

AN ARCHITECT'S
GUIDE TO
MULTICLOUD
INFRASTRUCTURE

An architect's guide to multicloud infrastructure

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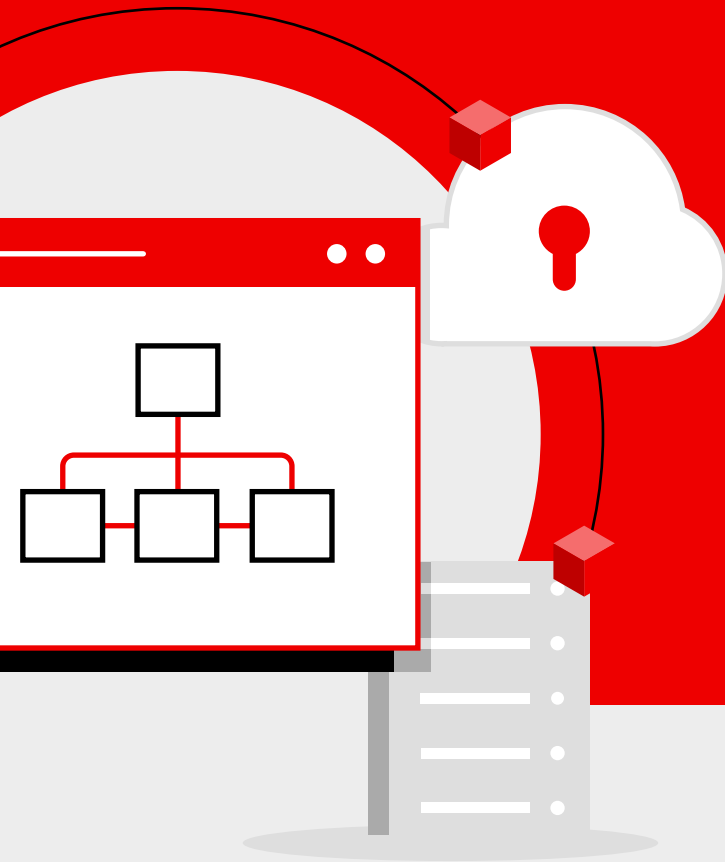
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A shifting technology landscape



The ability to deploy and manage applications when and where they are needed will be a differentiator.

Across nearly every industry, organizations are modernizing their digital infrastructure to:

- Take advantage of new markets.
- Adapt to changing customer expectations.
- Respond to increasing competitive pressures.

To succeed, organizations need to be faster, more agile, and more flexible—and IT infrastructure continues to play an important role.

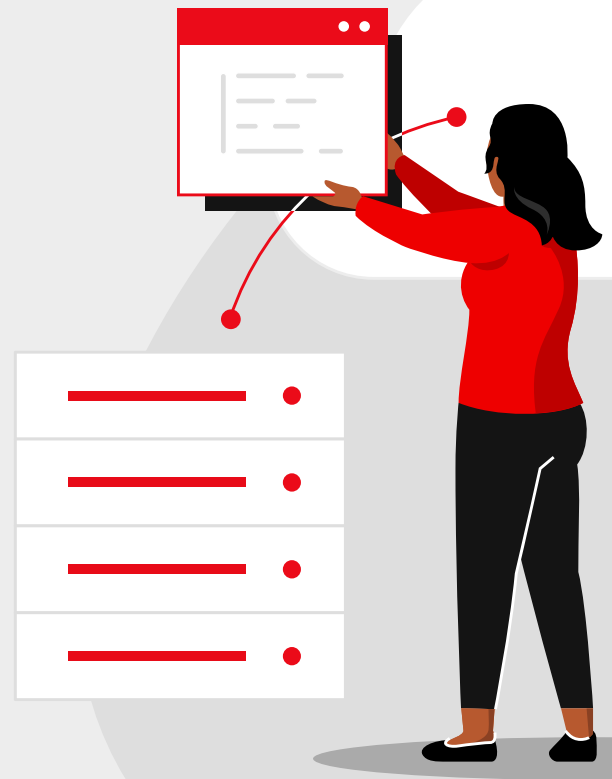
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percent of business and services will be delivered using digital infrastructure by 2025.¹

¹ IDC Technology Spotlight, sponsored by Red Hat. "Digital Business Success Depends on Effective Multicloud Kubernetes Management." IDC, #US47479221, Feb. 2021.

