

Bring insights and data closer to customers with edge computing

According to the 2022 Red Hat Global Tech Outlook, 61% of survey respondents ranked the Internet of Things (IoT), edge computing, or both as a priority emerging tech workload for 2022.¹

Taking advantage of digital disruption with edge computing

Modern businesses are realizing that digital disruption is more than a challenge to overcome—it is also an opportunity to use to their advantage. Organizations are exploring how technologies like artificial intelligence (AI), machine learning (ML), and Kubernetes-orchestrated containers can help them innovate, make critical business decisions faster, and provide their customers and employees with more engaging experiences.

To fully harness the power of disruption, however, businesses must first look at where they generate their value—whether on the factory floor or in a medical lab—to create their competitive advantage and find ways to strengthen their value proposition.

Edge computing provides one of the most effective ways to improve these value-generating business operations.

This whitepaper provides an overview of edge computing and what to consider when planning an edge deployment. It also explains how organizations can apply the right edge strategy to accelerate innovation and become more operationally agile.

Exploring what is possible beyond datacenter and cloud footprints

At one time, IT systems followed a predictable model. Customer or employee end users used an individual workstation or device to access applications hosted in a centralized datacenter, sometimes located far from end users' physical locations. More demand meant organizations further centralized compute resources, increasing those resources' distance from customers and employees.

Two trends have upended this model: the rise of cloud computing and the increasing availability of more powerful, less expensive computing resources.

Edge computing explained

Today, businesses have the freedom and flexibility to place their compute, networking, or storage resources outside their core datacenters or cloud environments. Even more important, they can place these resources in a way that works best for their business needs, allowing them to deploy applications at edge sites, closer to end users on manufacturing plant floors, in hospitals, at retail outlets, or wherever their business's core value chain is located.

"Alstom [is deploying] thousands of wayside devices throughout the globe, providing our customers with actionable intelligence from the edge."²

Emilio Barcelos

Product Manager, Wayside Intelligence and Analytics, Alstom

The concept of edge computing is not new. But in recent years, interest in adopting edge computing to improve business outcomes has grown sharply as more companies come to understand its potential.

Applying edge computing across industries

Consider how an energy company could benefit from the ability to quickly analyze data generated at one of its remote oil well sites. Having this capability would make it much easier for teams to optimize bit, speed, and pressure, allowing them to maximize output and improve operational efficiency. Select data could then be funneled back to the cloud for further analysis, leading to more insights.

Or imagine how a clothing retailer could strengthen its competitiveness by harnessing real-time data analysis to understand in-store shopper behavior. Retailers could then use those insights to deliver timely and relevant offers to their customers before they leave the store.

In each case, edge computing helps these insights become more timely and actionable, allowing them to spark innovative ways of working, increase productivity, and help leaders uncover previously unknown business opportunities. Understood in this context, edge computing represents far more than an approach to distributing compute resources. It is a way for any organization to gain a significant and lasting competitive advantage.

How edge computing paves the way to business transformation

Because of its transformative potential, it should come as no surprise that edge computing has seen strong market momentum. IDC estimates that worldwide edge technology spending will reach \$251 billion by 2025, with a CAGR of 16.4%.³ According to the 2022 Red Hat® Global Tech Outlook, 61% of survey respondents ranked IoT, edge computing, or both as a priority emerging tech workload for 2022.⁴

Businesses that have yet to fully consider edge computing need to understand how they can benefit from adopting this computing architecture. While every company faces unique challenges and opportunities, organizations that deploy a modern edge computing infrastructure will be equipped to realize gains in the following four areas.

Faster, data-driven business outcomes

Many organizations are looking for ways to reduce the time needed to collect and analyze data, and edge computing may provide a solution. One of the advantages of placing compute power at edge sites is the ability to circumvent the latency and bandwidth limitations of the centralized computing model. Analyzing data at the source can also reduce the time companies need to make critical decisions.

Consider manufacturers, who must ensure strict quality control on items built on the factory floor. Deploying real-time video sensor applications on the production line can help organizations monitor and spot issues the moment they occur. Better still, manufacturers can take advantage of applications that support predictive maintenance capabilities, preventing unplanned downtime. Minimizing quality errors at the source not only helps deliver more production yields, it can also help improve profitability by ensuring an optimal customer experience.

² Red Hat press release., "Alstom and Red Hat Team to Transform Railway Communication with Edge Computing and Open Hybrid Cloud," April 2021.

³ IDC Spending Guide. "Worldwide Edge Spending Guide," June 2021.

⁴ Red Hat overview. "2022 Global Tech Outlook," Oct. 2021.

