ENHANCING QUICK-SERVE RESTAURANTS WITH EDGE COMPUTING

Technical White Paper from the experts at Scale Computing and IFBTA

SCALE COMPUTING

ifbta
international food & beverage technology association

EXECUTIVE SUMMARY

This white paper is aimed at anyone with responsibility for choosing, implementing, and managing distributed IT infrastructure in a retail, or more specifically, a quick-serve restaurant setting. That means IT architects, software integrators, platform and site reliability engineers, CIOs and CTOs, and virtualization, network, and storage administrators in those industries will find value here. Ideally, each of those individuals will read this, and work together as a cohesive team to bring a solid edge computing platform to fruition.

Current State of IT Infrastructure in Quick-Serve Restaurants

Quick-serve restaurants operate within a dynamic technological ecosystem comprised of diverse systems that collectively ensure seamless operations and enhanced customer experiences. Siloed systems with separate tools, applications, and teams lead to massive duplication and confusion. Lack of central and automated management hinders IT asset reuse, causing inefficiencies, costly replication, and slow problem resolution resulting in downtime and loss of revenue.

Point of Sale (POS) System. Quick-serve restaurants rely on POS systems to streamline customer transactions, manage payments, and monitor sales data. Modern POS systems have user-friendly touchscreens, order customization options, and integration capabilities with other crucial systems. This centralized hub ensures accuracy and efficiency in order processing, providing a seamless experience for both customers and staff.

Kitchen Display Systems (KDS). KDS facilitate efficient communication between front-of-house staff and back-of-the-house staff, allowing for real-time tracking of order progress, task prioritization, and timely preparation and delivery of food items. Inventory Management System. By preventing shortages, minimizing waste, and optimizing supply chain operations, automated systems contribute to efficient and cost-effective restaurant management.

Employee Management Systems. Dedicated employee management systems handle various aspects of workforce management, including scheduling, time tracking, and payroll. These systems ensure that quick-serve restaurants can efficiently manage staff, particularly during peak hours, fostering smooth operations.

Customer Relationship Management (CRM). CRM systems assist in managing and leveraging customer data, preferences, and loyalty programs. This information enables quick-serve restaurants to create personalized experiences, tailor marketing strategies, and foster long-term customer loyalty.

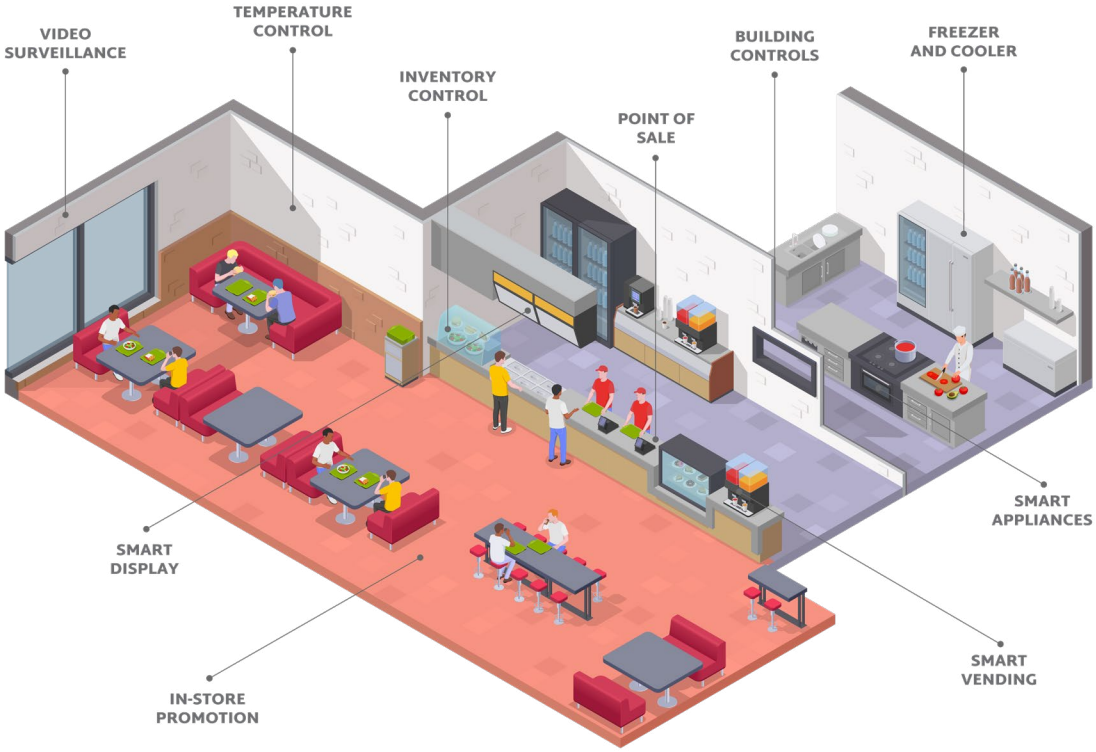
Payment Processing Systems. Systems for processing various payment methods, including credit/debit cards, mobile payments, and contactless payments, ensure a smooth and secure transaction process.