At the heart of this move to modernize infrastructure is a push to get applications where the customers are.

As an enterprise architect, you may look across your ever-evolving application portfolio and see a mix of architectures, technologies, and frameworks that have built up over time.



According to IDC, approximately

50% of containerized applications are net new,

while the other half are existing applications that have been refactored or lifted and shifted to container platforms to improve scalability and portability.¹

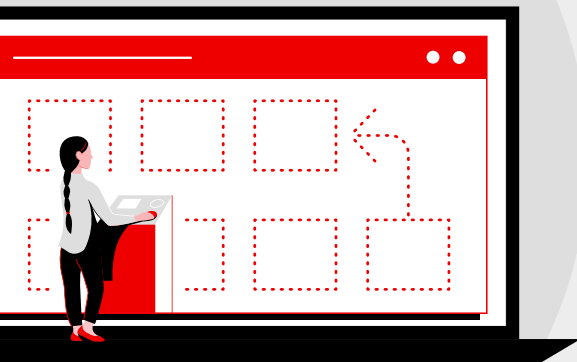
These applications may be running or need to run across multiple infrastructures that are:

- Spanning your datacenter.
- Extending to one or more public clouds.
- Reaching out to the edge.

¹ IDC Technology Spotlight, sponsored by Red Hat. "Digital Business Success Depends on Effective Multicloud Kubernetes Management". IDC, #US47479221, Feb. 2021.

As this hybrid mix of applications and infrastructures grow, complexity increases.

Hard-to-manage environments and manual processes can slow the operations team's efforts to provide resources and services at the speed that developers need.



Enterprise architects are in a position to lead the way forward—and help maintain infrastructure control, security, and reliability. To succeed, you need to build a flexible, modular, and scalable IT environment.

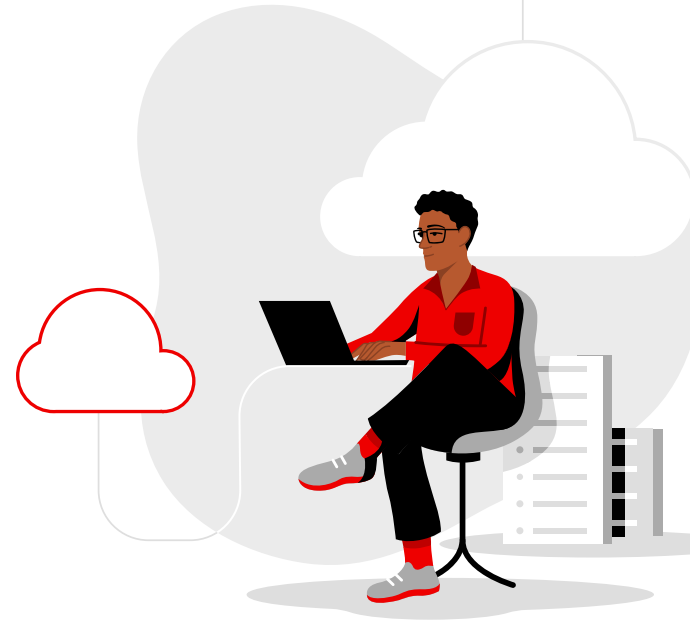
Key concepts

While often used interchangeably, there are important architectural considerations for the variety of modern cloud architectures discussed today. Together, the following provide the agility and portability required for IT to deliver services faster to developers and lines of business.

- 1 Hybrid cloud
- 2 Multicloud
- 3 Containers
- 4 Kubernetes technologies



Architects have a **strategic advantage** when they get everyone on the same page with a common understanding of key concepts.



1 Hybrid cloud

Hybrid cloud lets you use the same methodologies, workflows, and technologies regardless of environment. This includes public and private clouds, on-premise datacenters, and can be extended out to the edge. It also supports combining these resources for a single connected environment.

2 Multicloud

Multicloud is a cloud approach that offers a single set of interconnected services hosted on multiple private or public cloud providers, without any predefined interconnectivity between clouds.

3 Containers

Containers allow you to package and isolate applications with their entire runtime environment—all of the files necessary to run.

4 Kubernetes

Kubernetes is an open source platform that orchestrates and automates container operations, including scaling up and down automatically as needed, reducing many manual processes.

