The Four Key Benefits of Edge Computing

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Over the past decade, businesses have undertaken a variety of initiatives to improve the scalability, performance, security and cost-effectiveness of their IT assets. They have moved to the cloud. They have migrated from monolithic applications to scale-out microservices architectures. They have adopted software delivery strategies like DevSecOps.

All of these changes have enhanced IT outcomes in many ways, but there remains room for further progress especially as new modern, data-driven services and applications are now powering differentiation for today's businesses.

That's why many organizations are now focusing on a new strategy for optimizing IT: edge computing. Edge computing enables businesses to extract actionable insights by processing data closer to devices, sensors, and other sources. With edge, businesses can use Artificial Intelligence and/or Machine Learning (AI/ML) powered applications to make data-driven decisions to enhance the business.

But edge computing goes beyond gathering and processing data—it opens up the ability to create new customer experiences for latency sensitive applications such as AR/VR, remote learning or healthcare, and live communication. By gaining the ability to support low-latency applications, organizations are able to better meet user expectations for a great application experience and even open new revenue streams.

For businesses of all sizes, and across all industries and verticals, edge computing offers a variety of advantages for deriving greater value from IT investments and, in turn, enhancing the success of the business.

To illustrate how modern businesses can leverage edge computing architectures and platforms, this eBook walks through four key benefits of edge computing. In doing so, it explains the main reasons why businesses should consider expanding their existing IT infrastructures to the edge, or increasing their edge presence further if they already maintain some edge locations. It also highlights examples of specific use cases that stand to gain the most from an edge strategy.

What is edge computing?

Edge computing refers to an architectural strategy in which data processing happens as close as possible to the devices or users who generate it.

In this respect, edge computing is different from conventional cloud-based or on-premises architectures, in which workloads that are hosted in centralized data centers, are then accessed over the network, and remain comparatively distant from users.

In an edge architecture, workloads are typically hosted in localized aggregation points that are physically closer to users, devices, sensors, production tools or other operational equipment rather than in the larger central data centers of public clouds or on-premises infrastructures.

What changes when workloads move closer to data sources than when they are in traditional architectures? Keep reading to learn how edge architectures improve the end-user experience and, in turn, drive business success.

1. Performance

Perhaps the most significant benefit of edge computing for the typical business is the improved response time brought forth through enhanced IT performance.

To understand how edge architectures improve performance, you must first recognize the performance limitations inherent in the conventional, non-distributed computing architectures that most businesses have relied upon for at least the past decade. When businesses host their applications and data in centralized data centers, and users access those resources over the Internet, the Internet typically becomes the weakest link in workload performance. A sluggish network connection between remote locations and the central data center translates to slower application response times and delays in downloading data. If the connection fails entirely, the workload becomes completely inaccessible.

Edge architectures don't take the network out of the picture; on the contrary, network connectivity remains a core component of edge environments. However, by reducing the geographic distance between end-users and workloads, edge architectures reduce the potential for network-related performance problems. In fact, with edge computing, only the data that needs to be sent to the central data center or cloud needs to travel back. This enables more efficient use of the existing network while providing a great application experience.

Telecommunications providers are enabling smart cities through 5G connectivity by helping cities manage many different elements of their infrastructure and services. For example, public safety involves communications, video and audio surveillance, location tracking, and even traffic control. When you can analyze the data as it comes in from video and audio sensors at the edge and identify the anomalies for further review, you can mobilize public safety resources whose location is nearby and aid in clearing the way by controlling the traffic management systems on their paths to an incident. Having the data collection, analysis and artificial intelligence near the sources makes it more feasible to implement and deliver the capabilities and faster to respond to events in near real-time.

Summary

By processing data locally, edge computing enables better user experiences, drives faster data processing and allows IT assets to achieve a level of performance that conventional infrastructures can't match. By extension, edge enables businesses to deliver a level of service that would be impossible under a different approach. Although not every use case requires this level of performance, an increasing number do, which makes edge an essential strategy for more and more businesses.

