Enterprise Strategy Group™ by TechTarget

ECONOMIC VALIDATION

The Economic Benefits of Google Distributed Cloud, Powered by Intel, in Retail Environments

Enable Innovative AI-driven Retail Use Cases, Simplify Operational Complexity, and Reduce Risk Across Thousands of Retail Locations While Lowering Costs by Up to 24%

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January 2025

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Enterprise Strategy Group by TechTarget — Economic Validation: Key Findings Summary

Validated Benefits of Google Distributed Cloud, Powered by Intel

Up to 24% Lower TCO
compared to traditional retail IT infrastructure

492% to 1,190%
Return on Investment (ROI) over 5-years

Up to $100s of Millions
In potential avoided downtime and retail revenue improvements

- **Improved Retail Business Capabilities and Agility:** By empowering organizations to deploy and scale Intel-powered infrastructure at retail locations faster, better adjust to changing markets and customers, and accelerate innovation by enabling modern use cases like AI-driven analytics that impact retail store performance.
- **Improved Operational Efficiency and Savings:** By removing the burden of deploying, managing, and maintaining infrastructure and platforms at each retail location and simplifying the effort required to develop and support applications, enabling retail organizations to focus their efforts on modernizing capabilities, improving productivity, and improving business outcomes.
- **Reduced Risk for Retail Operations:** By reducing the risks associated with planned and unplanned downtime, security incidents, non-compliance, and interoperability issues—all of which can greatly impact the bottom line of the business.

Introduction

This Economic Validation from Informa TechTarget's Enterprise Strategy Group focused on the quantitative and qualitative benefits retail organizations can expect by using Google Distributed Cloud (GDC), powered by Intel, to modernize and optimize their distributed retail environments.

Challenges

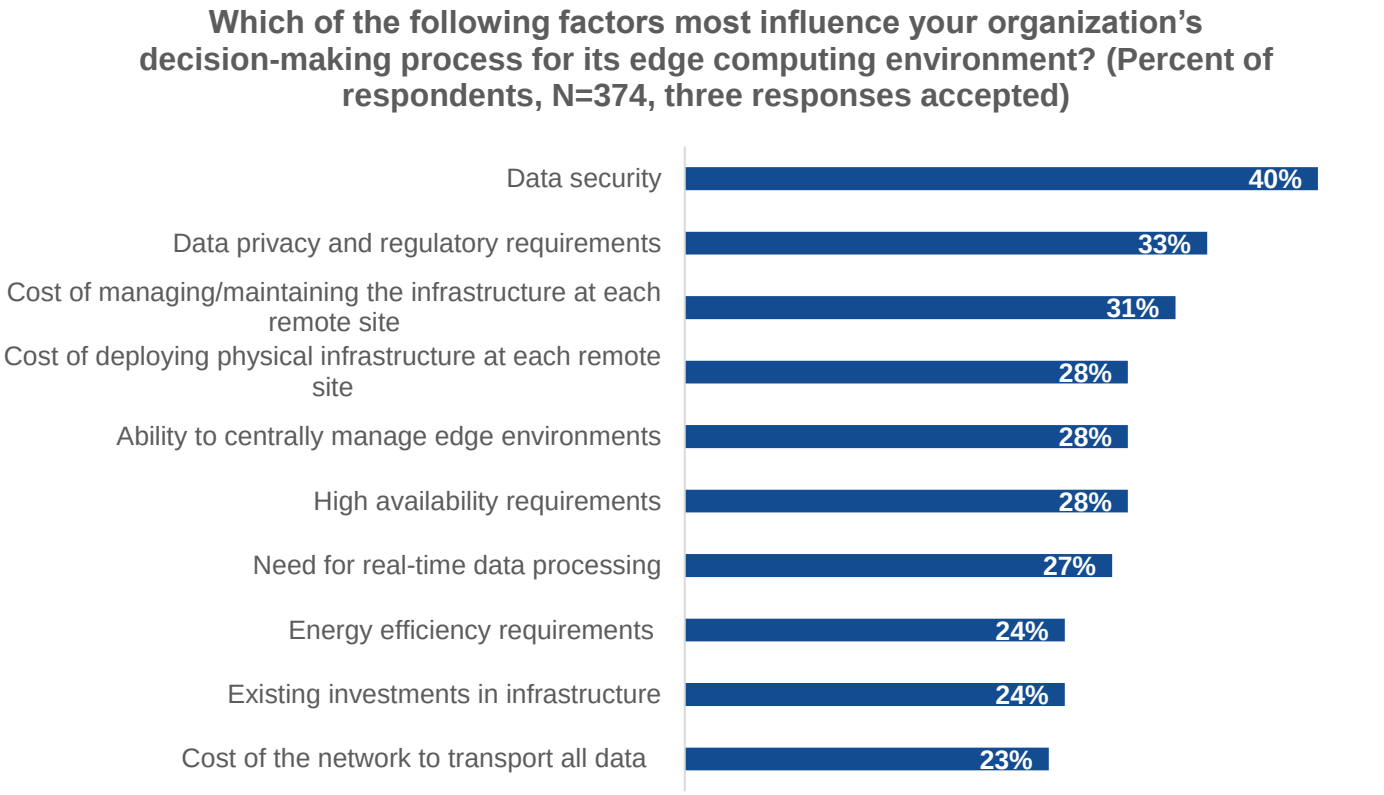
For large, distributed retail organizations, effective operational services running on edge computing solutions play a critical role in the overall capabilities and success of both the local store and the global organization. Stores, warehouses, and delivery mechanisms operate at the edge, and shoppers expect their purchasing experiences to continue regardless of where on the omnichannel they choose to shop, especially in physical stores—"the edge." Operational Technologies (OT) at the edge work together to increase sales for the retailer and improve retail operational efficiencies. Improvements in shopper experience using OT have proven to increase consumer interaction, leading to higher revenues for those retailers that invest and expand edge OT. Edge computing enables applications to run and data to be processed closer to the source for better inventory tracking, demand forecasting, and personalized customer experiences, as well as more efficient sales operations.

