructure components to validate architectural alignment and operational assumptions.

Where appropriate, specific sources and materials are referenced through footnotes to provide transparency and traceability.

Claim Verification and Analysis Approach

Operational and architectural claims presented by Dell, Intel, and Red Hat were evaluated for accuracy, clarity, and consistency. Claims related to deployment time reduction, node lifecycle automation, storage configuration efficiency, and upgrade reliability were examined using Dell-provided data, supporting architecture documents, and follow-up discussions with engineering teams.

Performance and efficiency characteristics of Intel-based PowerEdge 17G systems were cross-checked against vendor-published technical specifications and, where applicable, referenced lab validation materials. Architectural assertions were reviewed against publicly available platform documentation to ensure alignment with documented capabilities, constraints, and design patterns.

Futurum Research applied practitioner-informed judgment to contextualize metrics and claims, focusing on operational relevance rather than isolated benchmark results.

Limitations and Context

This report relies in part on vendor-provided data for specific performance metrics and operational claims. While efforts were made to validate these claims through documentation and expert review, real-world outcomes may vary based on customer environment, workload characteristics, operational maturity, and other factors.

Some capabilities covered reflect features that are generally available or expected to be available in the near term. Findings reflect the state of the products and services at the time of publication.

The purpose of this methodology is to provide readers with confidence that the analysis reflects an independent assessment grounded in verifiable information, while acknowledging the practical limits inherent in evaluating complex, evolving enterprise platforms.



Important Information About This Report

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