2. Adopt applications to meet new opportunities

Traditional infrastructure strategies can restrict a business' ability to place workloads where they need. The ability to gather and analyze data quickly and respond to changes in traffic patterns, user expectations or the opportunity to offer new services is of utmost importance to the business bottom-line.

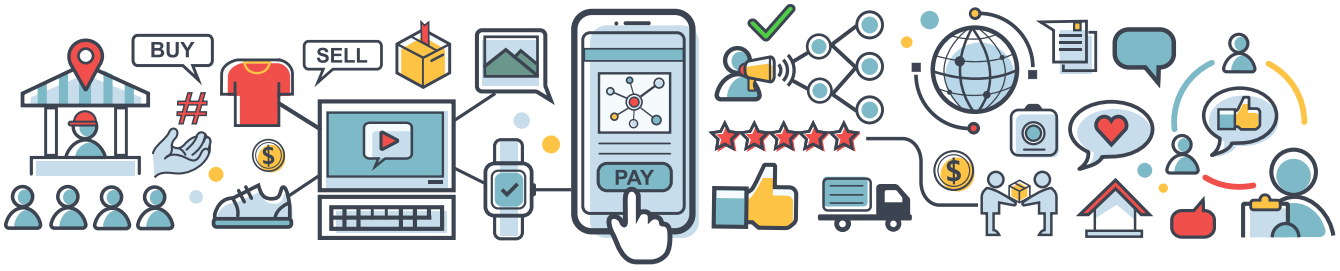
This is especially true not only for organizations with remote or branch offices, but also for other less traditional locations that can now host applications such as ships, airplanes, trains, oil-rigs, and many more.

For all of these, edge computing provides organizations with the flexibility to adopt applications that can help them offer differentiated services, control costs, and increase user engagement and satisfaction. When applications and data are tied to a centralized data center either in the cloud or on-premises, adopting workloads that need immediate processing can be a challenge and hinder the business. This is especially true for locations that can have intermittent connectivity to a central site.

For retailers who may need to deploy applications to local stores to handle seasonal uptick in demand, or to perform recurring operations like inventories, having the ability to place workloads at the remote site is especially useful as they can get very close to real-time data as to what products they have on-site. Retailers may also want to process transactions using local caches of databases that respond faster, while at the same time syncing those databases with centralized instances hosted in the cloud. That way, customers enjoy low-latency in-store transactions using local databases, while still being able to offer national or global benefits such as rewards and membership programs.

Summary

The ability to place workloads where the business needs is critical for organizations that must respond to user expectations, evolving business needs, or to the use of new technologies that help transform their organizations. From this viewpoint, edge computing unlocks a level of agility that cloud and on-premises architectures alone cannot match.



3. Meeting regulatory and compliance frameworks

An organization's ability to collect, process, and/or store data continues to be at the forefront of many businesses that must adhere to data residency/localization laws. For organizations that have remote locations, edge computing can help meet these requirements.

By placing processing and data storage in edge locations, organizations can achieve fine-tuned control over the jurisdictions in which different applications and data are hosted. In turn, they are in a stronger position to meet regulatory compliance rules that apply only to certain countries or regions. For example, a business may choose to use edge servers to keep the data of EU-based users in the EU, where it can be managed in a way that complies with the EU GDPR, while the data of users in other jurisdictions, who are not subject to those laws, is managed differently.

Businesses across a range of industries that are subject to data privacy and compliance requirements can leverage edge computing to meet these rules. By providing greater opportunities for localized collection, processing and storing of customer data, edge computing enables businesses to extend their services to locations, no matter how geographically distributed they are, and meet their requirements.

The healthcare industry has historically been challenged to digitally transform in the midst of both federal privacy requirements and the resource-intensive nature of digital health information. Both healthcare providers and insurance industries can leverage edge architectures to not only help deliver higher quality care, but to also ensure that patient records and other personally identifiable information complies with legal requirements that protect confidential information from fraud and theft by keeping it within geographical boundaries.