Over time, retail organizations have relied on point or regional teams or managed services to handle local IT operations. Such manual operations result in a lack of consistency in deployed solutions and have increased complexity to deploy, manage, secure, and scale services. Running edge services on disparate legacy three-tier or hyperconverged infrastructure can be costly to maintain and manage and difficult to secure and protect, while also limiting operational visibility and impeding modern capabilities such as running analytics workloads locally or realizing efficient distributed DevOps practices.

Today's retail operations need to deploy edge computing solutions that are more agile and efficient than ever before to support both legacy and modern applications while also being under heavy scrutiny to limit risk and optimize costs. As shown in Figure 1, Enterprise Strategy Group research showed that some of the most important factors that influence an organization's decisions around edge computing environments include data security, privacy and regulatory requirements (reduced risk), the cost of managing and deploying the infrastructure at each remote site (reduced local complexity), and the ability to centrally manage edge environments (reduced complexity of global operations).[1]

[1] Source: Enterprise Strategy Group Research Report, *Unleashing the Edge: Use Cases, Challenges, and Requirements in Edge Infrastructure and Environments*, March 2024.

Figure 1. Reduced Risk and Complexity Are Most Important Factors for Edge Computing



Source: Enterprise Strategy Group, a division of Informa TechTarget, Inc.

Keeping security and governance practices up to date with the latest best practices is crucial for minimizing risk, but local IT teams might not be experienced enough to be effective. Network downtime, hardware issues, and software problems can disrupt retail applications, and limiting the financial impact of local application downtime is critical to business operations. It can take significant investments in developing or outsourcing the skills required to properly secure, protect, and keep retail locations in compliance. In addition, the ability to collect and generate real-time insight from high volumes of data at the edge has become increasingly important. Bringing modern AI-driven capabilities into retail locations can result in improved sales, better customer reach and experiences, reduced risk, and improved business decisions. And extending AI-optimized applications from the cloud to the edge can bring new insights and optimizations across all retail locations and critical functions of the business.

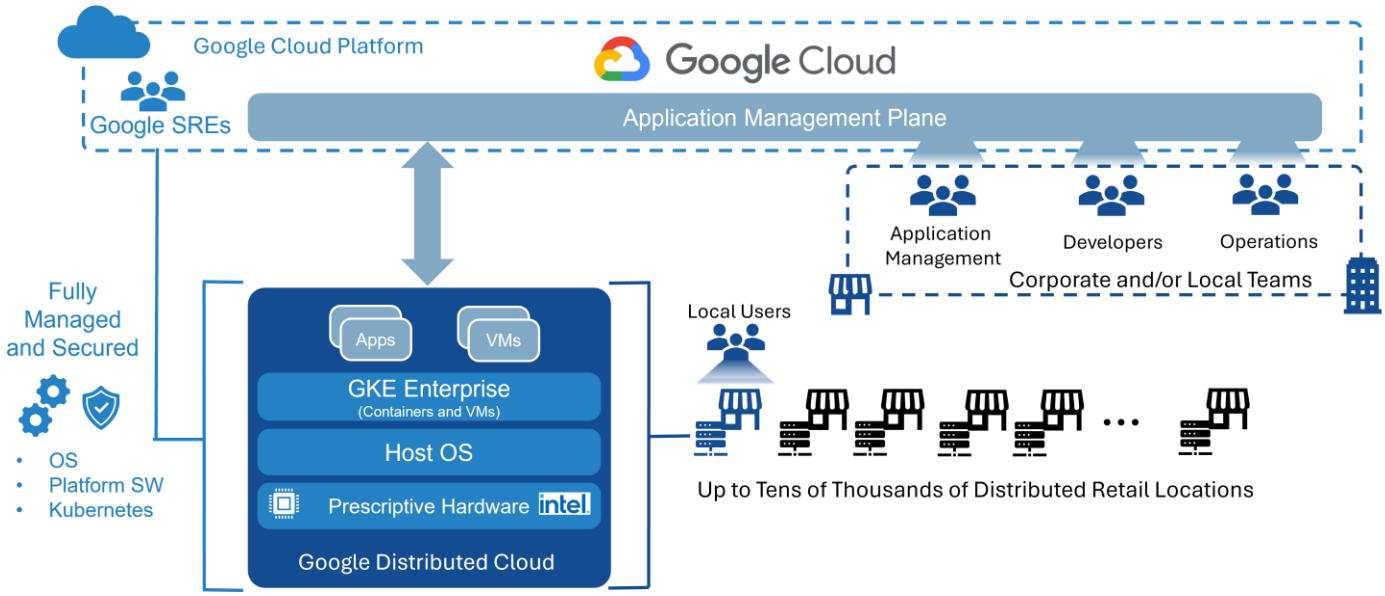
Continuing to rely on custom solutions and local IT teams to manage traditional disparate three-tier or converged IT infrastructure at the edge in retail environments results in inefficient use of resources, reduced sales and profitability, and higher costs to the organization. Retail organizations would benefit from rethinking and modernizing edge compute infrastructure with a solution that enables reduced operational complexity, continuous innovation, improved security, and the ability to run legacy and modern AI-driven applications at the edge while seamlessly integrating applications and data with cloud services and operations.

The Solution: Google Distributed Cloud, Powered by Intel

GDC is fully managed hardware and software infrastructure extending AI-enabled infrastructure, AI models, and Kubernetes from the cloud to an organization's on-premises data center. VMs and containerized applications can be managed locally or through Google Cloud tools and APIs, while Google Cloud's site reliability engineering securely handles operations for the entire distributed deployment from the Google Cloud Platform. When deployed

at retail locations, GDC can provide accelerated speed to market with application modernization, reduce the cost and complexity of store IT management, and make developers and platform operations teams more productive.

Figure 2. GDC, Powered by Intel



Source: Enterprise Strategy Group, a division of Informa TechTarget, Inc.