In their survey, “2021 Trends to Watch in Cloud Computing,” Omdia found that 72% of survey respondents cited “manageability” as the biggest obstacle in adopting edge computing.⁵

Better end-user experiences

Edge computing also makes it simpler for businesses to strengthen connections with customers. For example, applications deployed at retail stores can add the ability to analyze shopper behavior and use trained algorithms or decision trees to change digital signage in real time. Having this type of responsive capability allows businesses to serve their target audiences with personalized offers or customized upsell opportunities that reflect exactly the information each audience needs to see.

Healthcare providers can also greatly benefit from an edge approach. Many organizations are taking advantage of AI/ML technologies that make it possible for clinicians to conduct faster medical image analysis. When working on AI/ML applications that will be deployed at edge sites like clinics and hospitals, developers benefit from using a standardized platform and cloud-native technologies. Such technologies also allow teams of clinicians to work collaboratively, improving the accuracy of each diagnosis and supporting better patient outcomes.

Achieving greater resilience

Some organizations may have facilities that are more at risk for occasional connectivity interruptions due to their remote locations or heightened security protocols. And any organization can suddenly find itself facing connectivity failures due to bad weather, natural disasters, or unexpected issues with third-party providers.

Even in such scenarios, edge computing can help companies improve their infrastructure resilience and application availability. For example, if a local retail outlet finds itself cut off from its corporate datacenter due to the impact of a hurricane, the use of edge-connected devices can help ensure continuity of operations for staff and customers until proper connections can be restored.

Regulatory compliance

Modern organizations face ever-increasing levels of complexity when navigating compliance and security rules that dictate how customer data can be stored or moved. With the right IT platforms and management solutions, edge computing can help them meet their obligations more efficiently.

In the retail sector, storing and analyzing data at the edge allows retailers to gather detailed behavioral data on shoppers at the local level while also ensuring that this information undergoes the proper due diligence. Then, that information can be shared more broadly across the organization, maintaining compliance with industry or government regulations. This level of control and visibility gives compliance teams confidence, knowing that sensitive information will not cross international borders in violation of governance policies or regulations.

Common edge computing challenges and how to avoid them

Just as the benefits of edge computing can be broadly categorized, so too can the associated obstacles. Businesses should consider how to overcome the following challenges when selecting edge computing solutions:

Complexity

When adopting edge computing, one of the biggest obstacles companies will face is complexity. Many organizations rely on a mix of heterogeneous hardware and industry-specific applications assembled over decades at their edge sites. These environments may not be well integrated and will

⁵ Omdia. “2021 Trends to Watch: Cloud Computing,” 12 Jan. 2021.

often rely on a sizable amount of do-it-yourself code. In their survey, "2021 Trends to Watch in Cloud Computing," Omdia found that 72% of survey respondents cited "manageability" as the biggest obstacle in adopting edge computing.⁵

Then, organizations must consider the sheer size of edge deployments, which can range from hundreds to thousands of nodes and clusters that may have to operate in remote locations. Managing all these edge deployments and the data streams they create represents an enormous task. A single sensor tracking temperature or vibrations on one piece of manufacturing equipment can generate up to 1,000 data points per minute. And a company may have to track tens of thousands of these sensors and manage the data they generate.

For these reasons, devising ways to limit and manage complexity is a vital part of any edge deployment strategy.

Vendor lock-in

One of the most compelling aspects of edge computing is the flexibility it provides businesses. As needs change, organizations require an IT platform that allows them to grow and adapt—one that will not force them to stop, re-evaluate their technology needs, and potentially migrate to yet another solution in order to keep pace.

Before devising and launching an edge strategy, organizations should carefully review their IT portfolio. Over-reliance on proprietary software can greatly limit their ability to develop the differentiated solutions they need to stand out in a competitive marketplace.

Security and compliance

Edge computing can give organizations the flexibility to consider IT implementations in locations that are challenging to serve, either due to their location or complex security needs. Often, these locations are unlikely to have adequate IT staff to address issues as they arise.

To overcome this challenge, organizations need to have controls and policies in place to ensure systems are maintaining a proper security posture, even when deploying applications in remote locations. According to Gartner®, internet-connected devices on enterprise networks can be hacked in as little as three minutes, and breaches may take six months or more to discover.⁶ Companies will need the ability to set policy that ensures that software is updated properly and that data security measures are put in place to prevent vulnerabilities.

Intermittent connectivity

Some edge sites face ongoing issues with intermittent connectivity due to specific security and regulatory constraints. And any organization with facilities in remote locations—or sites that are based in areas prone to hurricanes, earthquakes, flooding, or other natural disasters—need to be prepared in the event of disruption.