Summary

Organizations must continue to follow regulatory and compliance frameworks in order to comply with the laws of different geographical locations and be able to operate their business. Edge computing provides the ability to place data processing within these locations while using an automated DevSecOps approach to protect applications and data across the software development life cycle.

4. Enabling AI/ML use cases

Artificial intelligence and machine learning are growing increasingly central to IT and business strategies. For businesses seeking to take full advantage of AI/ML, edge computing is a must-have architectural topology as it places processing power close to the data being generated by devices and sensors - enabling faster data-driven actions.

The promises of AI and ML are that, by processing massive amounts of data, software can make decisions with much higher degrees of accuracy and speed than humans could achieve manually. The ability of AI-powered applications to deliver this level of performance, however, is contingent on being able to move that data across the IT environment quickly enough to process it in real time or near real time in order to use the insights gathered to positively impact the business.

Without processing data in edge locations, network latency and available bandwidth can impact an organization's ability to quickly react to identified trends as all gathered data would need to travel back to the central site for analysis. Edge computing provides the infrastructure upon which AI/ML powered applications can gather and process data as quickly as possible - close to the devices generating it. With this faster processing, trends can be quickly identified and used to highlight any new opportunities, minimize risks, or even save lives.

Manufacturers sometimes need to make automated decisions in split seconds in order to perform inline quality control. When they detect an anomaly in a production line, they need to be able to act instantly in order to remove the problematic component without disrupting the rest of the manufacturing process. By placing anomaly-detection applications powered by AI/ML close to the production line, edge helps ensure the speed required for improving quality management in manufacturing.

Summary

Achieving optimal results from AI tools requires the ability to avoid the network and data processing bottlenecks that delay analytics results within conventional IT environments. Edge computing allows businesses to deploy AI applications directly where data is sourced, which in turn enables near real-time analytics results.

Realizing the benefits of edge computing for your business

As you can see, the opportunities associated with edge computing are vast. However, edge computing comes with some key considerations that must be addressed in order to have a successful implementation. These include:

1. **The variable nature of edge locations:** Remote sites can have different available physical space to house hardware, varying power and cooling capabilities, and network connectivity that can be intermittent or slow.
2. **On-site expertise:** With the variability in space, location, and scale that can comprise an edge architecture, availability of in-person resources that can manage every site can increase complexity, costs, and risk.
3. **Application life-cycle management:** Developing, deploying, and updating applications that are at the core of the business can be a daunting task, especially when needing to do this across hundreds to thousands of sites.

Edge computing with Red Hat OpenShift

Red Hat OpenShift helps organizations gain the benefits of edge computing by providing an application deployment and management platform that can deploy virtually any type of application to any location – whether on-premises, in the public cloud or at the edge while addressing all of the critical requirements that come with cloud-native applications, including their consistent life-cycle management with built-in security and reliability.

With OpenShift, organizations have access to capabilities that can help build what they need today, but also what's next to keep them at the forefront of their industry. OpenShift helps address the needs of the most demanding workloads including those powered by AI/ML. Together with Red Hat's portfolio of data and application services and a broad ecosystem of technology partners, OpenShift brings the power of an open community of Kubernetes innovators to meet the needs of various use cases within and across industries.

Develop once, deploy anywhere

Although edge architectures differ fundamentally from conventional cloud and on-premises environments, edge isn't an alternative to traditional infrastructure strategies as much as it is an augmentation of them. As such, with Red Hat OpenShift, businesses can extend their traditional hybrid cloud architectures and inclusive of their edge locations – providing more agility and flexibility than organizations can gain from any type of conventional cloud environment alone.

OpenShift enables a consistent develop-once, deploy-anywhere level of flexibility that allows businesses to take full advantage of edge computing while at the same time retaining their investments. No matter what your edge strategy looks like, or how it might change in the future, OpenShift provides the application deployment and management tools you need to capture the opportunities of extending infrastructure and applications out to the edge.

To learn more about how OpenShift helps businesses extend their workloads to the edge and optimize them once they are there, visit Red Hat's OpenShift edge computing resources page.

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