Aligning infrastructure with business goals

Creating digital relationships with customers is how organizations will differentiate themselves going forward.

This approach often means creating new applications or modernizing existing ones. As your organization strives to deliver applications faster, enterprise architects will play a role in shifting thinking from customers to users.

For example:

Customer acquisition can be measured in **single year bookings** (SYB), a metric that is commonly tied to sales, but creating digital relationships goes beyond an individual transaction.

Many organizations are shifting toward a **Software-as-a-Service** (SaaS) mindset, focusing on **daily active users** (DAU) to respond to changing customer needs and new opportunities. Enterprise architects must determine the right combination of infrastructure, both existing and new, to respond accordingly.

IDC research shows that worldwide,

97%

of enterprises expect to take advantage of connected hybrid and multicloud infrastructure,

spanning both on-premise resources and one or more public cloud platforms to support cloud-native applications.¹



¹ IDC Technology Spotlight, sponsored by Red Hat. "Digital Business Success Depends on Effective Multicloud Kubernetes Management". IDC, #US47479221, Feb. 2021.

Change is constant and inevitable

While we have all heard that organizations need flexibility to adapt and respond to new opportunities, jumping on the newest technology does not ensure long-term success.

Custom software applications, for example, have quickly become a key area of focus with the promise of **competitive advantage**, but they can also add **complexity** and **strain on IT teams**, not to mention **increased costs**.



This e-book explores the **key components, benefits, and tradeoffs** of a **hybrid cloud approach** to help inform your planning as you build the right strategy for your organization.

Why containers are the new paradigm



Understanding containers for today and the future

Containers use Linux® subsystems to allow you to package and isolate applications with their entire runtime environment—all of the files necessary to run. This ability makes it easy to move the contained application between environments while retaining full functionality.

Using them to deploy applications can:

- Boost deployment speed.
- Make workloads portable.
- Reduce stress on infrastructure, IT teams, and processes.

Containers allow applications to be abstracted from the environment in which they run, and in doing so, allow the application to be deployed with ease and consistency across any environment—private datacenter, public cloud, or edge device.

While this might sound like an all-in-one architectural solution, there are some things to consider as you integrate containers into your organization's long-term plan.

Containers are here to stay

Although they have been around for more than a decade, containers are quickly becoming a leading method for organizations to be agile and resilient at scale.

What makes this possible?



1 Size is a leading differentiator

Compared to virtual machines (VMs), containers are able to be much smaller because they can contain the minimum software packages needed, and they can start in hundreds of milliseconds instead of minutes.

As a result, containers can deploy and execute an application specifically when it is needed instead of being constantly deployed, providing greater agility for the teams using them.

This ability to power services on and off as needed also helps teams increase the overall scale that container-based solutions can reach, using the same underlying hardware.

2 Containers are portable across infrastructures

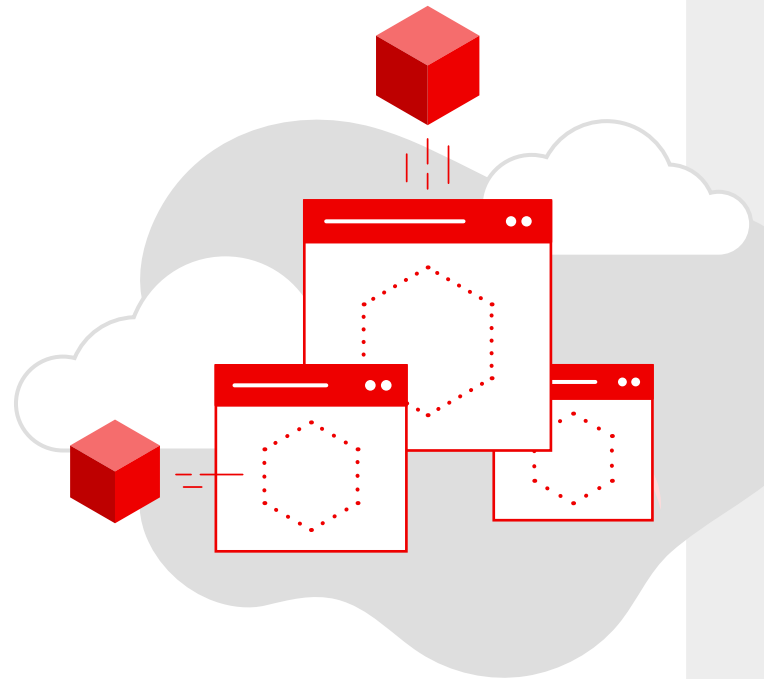
In a VM-based architecture, architects might have protected themselves against risk by deploying across several clouds, but they would likely have come up against the various noninteroperable VM formats available to them.