In all cases they require predictable, stable, zero-touch edge platforms. That way, IT teams will only need to do minimal on-site maintenance but still be able to discover and solve performance issues as they arise.

⁶ Smarter with Gartner. "[Gartner Predicts the Future of Cloud and Edge Infrastructure](#)," Feb. 2021.

Successful edge deployments start with asking the right questions

Given that edge computing can strengthen and accelerate the core value of a business, it is important to develop and implement a plan that is right for each organization's unique business requirements. Such plans should provide the flexibility and scalability organizations need to ensure quick results and long-term success. These are the most important questions to consider:

Is my platform edge-ready?

Look for a platform ecosystem that provides the necessary solution building blocks, providing easy access to the business rules and algorithms that make rapid decisions at the edge possible.

To take full advantage of edge computing, organizations need a common platform that efficiently connects operations from the edge to core datacenters and any cloud environments. Your chosen platform should take full advantage of modern application development and infrastructure management capabilities and support public and private cloud in any hardware or software ecosystem. The platform should also give IT teams the ability to integrate with third-party applications so they can automate the deployment, configuration, and maintenance of the edge computing landscape.

With a scalable platform in place that allows for easy integration and extensibility, your organization will be better equipped to achieve continuous innovation and quickly adapt your architecture to seize any business opportunity the future may bring.

Do we have the necessary skills?

One of the most compelling aspects of edge computing is the ability it gives IT teams to quickly build new applications designed to run at the edge.

Harnessing existing IT skills and capabilities is the fastest and most efficient way to achieve this outcome. The more new skills needed, the slower the process will become. Look for an edge ecosystem that simplifies how you extend existing cloud-native capabilities and build new edge applications, while also minimizing the need for dedicated, on-site IT support to manage them.

Will we have to build everything ourselves?

As important as a common and open platform is, businesses also need a way to get lightweight applications, processes, and data storage capabilities to edge sites efficiently. To make sure application development does not become a time-consuming challenge, choose a platform ecosystem that provides the necessary solution building blocks, providing ready access to the business rules and algorithms that make rapid decision-making at the network edge possible.

Another way to emphasize speed is to look for a solutions provider that offers computing blueprints—such as configuration templates in the form of Kubernetes manifests—that describe an edge computing stack comprehensively, from its services down to the supporting infrastructure. These validated patterns allow IT teams to access complex, highly reproducible deployments, ideal for operating at scale.

Will it meet the specific needs of my industry?

No two organizations are alike, and every edge deployment needs to be implemented so that it addresses specific business needs and industry realities.

This process becomes much simpler when an edge platform is backed by a robust partner ecosystem with open methodologies. Organizations can learn from the experiences of others—adopting the same features, tools, services, and support that have had demonstrable success in similar conditions—all while maintaining their ability to innovate and differentiate themselves in a crowded marketplace.

The Red Hat approach

Red Hat has extended its [open hybrid cloud strategy](#) to encompass deployments at the network edge and offers a portfolio of technologies and processes to help organizations create their own implementation journey:

- ▶ Red Hat offers a **common and open platform** that extends from the edge to core datacenters and the public and private cloud, frees organizations from the disadvantages of vendor lock-in, and works with any hardware and software ecosystem—all while minimizing the need for development and operations teams to invest time in learning new skills.
- ▶ Red Hat also makes edge deployments **more robust and manageable**. The Red Hat approach to edge computing ensures organizations can automate the deployment, configuration, and maintenance of their edge computing landscape through third-party integrations.
- ▶ By using trusted open source software backed by a **strong partner system and community-powered innovation**, organizations can turn plans into action with speed and efficiency and create applications that meet their specific needs.
- ▶ Red Hat can also help businesses implement a **layered security approach** across their infrastructure, application stack, and life cycle for improved workload security on-premise, in the cloud, or at edge sites.

Learn more

Is your organization ready to bring applications, insights, and responsive experiences closer to your end users? Red Hat is here to help.

Read more about our approach, dive into relevant use cases, and explore how organizations are benefitting from [operating at the edge](#).

Once you are ready to take the next step, Red Hat Consulting can get you started with an [edge platform architecture review](#) to evaluate your edge capabilities.



About Red Hat

Red Hat is the world's leading provider of enterprise open source software solutions, using a community-powered approach to deliver reliable and high-performing Linux, hybrid cloud, container, and Kubernetes technologies. Red Hat helps customers develop cloud-native applications, integrate existing and new IT applications, and automate and manage complex environments. A [trusted adviser to the Fortune 500](#), Red Hat provides [award-winning support](#), training, and consulting services that bring the benefits of open innovation to any industry. Red Hat is a connective hub in a global network of enterprises, partners, and communities, helping organizations grow, transform, and prepare for the digital future.