Communication Systems. Interconnected communication systems, such as headsets or messaging platforms, facilitate seamless communication between front-of-house and back-of-the-house staff, and management, ensuring efficient coordination, especially during busy periods, enhancing overall operational efficiency.

Security Systems. Security cameras and access control systems are implemented to monitor the premises, deter theft, and enhance the safety of customers and employees.

Wi-Fi and Networking Infrastructure. A robust networking infrastructure, including Wi-Fi connectivity, is essential for various digital systems to communicate effectively and support operations such as order processing, inventory management, and other digital processes.

The problem lies in QSR having IT systems that require manual updates within restaurants, leading to time-consuming installations. Manual updates are hindered by IT staff availability, causing delays and potentially higher costs. This results in inconsistent inventory, fragmented customer experiences, and security risks. While individual restaurants might cope with some manual processes, adding several, or even hundreds of locations, makes application lifecycle management and digitization improvements of any emerging technologies overwhelming.



IT Limitations

The QSR industry, like many other industries, faces unique challenges in the context of existing IT infrastructure. Many still rely on legacy systems and outdated technology. These systems might not support the latest software updates, security patches, or modern applications, leading to vulnerabilities, inefficiencies, and downtime. As technology continues to evolve rapidly, traditional IT systems may struggle to meet modern demands.

DEPLOYMENT

Quick-serve restaurants face significant challenges in keeping pace with technological advancements due to the lengthy deployment process across their extensive network of hundreds or even thousands of locations. Implementing new technology, whether it's digital ordering systems, self-service kiosks, or mobile payment options, requires meticulous planning, testing, and coordination across multiple sites. The sheer scale of these operations can lead to logistical hurdles, including compatibility issues, training requirements, and infrastructure upgrades, all of which contribute to delays in technology adoption. As a result, many QSRs find themselves lagging behind their more agile counterparts in the tech sphere, struggling to meet evolving consumer expectations for convenience and efficiency.

INTEGRATION

Integrating various components of the IT infrastructure can be challenging with older technology, especially when organizations attempt to introduce new modern technologies or applications. Lack of seamless integration can result in data silos, hinder overall operational efficiency, and result in compatibility issues. The complexity of integration can lead to project delays, increased costs, and potential disruptions to business operations. The substantial costs and effort required for hardware, software licenses, and dedicated data center facilities can strain financial resources and impede an organization's ability to respond promptly to industry changes.

MAINTENANCE

Maintaining and upgrading traditional IT infrastructure can be costly. The financial burden of ongoing maintenance and the need for specialized expertise to support outdated technology can strain the resources of QSR establishments. Regular updates, patches, and hardware maintenance can disrupt operations and necessitate downtime. The time and resources required for maintenance activities can strain IT teams and impact overall system reliability, posing a risk to continuous operations.

