Red Hat

A phased approach for moving your applications to the cloud

A guide for planning your application migration journey
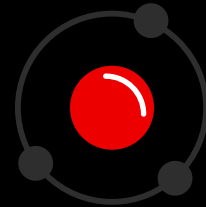
Contents

Cloud adoption is accelerating
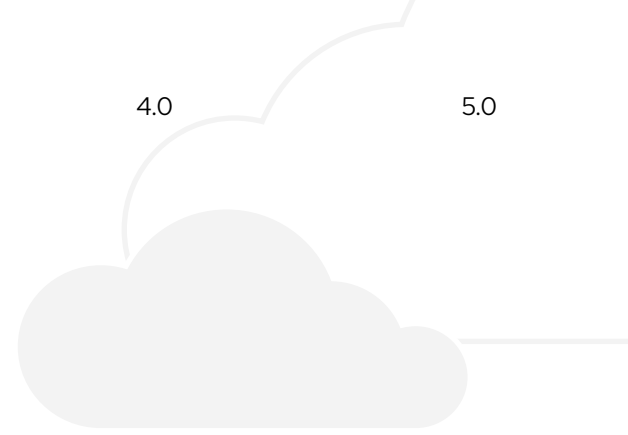
Cloud technologies are essential to success in a digital world.

Cloud environments offer greater efficiency, performance, speed, and cost savings for adopters. Application modernization often accompanies cloud adoption, allowing both developers and applications to take advantage of cloud features and innovation. By modernizing applications and moving them to the cloud, organizations can boost scalability, reliability, and security while reducing costs and improving customer experiences.

Even so, modernizing and moving to the cloud can be a daunting task and requires detailed planning, time, and resources. As a result, most organizations approach cloud migration and application modernization as an ongoing journey, rather than a single project. And, while the reasons to move to the cloud are clear, many organizations are still at the beginning of their cloud journey. In fact, 20% of organizations cite difficulty determining the right approach to be a barrier to getting started with application modernization.[1]

Gain business benefits through cloud technologies

Organizations choose to move to the cloud for many reasons. Top business benefits include:

- ▶ Faster time to market for new applications and features.

- ▶ Streamlined, focused developer experiences.

- ▶ Better support for DevSecOps approaches.

- ▶ Security- and compliance-focused frameworks, certifications, and controls for infrastructure and applications.

- ▶ Flexible, consumption-based purchasing and pricing options.

1 Red Hat. "How enterprises approach legacy application modernization," February 2023.

Top reasons for modernizing applications[2]

Increase scalability	68%
Increase reliability	67%
Decrease costs	59%
Improve security	54%
Improve customer experience	33%
Increase employee productivity	19%
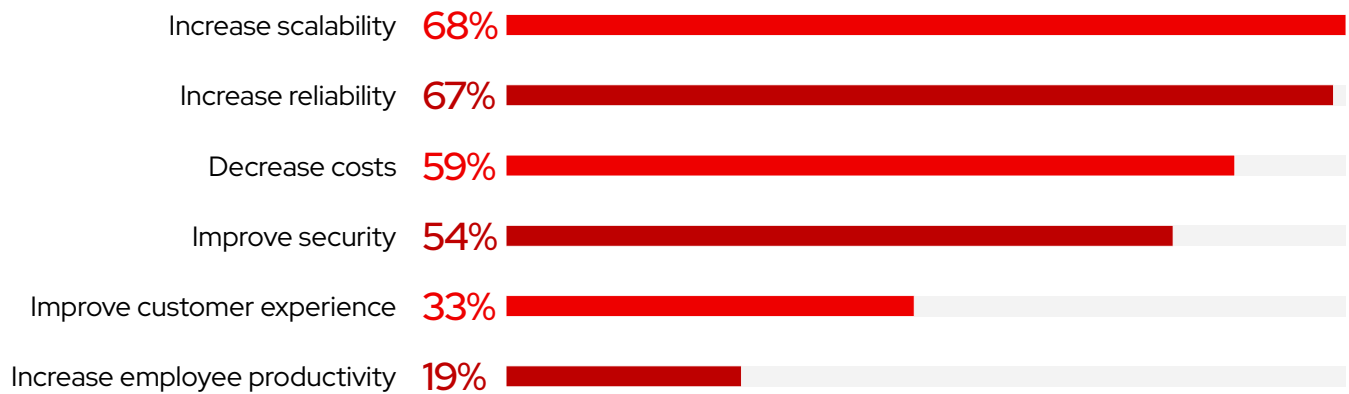
There are many paths to the cloud