Some key benefits of GDC include:

- **Centralized management and visibility.** Cloud-based operations for platform metrics, logs, events, and alarms enable centralized observability and fleet management with a single pane of glass for management, application continuous integration/continuous delivery (CI/CD), and configuration management (GitOps).
- **Fully managed operations.** Google Cloud provides proactive monitoring of hardware and software, automatic and managed software upgrades, and onsite hardware repairs/replacement.
- **Flexible hardware and software stack.** Organizations can choose from pre-integrated solutions or supported off-the-shelf deployment profiles powered by Intel CPUs and GPU accelerators to provide optimized resources and minimize total cost of ownership (TCO). Google Cloud-provided software includes firmware, operating system, and container orchestration.
- **Improved TCO.** GDC uses high-performing 5th Gen Intel Xeon Processors with the Advanced Matrix Extensions (AMX) built-in accelerator, which improves the performance of deep-learning inference on the CPU and is ideal for workloads like natural-language processing, recommendation systems, and image recognition.
- **Improved performance.** CPU-based acceleration can improve power and resource utilization efficiencies, giving organizations better performance for the same price. For example, 5th Gen Intel Xeon Platinum 8592+ with Intel AMX BF16 has shown up to 10.7x higher real-time speech recognition inference performance and 7.9x higher performance/watt vs. 3rd Gen Intel Xeon processors with FP32.
- **AI support anywhere.** GDC makes it simple and cost effective to deploy AI at data center and edge locations, powered by well-established Intel edge hardware solutions designed for retail, Intel Xeon processors, a consistent container platform with the Google Kubernetes Engine (GKE), and the Intel OpenVINO open source AI toolkit.
- **Cloud-native integration.** GDC is a unified cloud-native platform that supports both Google Cloud and third-party independent software vendor edge services and telecommunications network functions. Developers and platform operations teams can access the Google Cloud shell and cloud console.

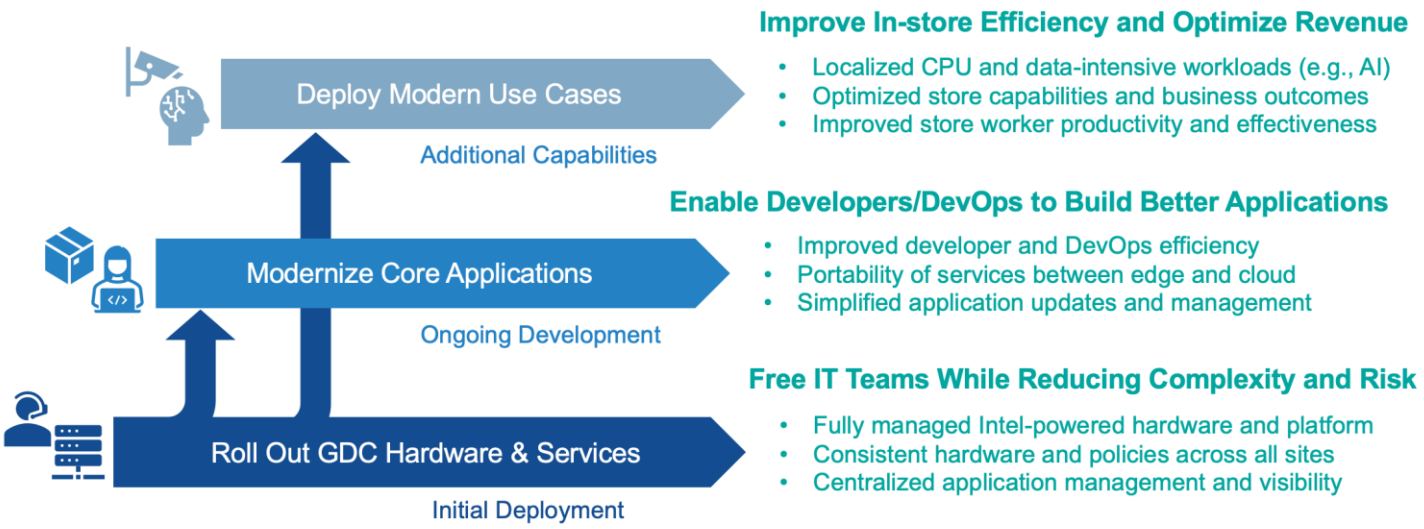
- **Integrated security and compliance.** Integrated Google Cloud security handles access management and protects applications and data at rest and in transport, while ensuring data sovereignty and simplifying compliance.

Enterprise Strategy Group's Economic Validation of GDC, Powered by Intel

Enterprise Strategy Group completed a quantitative economic analysis of GDC in retail environments. Our Economic Validation process is a proven method for understanding, validating, quantifying, and modeling the economic value propositions of a product or solution. The process leverages Enterprise Strategy Group's core competencies in market and industry analysis, forward-looking research, and technical/economic validation. We conducted in-depth interviews with end users and subject matter experts to better understand and quantify how using GDC has impacted or could potentially impact organizations, particularly in comparison with previously deployed infrastructure and platforms. The customers and experts that Enterprise Strategy Group spoke with were working for or with organizations using GDC in retail environments ranging from tens to tens of thousands of locations.

By deploying GDC hardware and services at retail locations, customers were able to remove the burden from their IT teams and reduce complexity and risk. After modernizing their applications to containerized microservices, customers were able to free up DevOps teams and improve the productivity of their developers to build better applications. Additionally, the localized processing power provided at retail locations enabled new and powerful applications that helped to improve in-store efficiency and contributed to revenue improvements. Figure 3 summarizes some of the savings provided by GDC in retail environments.

Figure 3. Summary of Savings Provided by GDC, Powered by Intel



Source: Enterprise Strategy Group, a division of Informa TechTarget, Inc.

Enterprise Strategy Group's economic analysis revealed that, compared with traditional retail IT infrastructure, when deployed in retail edge environments, GDC, powered by Intel, provides measurable value by enhancing operational efficiency, reducing risks, and accelerating edge innovation. Our research identified significant savings and benefits in the following key areas:

- **Improved retail business capabilities and agility.** Enterprise Strategy Group found that organizations were able to deploy and scale edge retail locations faster and with far less complexity and limitations. GDC also

helped improve development agility, enabling users to accelerate innovation and deliver new modern business use cases and AI inferencing-at-the-edge capabilities.

- **Improved operational efficiency and savings.** GDC was able to greatly remove the burden of deploying, managing, and maintaining infrastructure and platforms at each retail location and simplified the effort required to develop and support applications, enabling retail organizations to focus their efforts on modernizing capabilities, improving productivity, and improving business outcomes.
- **Reduced risk for retail operations.** Enterprise Strategy Group found that GDC could greatly reduce the risks associated with planned and unplanned downtime, security incidents, noncompliance, and interoperability issues—all of which can greatly affect the bottom line of the business.