And, although there are workarounds, this approach adds a layer of complexity for teams to navigate.

The “build once, deploy anywhere” design of containers allows operations teams to **run applications across multiple cloud providers,**

as long as the container orchestration engine (Kubernetes) is in place. But there are some tradeoffs to consider before adopting containerization.

Here are a few of the **leading advantages and considerations:**



Advantages

Faster deployment

Containers isolate an application from the host environment, which allows faster deployment than a VM and greater versatility due to shorter start-up times.

Increased portability

Because containers isolate the application, they become highly portable between different platforms and different cloud vendors. Containers simply need a Linux operating system on which to run.

Consistent operation

DevOps teams are assured applications will run the same way, regardless of where they are deployed.

Greater scalability

Increase the scalability of an application by allowing it to work in parallel with multiple containers as needed. Additional containers can be deployed in seconds without impacting the entire application or the need to add more servers.



Better application development

Support agile and DevOps efforts to accelerate development, test, and production cycles.

Considerations

Security

Containers are generally defined as being based on another container, including multiple levels called layers. For security purposes, all layers on which a container is based must be audited to ensure compliance. This may require a greater effort compared to a traditional stack.

Adoption

To speed adoption and get all the advantages from containers, organizations need to ensure they have the skills to work with containers from adoption onwards. This means training or hiring new expertise.

Long-term maintenance

Even if your organization is not yet ready to embrace the public cloud, on-premise infrastructure will need to be able to scale up and down in the same way as containerized applications, which will impact maintenance.

Future of operations

To take advantage of cloud-native features and run containers on different public clouds, separate site reliability engineering (SRE) teams may be needed to manage and maintain each cloud, resulting in higher costs.

Kubernetes for cloud-native and traditional apps

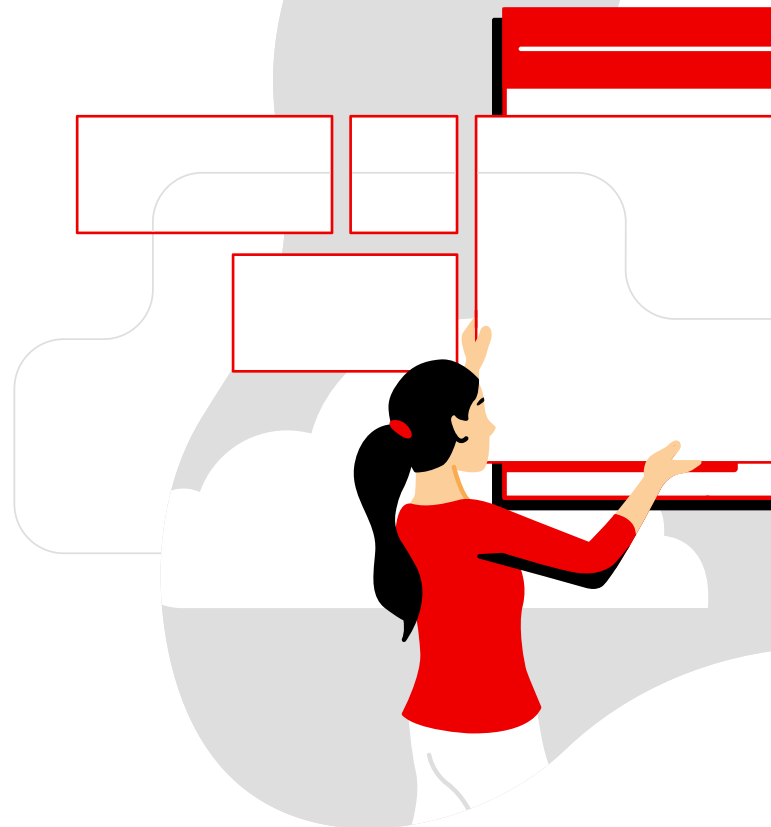
For most enterprise architects, the challenge is not just accelerating application delivery. It is also tying legacy IT to new solutions to make everything work seamlessly—including keeping traditional applications that are critical to the organization.