ANALYTICS AND REAL-TIME RESPONSE

Traditional IT infrastructure often lacks the capability to provide real-time insights and analytics, hindering strategic planning and optimization of business processes. Older hardware and software may also lead to slower response times and system lag. In a fast-paced industry like QSR, delays in any of these can affect order processing, payments, or inventory updates, negatively impacting customer satisfaction and operational efficiency.

SCALABILITY

One of the fundamental limitations lies in the realm of scalability. Traditional infrastructure often struggles to efficiently scale to accommodate growing workloads. This lack of scalability can result in performance bottlenecks and reduced operational efficiency, impeding the organization's ability to adapt to changing business needs. Flexibility and agility are pivotal in a rapidly evolving business landscape, but traditional IT infrastructure often falls short in these aspects. The rigid architecture makes it challenging for organizations to adapt quickly to emerging opportunities or changing market dynamics. The lack of flexibility can hinder innovation and responsiveness, putting businesses at a disadvantage in competitive markets.

SECURITY

With the increasing reliance on digital transactions and the collection of customer data, data security has become a critical concern. Traditional IT systems may lack robust security measures, making them more susceptible to cyber threats and data breaches. As cyber threats become increasingly sophisticated, legacy security measures may prove inadequate. The lack of real-time threat response mechanisms and outdated security protocols can expose organizations to significant risks, including data breaches, financial losses, and damage to their reputation.

Meeting industry regulations and compliance standards is a perpetual struggle for traditional IT setups. The manual processes involved in ensuring compliance can be error-prone, and the lack of automated solutions can hinder an organization's ability to maintain a robust and consistently compliant posture. Compliance difficulties can lead to legal ramifications and damage to the organization's reputation. Ultimately, it all comes down to meeting customer expectations. Consumers expect "always on" convenience, mobility, flexibility, speed, and personalized experiences. Traditional IT systems may not easily support mobile applications, online ordering systems, or other technologies that enhance the customer experience, leading to losing customers to competitors with more advanced and customer-centric technology.

Plan for the Future (Without Trying to Predict It)

As technology advances, quick-serve restaurants that embrace these innovations will be able to stay at the forefront of the evolving industry landscape. Emerging technologies, such as those below, have the potential to significantly impact the QSR industry, transforming various aspects of operations, customer experience, and overall efficiency. Embracing cutting-edge technologies is paramount to staying ahead of the competition.

Self-Service Kiosks/Digital Menu Boards. QSRs implement self-service kiosks to streamline the ordering process, reduce wait times, and enhance order accuracy. Digital menu boards provide a dynamic and visually appealing way to showcase menu items, promotions, and pricing. Easily updatable, these boards allow quick-serve restaurants to adapt to changing offerings and promotions swiftly, and allow customers to customize their orders, select preferences, and pay through the kiosk - enhancing the overall customer experience.

Mobile Apps and Online Ordering Platforms. Many quick-serve restaurants have their own mobile apps or are integrated with third-party online ordering and delivery platforms. These applications and platforms enable customers to place orders remotely, expanding the restaurant's reach and providing a convenient and efficient ordering experience.

Contactless Payments. Contactless payment options, such as mobile wallets and contactless cards, are becoming more prevalent, providing a faster and more secure transaction experience.

Data Analytics and AI. QSRs leverage data analytics and artificial intelligence to analyze customer preferences, predict demand, and optimize inventory management. Personalized recommendations based on past orders and preferences enhance the customer experience and drive loyalty.

Robotics and Automation. Some QSRs are experimenting with robotics for tasks like food preparation and cleaning, improving efficiency and reducing labor costs. Automation in the kitchen and backend processes helps maintain consistency and quality in food preparation.

Augmented Reality (AR) and Virtual Reality (VR). AR and VR technologies are being explored to enhance the customer experience. For instance, AR menus can provide interactive and immersive experiences, helping customers visualize their orders. VR apps can assist customers in aspects of ordering and settlement.