Improved Retail Business Capabilities and Agility

Retailers face increasing pressure to scale operations, adapt to evolving customer demands, and innovate quickly. GDC, powered by Intel, empowers organizations to deploy infrastructure faster, enhance business agility, and enable modern use cases like AI-driven analytics, resulting in measurable business improvements. Through discussions with customers and subject matter experts, Enterprise Strategy Group identified significant savings and benefits in the following areas:

- **Faster time to deploy and scale infrastructure and platform at the edge.** GDC enables retailers to efficiently scale their operations, with new individual locations rolled out in as little as a single day. Pre-tested, pre-cabled solutions, powered by Intel hardware, eliminate much of the manual effort and reduce setup errors, ensuring consistent deployments across sites. Google Cloud's implementation services further streamline the process, minimizing reliance on onsite resources and reducing planning risks. One retail customer shared, **"We can deploy a single store in a day and then scale across multiple locations at our own pace, giving us the flexibility to grow faster while minimizing risks,"** reflecting the operational simplicity and scalability GDC provides. GDC customers can choose the deployment strategy that works best for them, enabling retailers to do proof-of-concept (POC) testing in smaller stores or prioritize high-revenue locations first. Google estimates that, once deployed, software updates can be pushed to tens of thousands of locations in just hours, reducing previously lengthy processes that used to take weeks. By combining rapid physical deployment with scalable, centralized management tools, GDC helps retailers simplify operations, reduce complexity, and accelerate time to value.

> **"With GDC, we can deploy a single store in a day, modernize legacy applications, and build new services, enabling us to scale faster and focus on business growth."**

- **Improved business agility and flexibility.** GDC enhances business agility by enabling retailers to quickly adapt to changing consumer behaviors and market demands without planning IT services and solutions months in advance. Its flexible architecture leverages an open source design for improved interoperability with cloud-native applications and can either be purchased and provided by Google Cloud or the customer can choose to source hardware themselves. Google Cloud estimates that centralized configuration management enables global updates to be completed in just hours, enabling retailers to adjust pricing or policies rapidly across thousands of locations. GDC also provides agility by reducing the need to transfer large amounts of data for real-time workloads such as AI analytics and video streams to the cloud, helping to provide faster insight and lower costs. Retailers can quickly develop and test new applications, strategies, and functionality in smaller stores, helping to minimize risk and maximize success. By providing a platform that can seamlessly handle legacy and modern applications, streamline operations, and accelerate the deployment of new services, GDC helps organizations stay agile and competitive in changing retail environments and markets.
- **Accelerated innovation.** GDC fosters accelerated innovation by enabling organizations to modernize their application architecture while maintaining operational stability. One retail customer shared**, "Anything net new that we build will be containerized and built with a microservices architecture,"** highlighting their shift

from legacy, monolithic applications to modular, scalable, and portable solutions. This modernization enables organizations to develop singular scalable services that can run in the cloud or locally at retail locations, letting businesses innovate faster and more efficiently. GDC also supports streamlined CI/CD pipelines for developers and DevOps teams, enabling faster releases of products and features and reducing bottlenecks in workflows. Another retail customer noted, **"With GDC, we can build much faster and push code on our own."** Powered by Intel's advanced hardware, GDC supports resource-intensive next-generation workloads such as AI-driven analytics, in-store augmented intelligence, and visual inspections, unlocking new retail use cases. Kubernetes-based infrastructure future-proofs investments, enabling faster feature iterations, while Google Cloud's advisory services and partners provide vertical-specific insights and tools. By supporting both legacy VMs and modern containerized workloads, GDC accelerates modernization and innovation, without disrupting ongoing operations, enabling retailers to adapt and deliver exceptional new customer experiences.

- **Faster enablement of modern retail use cases.** GDC accelerates the deployment of AI-driven retail use cases by enabling local inferencing of workloads directly at retail locations without the need to first transfer large amounts of data to the cloud. A retail customer shared, **"We can run these services to generate insight locally and in the cloud, depending on what data is required and what makes the most sense,"** emphasizing GDC's flexibility to support both localized and cloud-based workloads. According to Google Cloud, localized AI workloads reduce latency and enable faster decision-making, with data processing times under 90 seconds—well within operational thresholds for critical operations such as license plate recognition, frictionless checkout, and inventory optimization. GDC's AI-ready environments leverage Intel's latest processors and accelerators, supporting advanced analytics like video monitoring, loss prevention, and customer behavior tracking, without requiring expensive cloud infrastructure. By reducing reliance on cloud data transfers, retailers can lower operational costs while improving responsiveness. These capabilities empower retailers to deploy AI-driven innovations faster, improve agility, and deliver enhanced customer experiences based on real-time insights.
- **Improved business outcomes.** GDC can help retailers improve many aspects of their business, including modernizing operations, enhancing customer experiences, and boosting revenue. Access to real-time insights, such as dwell time analysis, can help retailers optimize layouts, reduce costs, and increase satisfaction, creating opportunities for increased market share, revenue, and profit margins. GDC also enables AI-driven retail use cases like inventory tracking, shrink reduction, and customer behavior analysis, helping businesses address common challenges and unlock new revenue streams. Intelligent analysis that helps prevent stockouts is another critical use case, as missing key items directly impacts customer satisfaction and loyalty, which helps prevent churn. While these changes do not happen overnight, GDC can help make the transition a smooth one, as a retail customer explained, **"We run legacy applications in hybrid mode while we work on migration and modernization."** This highlights GDC's ability to support seamless technology transitions without disrupting business operations. As GDC is deployed in more retail environments and organizations are able to take full advantage of the capabilities, they have an opportunity to significantly expand retail store capabilities and improve measurable KPIs.