Kubernetes defined

Kubernetes is an open **source container orchestration platform** that automates many of the manual processes involved in **deploying, managing, and scaling containerized applications**.

Accepted by many as the de facto control plane for managing and deploying containers, Kubernetes can also help you deliver and manage containerized, traditional, and cloud-native apps at scale.

While it may seem like containers introduce new layers of complexity, **Kubernetes applies automation to streamline operations**.



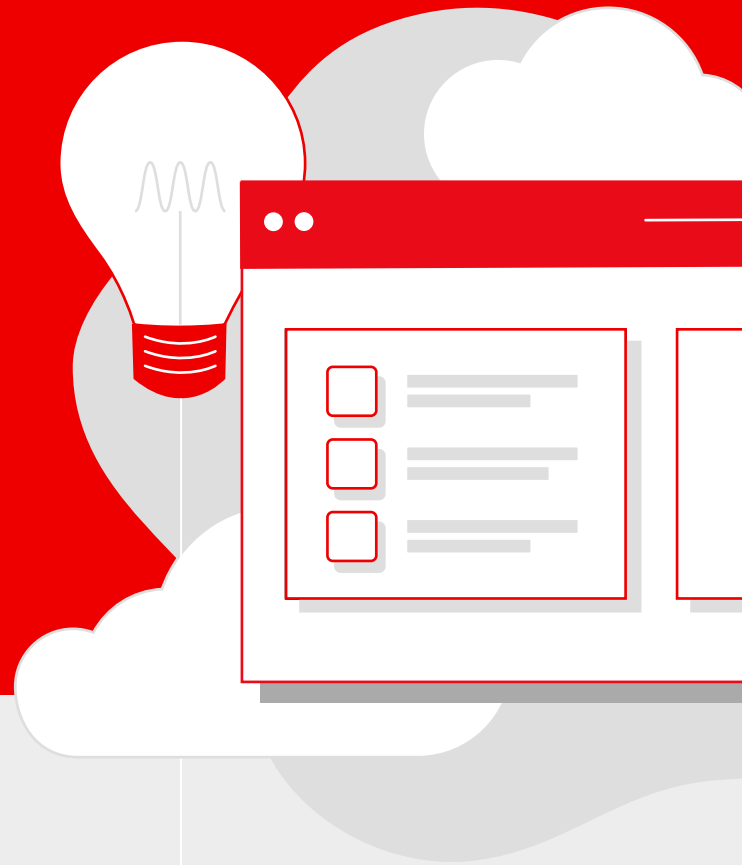
Ask questions to accelerate IT and development

To make the most of your digital infrastructure, enterprise architects need to ask questions and bring departments together.

As enterprise architects develop a strategy to maximize existing infrastructure while keeping future needs in mind, asking the right questions can provide the input needed to manage and solve complex infrastructure challenges.

Enterprise architects cannot work in a bubble

Before you can begin to lay the foundation for new digital infrastructure, it's important to ask key questions to assess the current state of the application portfolio and understand the goals behind them.



These questions offer a good starting point:

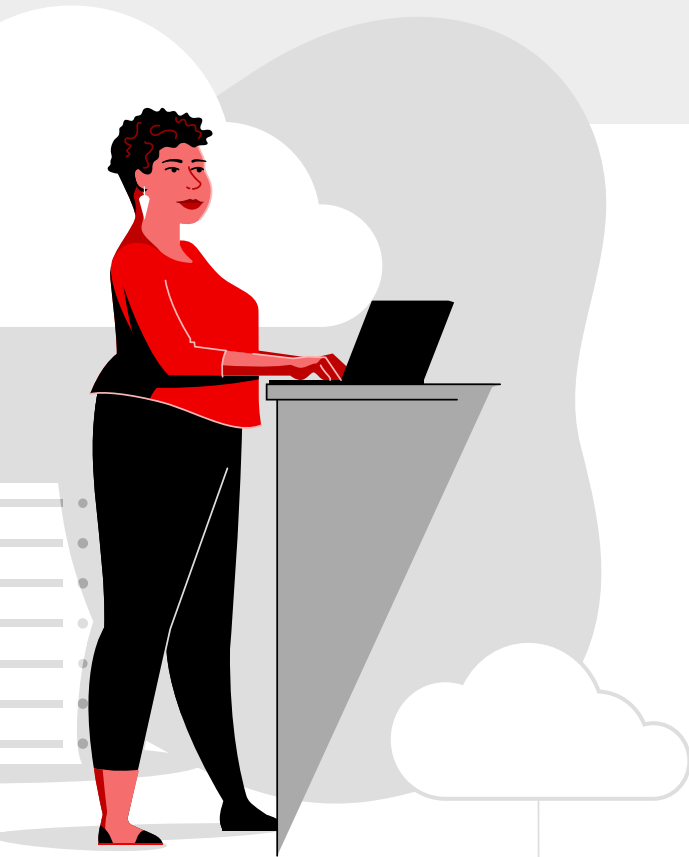
- What business problem is the application trying to solve?
- Who is the end user?
- Where is that data stored?
- Does the data that the application accesses have special security or legal requirements?
- Who needs to access the application?
- Does the application run across multiple locations or different geographies such as the datacenter, cloud, or edge?
- What is the security model for what the application is trying to do?