Internet of Things (IoT). IoT devices are used to monitor equipment performance, track inventory levels, and ensure food safety. This connectivity helps in proactive maintenance and reduces downtime.

Biometric Technology. Biometric authentication is being used for secure access to systems and payment authorization, ensuring a faster and more secure transaction process.

Voice Ordering and Virtual Assistants. Integrating voice-activated systems and virtual assistants for order placement and customer service provides an additional channel for customer interaction.

Sustainability Initiatives. Technologies are being employed to enhance sustainability, such as smart waste management systems, energy-efficient appliances, and eco-friendly packaging solutions.

Augmented Staff Training. Virtual reality is utilized for staff training, providing a realistic and immersive environment for employees to learn about food preparation, customer service, and other essential skills.

Adding these emerging technologies to existing legacy infrastructure proves challenging, and will create a patchwork of vendors and tools that is ultimately unmanageable, halting any future business growth.

A future-proof QSR infrastructure provides scalability, flexibility, resilience, and adaptability to emerging technologies and business needs. It is adaptable to emerging technologies and innovations, allowing QSRs to embrace new trends such as 5G connectivity, edge AI, augmented reality, and others. This adaptability enables QSRs to stay ahead of the curve, innovate, and deliver exceptional customer experiences in an ever-changing landscape.

Introduction to Edge Computing

While edge computing isn't a new concept, it has become increasingly important for almost every kind of organization. The central idea involves locating computing capabilities away from the data center and closer to where data is created and used.

Edge computing addresses the unique requirements of emerging technologies in QSRs by providing a decentralized computing model that enhances performance, reliability, security, and flexibility. It enables QSRs to leverage the benefits of emerging technologies while overcoming challenges associated with latency, bandwidth, and connectivity of traditional infrastructure. It also unburdens networks by transferring some information to distributed locations rather than all information, and it relieves centralized compute and storage facilities from handling all that data.

Edge computing makes the case even more compelling by incorporating virtualization and, in some cases, convergence (for example, hyperconverged infrastructure, or HCI). This means companies can do even more with infrastructure investment by running multiple applications and workloads on the same hardware.

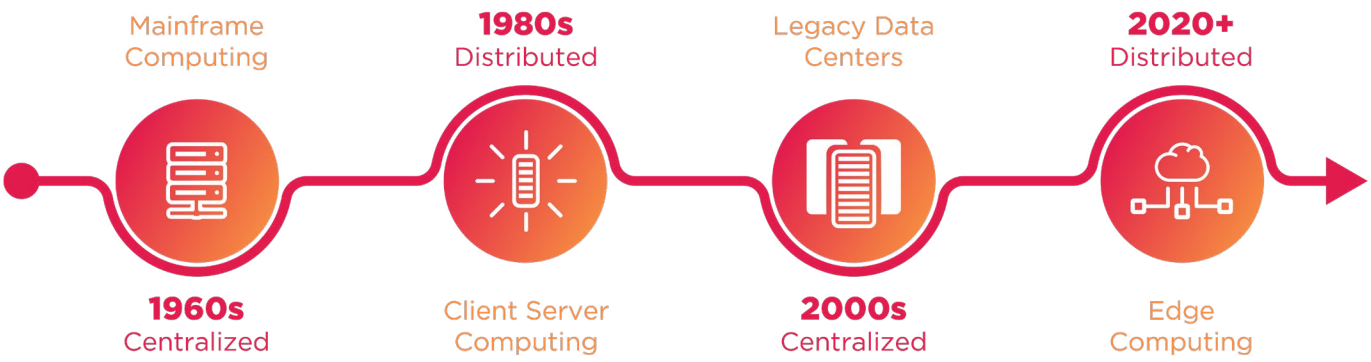
With the growth in IoT devices, sensors, cameras, and more at distributed locations, there has been a sharp uptick in data generation, and pushing all of that data to and through a central data center or cloud no longer makes sense. It taxes resources and consumes bandwidth, and it can slow response time both to the edge and to other key systems, such as those for transaction processing. By placing compute services at the edge, organizations can implement strategies that enhance content caching, IoT management, improving response time, and faster data transfer rates. This also represents capabilities that can't really be matched by cloud technologies, while delivering those capabilities at a very competitive price point.