Improved Operational Efficiency and Savings

Operational efficiency and productivity are critical priorities for retailers aiming to streamline processes and reduce costs. GDC empowers retailers to optimize their operations by centralizing management, automating routine tasks, and reducing the complexity of IT infrastructure. Customers highlighted GDC's ability to simplify application management, reduce staffing challenges, improve worker productivity, and provide lower and more predictable costs. These capabilities enable retailers to save time and resources, letting them focus on innovation and delivering better customer experiences. Customers reported savings and benefits in the following categories:

- **Less effort to manage at scale.** Simplifying retail IT operations, GDC offers fully managed hardware, software, and security, along with features like automated updates, proactive monitoring, and centralized management of VMs and microservices. These capabilities reduce the need for in-store IT teams or professional services, lower operational costs, and eliminate inefficiencies caused by diverse hardware (servers, networking, and potentially storage) or software platforms (hypervisors and Kubernetes). Desired state automation (the ability to preconfigure or push configurations and updates) further reduces the need for constant IT presence, enabling lean operations across thousands of stores. One retail customer shared**, "We spend a lot less time dealing with issues from disparate hardware and inconsistent versions and configurations between sites,"** emphasizing how GDC's unified platform streamlines management and enhances operational efficiency across distributed retail environments.

> **"We don't have to worry about any heavy lifting—we can just focus on the development and scaling of applications and services."**

- **Single-pane-of-glass management with consistent policies.** GDC centralizes management, providing retailers with a unified platform to manage applications, configurations, and infrastructure across thousands of locations. This cloud-based control plane simplifies operations by enabling consistent policies and configurations to be applied seamlessly across all sites. According to Google Cloud, integrating desired state automation reduces the need for constant IT presence, enabling retailers to operate more efficiently with fewer on-site resources. A retail customer shared, "**We had a dedicated team before, but now we rely on centralized pipelines,"** highlighting the significant shift from fragmented systems to streamlined operations. Additionally, scaling from single-node to three-node configurations is straightforward, with all nodes managed centrally through GDC's tools. These capabilities ensure simpler updates, better observability, and consistent management across locations, ultimately reducing operational complexity and improving IT efficiency.
- **Predictable and flexible pricing.** GDC provides a predictable cost model that enables businesses to better align their IT investment to their business requirements and financial strategies. The subscription-based Opex model offers predictable spending that scales with number of sites and reduces the need for large and disruptive upfront capital expenses for hardware, upgrades, refreshes, and professional services. For organizations that prefer to purchase and manage their own hardware, a Capex option lets them maintain control while still benefiting from GDC's cost-efficient software and platform. One retail customer shared, **"We think GDC will help us lower hardware costs, maintenance expenses, and operational overhead,"** reflecting the platform's potential to control costs and provide value. Additionally, Google Cloud's transparent pricing structure consolidates hardware and software licensing costs, avoiding unexpected financial surprises and providing consistency in long-term planning. By reducing complexity and enabling financial predictability, GDC empowers retailers to make smarter, more efficient budgetary decisions.
- **Reduced staffing complexity.** GDC streamlines infrastructure management with centralized processes and automation, reducing the need for highly skilled IT personnel at each retail location. This enables businesses to address staffing challenges without compromising operational efficiency. According to Google Cloud, centralized processes can significantly reduce staffing needs, with one person potentially managing tasks that previously required up to 10 individuals. Additionally, GDC eliminates the need to hire, train, and retain specialized IT staff at every site, enabling retailers to focus resources on customer-facing roles and strategic initiatives. In addition, next-generation assistive technology running on GDC can help make store employees more knowledgeable and productive by analyzing data to provide helpful insights, instruction, guided issue resolution, and real-time value-added suggestions. This helps improve employee productivity and customer experiences and also helps save employees time and effort while improving their confidence and job satisfaction.
- **Simplified application management.** GDC simplifies application management by enabling consistent oversight at both local and global levels. Through Google Cloud tools and APIs, GDC provides comprehensive visibility and control, ensuring seamless deployment, updates, and maintenance across distributed retail environments. This centralized approach supports consistent application configurations, making documentation, training, and support more efficient. Additionally, features like application auto-healing further

reduce the need for manual intervention, enabling IT teams to focus on strategic initiatives while ensuring system reliability.

- **Less effort for developers.** GDC provides a consistent Kubernetes-based application platform at all locations and leverages cloud-native tools through the Google Cloud console and Google Cloud Shell, simplifying development processes for retail organizations. GDC customers are in a better position to employ CI/CD practices that make application development and delivery far more efficient and seamless. Developers benefit from unified tools and processes that reduce the need for custom work and rework, minimizing the learning curve and effort required to manage diverse environments. With access to cloud-native DevOps capabilities, development teams can efficiently build and deploy applications, accelerating time to market for new applications, services, and innovative capabilities.

Reduced Risk for Retail Operations

Minimizing risk is crucial for ensuring business continuity, safeguarding sensitive data, and delivering consistent customer experiences in retail environments. GDC, powered by Intel, offers advanced features that mitigate key risks, including downtime, security vulnerabilities, and compliance challenges. Enterprise Strategy Group's discussions with customers revealed that GDC's resilient architecture, robust security measures, and standardized platform significantly reduced their exposure to operational disruptions, enabling seamless operations across locations. Customers reported savings and benefits in the following categories:

- **Reduced downtime and improved survivability.** GDC, powered by Intel hardware, minimizes downtime risks for retail environments through features like ruggedized hardware with 2+1 redundancy, high availability, self-healing capabilities, and nondisruptive updates during off-peak hours. The platform enables legacy VMs to run on Kubernetes, providing high availability for critical operations such as point-of-sale systems. These systems can continue to run during periodic network outages lasting for as long as seven days, after which systems can seamlessly report and sync back to any cloud services once connectivity is restored. Intel's advanced hardware enhances predictive maintenance capabilities by providing advanced telemetry and analytics acceleration, enabling GDC to proactively address potential issues before they escalate. A retail customer explained, **"We do have to deal with network downtime, we don't have the best bandwidth, but GDC is designed to be running without network access, and it quickly recovers once the network is back up."** This proactive approach reduces disruptions, potentially lowering downtime by up to 50% or more. Additionally, GDC's local processing capabilities ensure uninterrupted localized AI operations, reducing the effect of outages on customer experiences and maintaining operational continuity.