To answer these questions, among others, the conversation cannot begin with infrastructure. Instead, bring together leadership from across IT and business units to understand the business goal behind the application.

Once you know how the application works and what it aims to achieve,

you can make informed decisions about how best to set up or adjust infrastructure.



Build for consistency and security

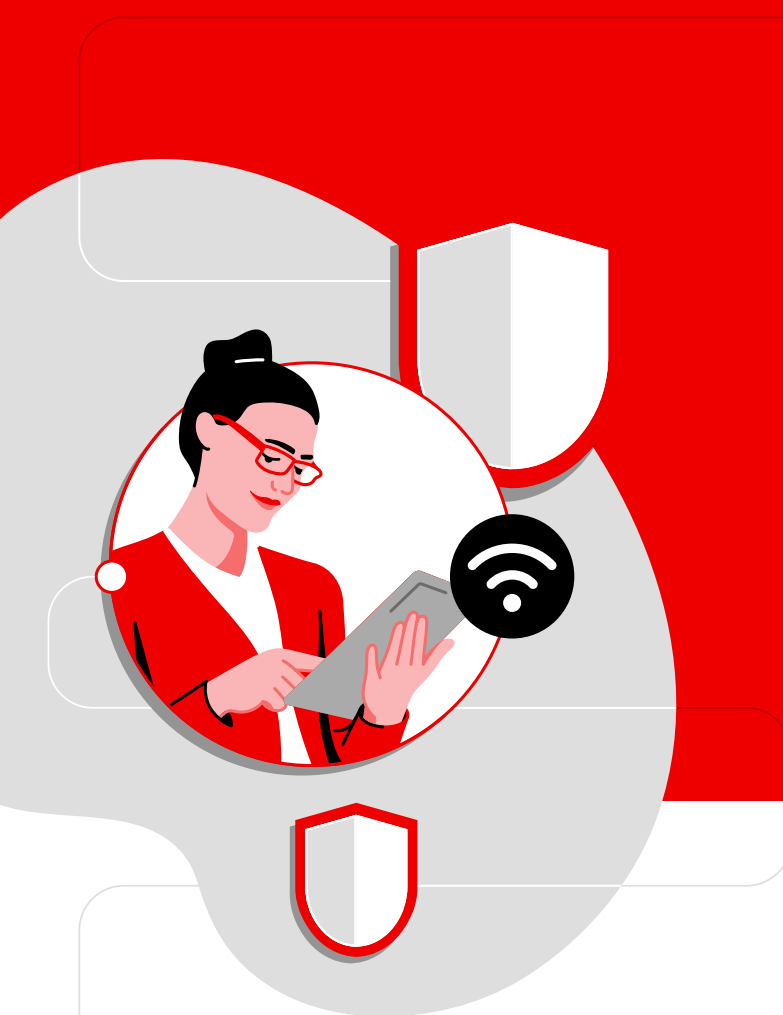
Manage a growing portfolio of applications

Containers give organizations options when it comes to public cloud providers. Because containers package and isolate apps with their entire runtime environment, users can move the containerized app between clouds while retaining full functionality and providing increased consistency and security.

You gain the freedom to choose a public cloud provider based on universal standards, such as uptime, storage space, or cost, instead of trying to determine whether or not your workload will be supported due to proprietary restrictions.