EVOLUTION OF EDGE COMPUTING

Edge computing has evolved over the years as a response to the increasing demand for faster and more efficient data processing closer to the source of data generation.

In the early days of computing, centralized mainframe systems were the norm. All data processing occurred in a centralized location, and users accessed the system through terminals. This model was effective for the time but had limitations regarding scalability and responsiveness.

With the advent of client-server architecture, computing became more distributed. Processing was distributed between machines and server systems, which improved scalability and responsiveness. However, most of the processing still occurred in centralized data centers.



The rise of IoT devices has led to a massive increase in the volume of data generated at distributed locations. Traditional cloud computing models struggled to handle the sheer volume and low-latency requirements of these devices. And, certain applications, such as real-time analytics, require extremely low latency for optimal performance. This need for low latency drove the exploration of decentralized computing models that could process data closer to the point of origin. Instead of sending all data to a centralized cloud server, processing occurs at the edge devices or in local data centers.

As edge computing gained traction, industry players started working on standardizing architectures and protocols to ensure interoperability and ease of adoption. Various organizations and consortia have contributed to the development of standards for edge computing.

The Role of Edge Computing for Quick-Serve Restaurants

Edge computing provides quick-serve restaurants (QSRs) with the tools to minimize downtime, streamline operations, enhance customer satisfaction, and ensure the seamless flow of critical data for optimal business performance to meet and exceed the expectations of today's tech-savvy and time-conscious customers. Edge computing benefits include:

System Reliability and Uptime. Employs redundant systems, regular maintenance, and proactive monitoring to help minimize downtime, ensuring continuous service and customer satisfaction

Offline Operation. Allows certain operations to continue even when there is a loss of connection to the central cloud. This is especially important in the QSR industry, where continuous operations are crucial for business continuity.
Cost Savings. Reduces bandwidth usage and costs associated with transmitting large amounts of data to the cloud, enabling the use of smaller, less expensive hardware devices for local processing

Reduced Latency. Minimizes the latency in data processing by performing computations locally for tasks like order processing, inventory management, and customer service

Enhanced Efficiency. Handles specific tasks such as inventory management, monitoring equipment health, and processing orders, making operations more efficient

IoT Integration. Enables real-time process of Internet of Things (IoT) devices, such as sensors and smart kitchen equipment that generate massive amounts of data, leading to better monitoring of food safety, equipment performance, and overall operational efficiency

Data Security and Privacy. Helps keep sensitive data within the premises of the restaurant rather than transmitting it over long distances to a central cloud, enhancing data security and privacy, which is critical for compliance with regulations such as the Payment Card Industry Data Security Standard (PCI DSS)

Customization and Personalization. Facilitates on-site analysis of customer preferences and behaviors to customize offerings and provide personalized experiences based on real-time data, increasing customer satisfaction

Supply Chain Optimization. Optimizes supply chain processes, including inventory management, order fulfillment, and logistics, which is particularly beneficial for ensuring the freshness and availability of food items

Edge computing in quick-serve restaurants not only ensures operational efficiency, reliability, and enhanced customer experiences but also heralds a new era of data-driven decision-making, security, and personalized services, positioning QSRs at the forefront of innovation in the fast-paced and competitive food industry.

Case Study - NENI

DELIVERING HIGH-QUALITY FOOD PRODUCTS ON TIME, EVERY TIME.

NENI deployed an easy-to-manage hyperconverged solution based on Scale Computing HyperCore at its distributed locations, boosting the availability of mission-critical business systems to 100% while keeping IT spending under tight control.