> **"GDC reduces operational risks with consistent performance during outages, enhanced data protection, and simplified hardware management, allowing us to focus on delivering better customer experiences."**

- **Improved security at edge retail locations.** Retailers benefit from enhanced security at edge locations by leveraging Google Cloud's advanced security tools, services, and site reliability engineer expertise to augment their own security practices. GDC provides comprehensive security protection for data, transport, applications, and access management. Hardware security in select 4th Gen and newer Intel Xeon processors is enhanced by Intel's Confidential Compute technologies, including Software Guard Extensions (SGX) and Trust Domain Extensions (TDX). These technologies isolate applications and memory, effectively restricting unauthorized access. These technologies combine to strengthen data and application security, ensuring sensitive information remains protected. The robust security infrastructure helps mitigate risks from data breaches, viruses, and ransomware at retail locations, without requiring dedicated local IT security staff. Google Cloud emphasizes that GDC minimizes vulnerabilities and ensures compliance across distributed retail environments through managed hardware, integrated security features, and automated updates. A retail customer shared, **"Google Cloud's security expertise gives us peace of mind,"** reflecting the confidence provided by offloading security responsibilities to GDC. Additionally, GDC's ability to define granular access policies and

segment workloads enables better control and protection against unauthorized access. With tamper-proof infrastructure and automated compliance measures, GDC safeguards critical applications from cyberthreats, providing retailers with a reliable and secure edge environment.

- **Improved data compliance at edge retail locations.** Retailers rely on GDC to simplify compliance with complex regulatory standards, ensuring sensitive customer and organizational data remains secure. GDC empowers retailers to maintain sovereignty over their data and infrastructure while leveraging segmentation and isolation to manage sensitive information effectively. Personal identifiable information and other critical data can be anonymized or processed at the edge before being sent to cloud analytics solutions, reducing compliance risks tied to regulations like PCI, HIPAA, and GDPR. According to Google Cloud, the platform's built-in compliance features, such as automated monitoring and managed updates, minimize the risk of fines, legal exposure, and reputational damage. Highlighting the value of segmentation, a retail customer shared, **"With GDC, we focused on isolating workloads so the platform only does what it is supposed to do. This ensures sensitive data is secure and inaccessible from other parts of the network."** Another retail customer added, **"It helps us handle proprietary and unprotected sensitive data by keeping it isolated."** By reducing the burden of compliance management, GDC enables retailers to focus on delivering exceptional customer experiences while maintaining adherence to evolving security and privacy requirements.

> **"We leverage GDC to help segment our workloads and to define and enforce policies for access."**

- **Fewer localized interoperability issues.** Retail environments often face challenges with disparate hardware, software, and services across locations, leading to operational silos, technical errors, and troubleshooting delays. GDC mitigates these issues by providing a unified platform with standardized processes and a common stack, eliminating the need for bespoke solutions at individual sites. This consistent architecture supports seamless integration of Kubernetes, VMs, and legacy systems, enabling modernization without disrupting existing workflows. The unified platform also enhances visibility for global operations and development teams, reducing the risk and impact of localized issues. Declarative configuration and eventual consistency simplify deployments across distributed environments, ensuring consistent performance even during network disruptions. A retail customer shared, **"We spent a lot of time dealing with issues from disparate hardware and configurations. Now we have a consistent platform across locations."** By minimizing troubleshooting efforts, eliminating silos, and reducing technical errors, GDC empowers retailers to focus on improving customer experiences and operational efficiency.

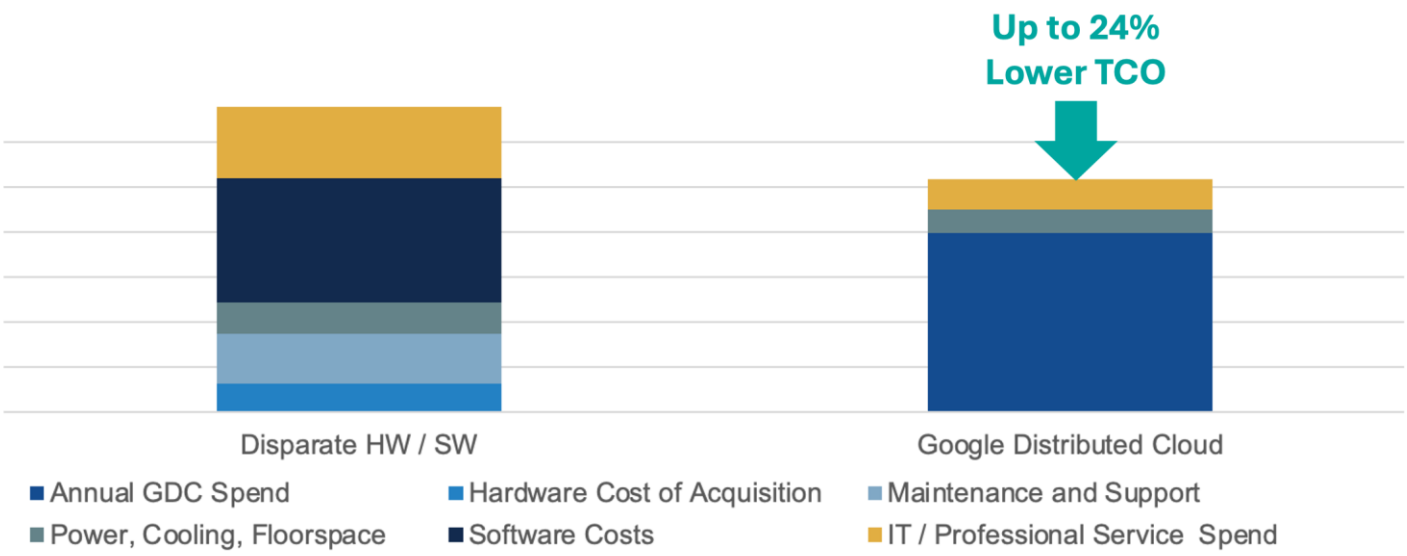
Enterprise Strategy Group Analysis

Enterprise Strategy Group leveraged the information collected through vendor-provided material, public and industry knowledge of economics and technologies, and the results of customer and subject matter expert interviews to create a modeled scenario that compares the costs and benefits of providing connected services for retail environments with GDC against the expected costs to continue to refresh and operate disparate localized hardware, software, and services at edge retail locations. Enterprise Strategy Group's interviews with retail environment subject matter experts and customers who have recently made the transition to GDC, combined with experience and expertise in economic modeling and technical validation of infrastructure and distributed solutions, helped to form the basis for our modeled scenario.