Microservices

Microservices are an architectural approach to writing software where applications are broken down into their smallest components, independent from each other. Together with containers, they can help you take your apps to any cloud.



The future of operations

Before jumping in with containers, there are some trade-offs to consider.

A good question to ask before adopting or expanding containerization is, “What will my operations team look like in the future?”

Infrastructure strategies can go wrong when organizations make the assumption that running on one public cloud will provide the same experience as another.

A common misconception is that if you run Kubernetes on AWS, and on Google Cloud Platform, and on Microsoft Azure, **it should be fine for one team to manage them all because it is all Kubernetes.** However, this is not always true.

The nuances between public clouds can be numerous.

Load balancing, backups, and logging, to name a few, will require a unique architecture for each public cloud, not to mention the fact that Kubernetes versions and features can vary widely between cloud providers.

Without an abstraction layer such as [Red Hat® OpenShift®](#), separate SRE teams will be needed to manage each environment, which will be exponentially more costly.



What you need to manage a multicontainer-based application

- Enterprise-ready infrastructure
- Enough machines for masters and nodes
- Messaging server

Red Hat OpenShift

is a security-focused container platform with full-stack automated operations to manage **hybrid cloud**, **multicloud**, and **edge deployments**. It provides the following benefits.



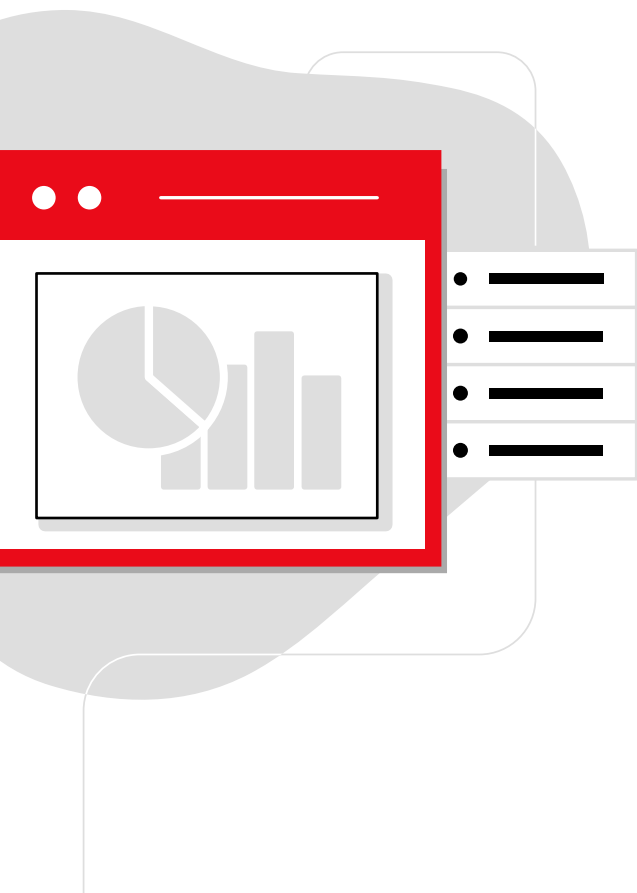
Consistency

A common abstraction layer across any infrastructure to give both developers and operations teams commonality in how applications are packaged, deployed, and managed.



Speed

Build, test, deploy, and run applications faster through self-service access to developer tools, a broad selection of coding languages, data and storage services, and full continuous integration and continuous delivery (CI/CD) services for automating application delivery and supporting a DevOps process.





Security

Continuous security from the operating system to the application and throughout the software life cycle and supply chain. Plus, built-in authentication and authorization, secrets management, auditing, logging, and an integrated container registry for granular control over resources and user permissions.



Management

System administrators and operations teams can manage applications, virtual machines, and containers from a single control plane. A common management platform allows administrators and developers to control clusters, services, and roles for multiple teams from a central administrative console.



Scale

Get advanced management and automation to scale applications quickly and efficiently. Red Hat OpenShift provides the control plane to manage containers at massive scale and delivers innovative container life-cycle administration capabilities.

Adapt to change with Red Hat

Hybrid cloud is not an end state, but the capacity to adapt to change.

To deliver solutions faster today and set up digital infrastructure for the future, enterprise architects must integrate new solutions with traditional technology while keeping costs in check.