CUSTOMER OVERVIEW

NENI is an international hospitality business and food producer headquartered in Vienna, Austria. The family enterprise, built around the motto “life is beautiful”, operates nine restaurants in Austria, Germany, Switzerland, The Netherlands, Spain, and France for casual, communal eating influenced by the family’s diverse Israeli, Romanian, and Spanish heritage.
In addition to its restaurants, NENI produces chilled foods for major supermarket chains across Germany, Austria, and Hungary, including SPAR, EDEKA, Tegut, and GLOBUS.

The company depends on continuous processes to support its large-scale food production and distribution operations. Every day, the company processes huge quantities of raw materials to produce 60,000 food items. To keep its production lines stocked with raw materials and deliver finished products to restaurants and retailers on time, NENI relies on its inventory and logistics planning systems 24/7.

CHALLENGES

As NENI’s end-to-end processes are so tightly integrated, an ERP system outage of as little as three hours can cause production delays as long as two business days—adding up to a six-figure sum in lost revenue.
As the infrastructure for its ERP system approached end-of-life, NENI realized that the business risk of unplanned downtime was rising fast—presenting a significant threat to profitability.

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> **"Margins are tight in our industry, so it's very important to keep costs under control. To protect our all-important production processes, we decided to move our mission-critical ERP systems to a highly available and reliable platform. Crucially, we targeted a solution that would enable us to keep IT headcount and spending lean."**
>
> **— Ilan Molcho, CEO, NENI**

RESULTS

NENI has peace of mind that mission-critical business systems will be online 24/7/365. Equipped with advanced disaster recovery capabilities such as snapshots for virtual machine backups, NENI can now recover from failures within minutes, minimizing the business impact of potential IT issues.

The edge solution enabled NENI to consolidate IT workloads and reduce administration and maintenance overheads. NENI capitalized on its investment by adding a new production management solution to the platform, harnessing real-time Internet of Things (IoT) sensor data to enhance quality management for fast-moving food production lines.

Summary

Edge computing presents a decentralized computing model tailored to the needs of emerging technologies in quick-serve restaurants (QSRs), improving performance, reliability, security, and flexibility. By processing data closer to its source, edge computing addresses challenges such as latency, bandwidth constraints, and connectivity issues, enabling QSRs to leverage emerging technologies efficiently. Initially, computing relied on centralized mainframe systems, later evolving into a distributed client-server architecture. However, the rise of IoT devices necessitated decentralized computing models to handle vast data volumes with low latency.

Edge computing emerged as a solution, bringing processing closer to data sources, reducing latency, and enhancing system efficiency. In the QSR industry, edge computing ensures system reliability, offline operation, cost savings, reduced latency, enhanced efficiency, IoT integration, data security, customization, and supply chain optimization, ultimately improving customer satisfaction and business performance.

Overall, the future of IT infrastructure in QSRs is marked by increased automation, agility, and responsiveness, enabling businesses to adapt to changing customer preferences and market dynamics while delivering seamless and personalized dining experiences—at the edge.

SC//PLATFORM

About SC//Platform

Cultivate more seamless, personalized customer experiences and spend less time managing infrastructure. Combine virtualization, IoT, and edge computing with an adaptable infrastructure that streamlines QSR IT operations and provides major opportunities to enhance the customer experience while also lowering costs.

SC//Platform allows your traditional applications—such as point of sale, inventory management, and video security—to run alongside new transformative technologies such as IoT applications, contactless checkout, AI customer identification, real-time pricing, freezer and cooling systems, and electronic shelf labels.

LOWER TCO

When considering a new IT infrastructure solution, the acquisition cost of the hardware and software to stand up the infrastructure is only the starting point for cost analysis. It is important to look into the operational costs of deployment, training, licensing, scale-out, downtime, and management.

Reduce IT infrastructure costs in almost every way. Hidden IT infrastructure costs such as unplanned downtime, management, maintenance, training, and consulting are reduced to almost nothing.