Our modeled scenario considered a large, distributed retail organization with 550 stores and an average of $2.81 billion in annual revenues looking to update their infrastructure, modernize their applications, and deploy new and powerful local AI-driven applications at 110 selected locations over the next five years. The organization was considering deploying the fully managed GDC, powered by the latest Intel processors, against refreshing and continuing to manage their architecture composed of disparate server, networking, and storage from their existing three-tier technology provider. To begin, Enterprise Strategy Group modeled the expected per-site TCO by comparing the expected deployment and operational costs at each site over the five-year period. We assumed that

the organization would POC and roll out 10 stores in the first year, followed by an additional 25 stores per year over the next 4 years. Our analysis found that GDC could lower the expected five-year per-site TCO by up to 24% (see Figure 4).

Figure 4. Expected TCO at Each Retail Site Deployment



Source: Enterprise Strategy Group, a division of Informa TechTarget, Inc.

- **GDC.** We modeled the expected cumulative monthly costs cost to deploy a fully managed medium-sized GDC 3-node blade cluster providing 32 vCPUs, 64GB of RAM, and 1.6TB of storage to VMs and containerized services. We also modeled the expected power and cooling costs (approximately 25% lower due to the efficient design of the hardware) and the expected cost of IT services (approximately 57% lower based on advantage of Google Cloud's managed services for the hardware and platform and significant reduction in complexity for any existing on-site IT services required for tasks such as compliance work, configuration and building of VMs and containers, backup/DR, etc.).
- **Disparate hardware and software.** We modeled the expected one-time cost to purchase a high-availability cluster of three 1U rack mounted servers, each with dual 12-core Intel Xeon CPUs, 32GB of RAM, and two 480GB solid-state drives in a Raid 1 configuration. Even though this would be paid all upfront in the year of deployment, the total cost was annualized over a five-year period to normalize for the potential useful life of the deployed hardware. We also calculated the expected costs of hardware maintenance and support, power and cooling, software license costs for virtualization licenses, and security services. These costs were based on representative customer reported costs.

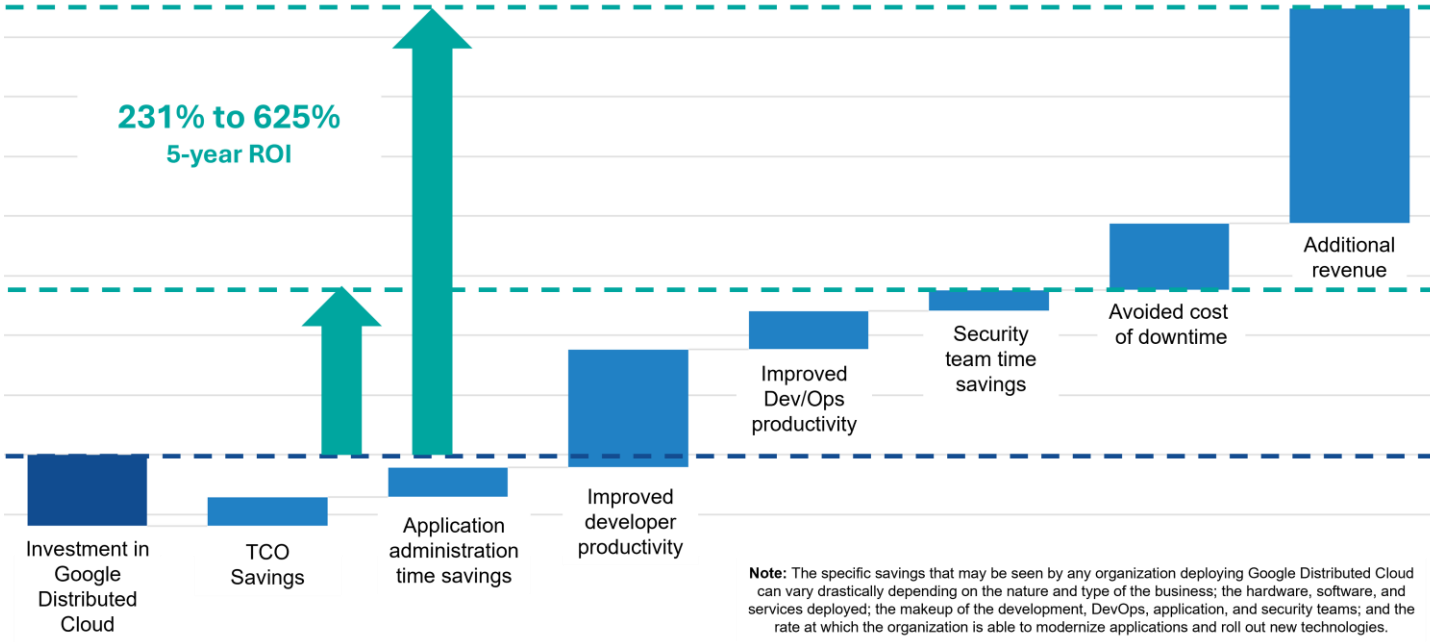
Next, Enterprise Strategy Group modeled the expected savings and benefits that could be enabled by GDC once deployed. Our models predicted the following savings and benefits:

- **Application administration savings.** Our models assumed up to a 30% improvement in efficiency through effective global monitoring and management of applications by a team of 20 application administrators (one per application) across a consistent hardware platform at all sites. Our models assumed a gradual transition over the five years to modernize applications, starting with 10% of applications in year 1, 25% in year 2, 50% in year 3, 75% in year 4, and 100% in year 5. Only modernized applications were subject to efficiency improvements each year. The same distribution was used for developer, DevOps, and security team productivity gains.