But the reality for most organizations is not as simple as a full-scale cloud migration.

Instead, the future of IT is hybrid cloud.



The process of designing a strategy that dictates which public and private clouds are right for each workload is complex, and **the plan you draw up today will not always be the best solution tomorrow.**

To sustain the long-term capability to bring together new clouds, tools, and integrations, especially when the future almost guarantees change, you cannot be locked into one cloud, or one vendor. But there is not a one-size-fits-all solution.

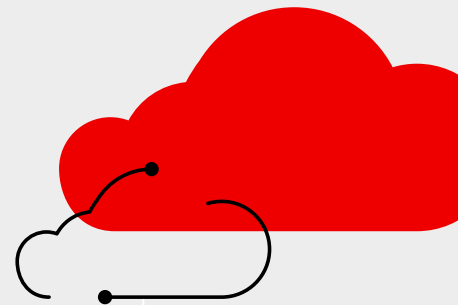


A hybrid cloud approach gives teams the ability to develop and scale new applications while still benefiting from existing systems.

However, managing disparate IT environments can present teams with unexpected technical and process challenges. By adopting a hybrid cloud strategy with a trusted partner, you have more options, plus best practices your teams can use to continuously support changing business needs.

The key is to build an approach for your organization that combines the best strategies for using cloud resources with the flexibility to adapt as those needs change.

To maintain the ability to adapt, you need a consistent, flexible platform across every cloud environment you choose, complete with services like integration, data, and analytics, to support the different apps you release.



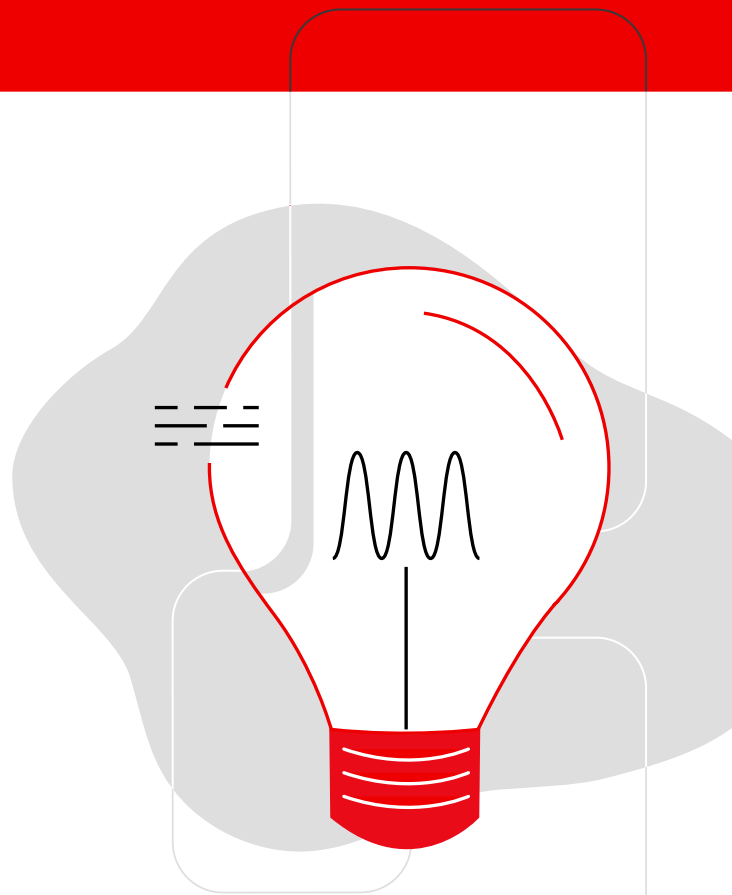


A hybrid cloud approach can help you do more across your IT organization:

- Build a hybrid cloud infrastructure so you can run workloads on any cloud or footprint.
- Adopt cloud-native development to deliver apps faster and easier.
- Automate to improve your processes at scale.
- Integrate team processes to get the most out of a hybrid cloud approach.

Combining these key aspects provides a consistent platform to run diverse workloads on every infrastructure, integrate management and automation capabilities, and change or add public cloud providers without costly refactoring or retraining. And, any proprietary software you use is connected to flexible open standards across your organization.

Ultimately, the right hybrid cloud infrastructure strategy should give your organization the ability to adapt and adjust based on needs and goals.



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