CONSOLIDATE QSR APPLICATIONS AND INFRASTRUCTURE

Compute, storage, virtualization, and disaster recovery are combined into a single, easy-to-use platform. Eliminate the cost and complexity of caring for separate hardware and software to support individual point solutions. Even run legacy and modern applications on the same infrastructure.

HIGH AVAILABILITY

Provide multiple backup and disaster recovery locations, and options to minimize or eliminate downtime and flexibility for data storage and application growth for critical on-premises applications.

Designed for locations with no IT staff on-site, autonomous, self-healing capabilities maximize the uptime and performance of applications. Failover, redundancy, and resiliency are fundamentally designed into every aspect of the solution to create a highly available, reliable computing environment unlike any other.

FLEXIBLE SCALABILITY

Easily scale up or down as needed with exclusively cloud-based management, including templated security and zero-touch deployment.

CENTRALIZED EDGE MANAGEMENT & ORCHESTRATION

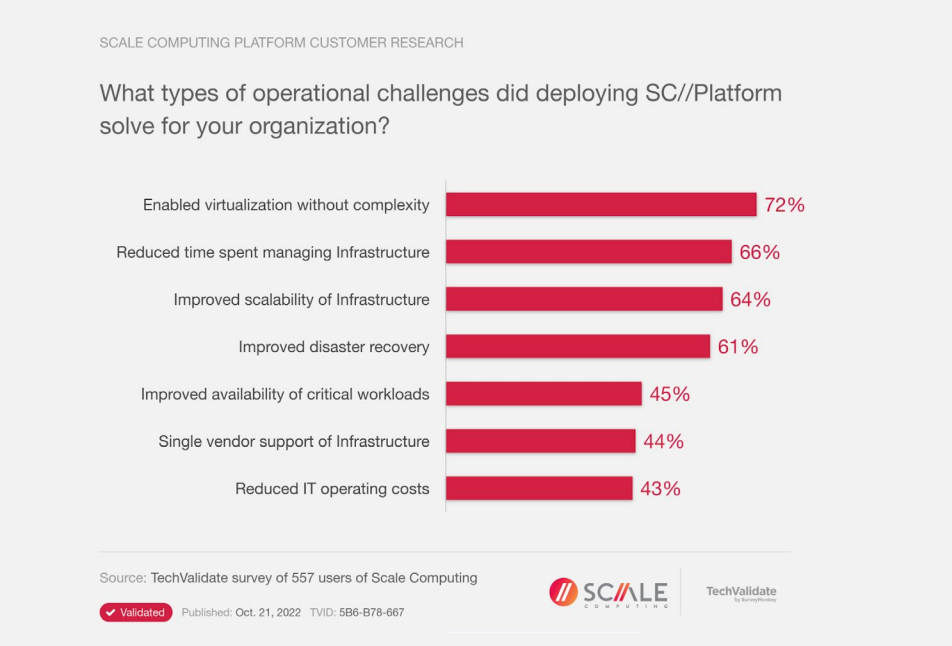
Centralized management provides instant visibility into the state of your entire in-restaurant environment, highlighting issues that may require attention or jeopardize application availability. By remotely orchestrating software updates, hardware swaps, and new infrastructure setups, skilled technicians no longer need to go onsite to manage environments.

CONSISTENT PERFORMANCE ACROSS LOCATIONS

Achieve consistency in application performance across multiple locations by leveraging the standardized virtualized environment. Ensure a uniform and reliable customer experience regardless of the restaurant's physical location.

Related Resources

- Self-guided Product Demo
- SC//Platform Data Sheet
- Pilot's Guide to Edge Computing
- Edge Readiness Self-Assessment



Corporate Headquarters
525 S. Meridian Street - 3E
Indianapolis, IN 46225
P. +1 317-856-9959

scalecomputing.com

EMEA B.V.
Europalaan 28-D
5232BC Den Bosch
The Netherlands

+1 877-722-5359