- **Improved developer productivity.** We assumed up to a 46% improvement in developer efficiency across 40 developers (average of two per app) through implementation of a CI/CD process, containerized microservices, cloud-based development tools, and a single consistent and reliable retail platform.
- **Improved Dev/Ops productivity.** Based partially on our previous validation of GKE, our models assumed that the 10-person DevOps team (one for every four developers) would see up to a 55% improvement in efficiency by easily pushing new production builds, configurations, and application patches and updates across as few or as many sites as needed without downtime and with minimal risk of issues.
- **Security team time savings.** Because the hardware, platform, and software at all sites is secured by Google Cloud's advanced security tools, practices, and expertise, we assumed up to 75% of the work performed by the existing four-person security team could be offloaded, enabling them to focus more time on open issues and proactive measures.
- **Avoided cost of downtime.** Enterprise Strategy Group's downtime model considered the expected downtime due to network issues, hardware failure, and software bugs based on reported standards for frequency of each of these events and the average duration of expected impact with and without the GDC. We assumed that 25% of sites relied on individual server installations, 75% operated HA server clusters, and downtime events were caused either by network outages (50%), hardware issues (20%), or software bugs/reboots (30%). This analysis was used against an average downtime cost of $300,000 per hour for retail environments to calculate an expected weighted and modeled avoided cost of downtime of $265,000 per event. We assumed that each year 5-7% of sites could experience a downtime event for a total five-year downtime avoidance cost of roughly $6 million USD.
- **Improved revenue.** Our revenue model assumed that approximately $562 million in revenue was expected across the 110 locations (20% of the total $2.81 billion annual revenue across all locations). This meant that each location currently contributes an average of $5.11 million in revenue today. Current GDC customers reported that they have or hope to see a 5% to 15% increase in revenues in stores due to the expanded capabilities of existing applications, improved employee productivity, and intelligent sales made possible by localized AI-driven services. While this impact could be extremely large for many organizations, our model assumed a range of increases in revenue (starting at 5% and increasing annually by 1%) for stores with GDC deployed and modernized applications (an annual total of $5 million per location). We then conservatively attributed only 15% of the $120 million in additional revenue over the five-year analysis to GDC alone—accounting for contributions provided by application modernization efforts, AI software, company training, etc.—for a total expected impact of roughly $18 million.

Taking all the potential TCO savings, savings, and benefits into consideration, we then calculated an expected five-year return on investment (ROI) for our modeled organization by comparing the expected cost of GDC investment to the net savings and benefits provided by deploying the technology instead of simply refreshing each site with new servers. As shown in Figure 5, our models predicted a five-year ROI of 231% to 625%. The lower end of the range (231% ROI) could be expected by organizations with little risk of downtime or smaller impact of downtime or those that do not plan to deploy new applications and technologies at this time. The higher end of the range (625% ROI or even higher) could be expected by organizations in which there is a larger risk or impact of downtime at each site and where the organization has plans to deploy new cutting-edge technologies like inferencing at the edge that can help to maximize revenue and improve store worker productivity.

Figure 5. Expected Five-year ROI for a 110-site Google Distributed Cloud Rollout



Source: Enterprise Strategy Group, a division of Informa TechTarget, Inc.

Considerations

Enterprise Strategy Group's models are built in good faith upon conservative, credible, and validated assumptions; however, no single modeled scenario will ever represent every potential environment. Each organization has a unique set of considerations that will determine how much of an effect GDC could have for their organization. The specific savings that may be seen by any organization deploying GDC can vary drastically depending on the nature and type of the business; the hardware, software, and services deployed; the makeup of the development, DevOps, application, and security teams; and the rate at which the organization is able to modernize applications and roll out new technologies. Our calculations for revenue increases, downtime avoidance, productivity, and time savings provide an estimate for one potential deployment scenario. Actual savings realized could be far lower or even far greater. Enterprise Strategy Group recommends that organizations perform an analysis of their situation and goals and then consult with their Google Cloud representative to understand, discuss, and predict the potential benefits that might be achievable for their organization.

Conclusion

Retail organizations are under immense pressure to modernize their operations, meet rising consumer expectations, and adapt to the challenges of managing distributed environments. Legacy IT systems deployed at retail locations are often fragmented and reliant on localized teams and make it difficult to deliver the agility, reliability, and scalability necessary to compete in today's fast-paced retail landscape. The need for solutions that reduce complexity, ensure operational consistency, and support both legacy applications and emerging AI-driven workloads has never been greater.

GDC, powered by Intel, addresses these challenges with a unified, fully managed platform designed specifically for retail environments that can run both legacy VMs and containerized applications and services. The solution

combines high-availability hardware and software, predictive maintenance, and localized data and application processing to ensure operational resilience—even during network outages of up to seven days. A retailer explained, **"The big use case is the outage reduction. If your point-of-sale application is down, how much is that going to cost your business?"** GDC simplifies the integration of existing systems and facilitates the transition to modern workloads and development practices. With robust security, compliance features, and a consistent operational model, GDC enables retailers to confidently navigate the complexities of modernization while safeguarding critical data and infrastructure.

From a financial standpoint, GDC provides substantial value by reducing downtime-related costs, streamlining operational expenses, and accelerating the deployment of innovative use cases. Our five-year model predicted that retailers can achieve an ROI of 231% to 625%—or even higher—and realize tens to hundreds of millions of dollars in avoided downtime-related costs and revenue improvements, thanks to GDC's advanced capabilities and lower total cost of ownership compared to traditional IT infrastructure. These savings, paired with impressive scalability and operational efficiency, enable retailers to focus on improving customer experiences, driving innovation, and staying ahead in constantly evolving competitive markets.

This report underscores the transformative potential of GDC, powered by Intel, for retail organizations seeking to modernize and future-proof their operations. Deploying GDC in retail environments provides the simplicity and power required by next-generation technologies that can significantly transform retail operations. Enterprise Strategy Group has validated that GDC is an ideal solution for retailers looking to enhance scalability, reduce risk, and deliver seamless, secure, and efficient retail experiences. We encourage IT decision-makers to explore how GDC can drive long-term success while enabling innovation at the edge.

About Enterprise Strategy Group
TechTarget's Enterprise Strategy Group provides focused and actionable market intelligence, demand-side research, analyst advisory services, GTM strategy guidance, solution validations, and custom content supporting enterprise technology buying and selling.

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