When moving applications to the cloud, organizations typically follow one or more of the following 6 migration paths, commonly known as the *6Rs*:

▶ **Retire.** Decommission applications that are no longer needed.

▶ **Retain.** Leave critical applications as-is until refactoring is required.

▶ **Rehost.** Lift and shift applications to a cloud with minimal changes.

▶ **Replatform.** Containerize applications or upgrade operating systems, databases, and other components as needed to allow applications to run in a cloud, without changing the core application code.

▶ **Refactor.** Rearchitect applications to be cloud-native by moving them to a microservices or serverless architecture, for example.

▶ **Repurchase.** Move from perpetual application licenses to a Software-as-a-Service (SaaS) model

Most application migration journeys involve rehosting, replatforming, or refactoring applications, and this e-book will focus on those migration paths. While each path has distinct technology, process, culture, and time requirements and delivers different benefits, all will help your organization operate more effectively in a digital world.

All of your applications need not follow the same modernization path. You can choose the path that best fits the characteristics of each application, as well as your organization's current—and expected—needs. You can also opt to make minimal changes to an application now and further modernize it as your requirements evolve.

Take an open approach to application modernization

As an expert in open source software, cloud-native technologies, and Kubernetes, Red Hat can help you modernize your applications and build an agile, cloud-native IT environment to support evolving business demands. We offer a complete, unified, open hybrid cloud foundation for your application modernization journey. Our solutions let you:

▶ Start where you are today and modernize applications as much or as little as needed, at the right time and pace for your organization.

▶ Increase operational efficiency, resiliency, and adaptability with platforms and products that support both traditional and modernized applications.

▶ Manage all applications via a common set of processes while continuing to use your preferred runtimes, languages, and development tools.

▶ Deliver a consistent, streamlined developer experience with standardized workflows, continuous integration, and support for multiple environments.

Our open, partner-focused approach brings together technology, people, and processes to help you successfully modernize your applications and move to the cloud. We foster a large ecosystem of certified partner technologies, products, and services so you can customize your cloud environment knowing all components will work together reliably. In fact, we partner with all major cloud providers—including **Amazon Web Services (AWS)**, **Microsoft Azure**, **Google Cloud**, **IBM Cloud**, and **Alibaba Cloud**—so you choose the cloud, or clouds, that work best for each application.

External partners will play roles in

70%

of application modernization journeys, either leading in-house teams or directly modernizing applications.[3]

We also offer **award-winning support** for all of our products, so you can deploy them with confidence across clouds. And you can engage **Red Hat® Consulting** experts to get started faster and learn the skills you need for efficient cloud operations.

---

*3 Red Hat. "**How enterprises approach legacy application modernization**," February 2023.*

No matter where you are in your modernization and migration journey, Red Hat can help you get the most benefit from your efforts.

Our open hybrid cloud foundation spans on-site datacenters, private and public clouds, and edge infrastructure to deliver both the consistency and flexibility you need to modernize and migrate on your terms. The components in this foundation are offered both as self-managed products and as cloud services that offload management and maintenance operations, allowing you to focus on your business priorities. These cloud services can help you rapidly build a hybrid cloud environment and focus on your business priorities, rather than administering your application platform.
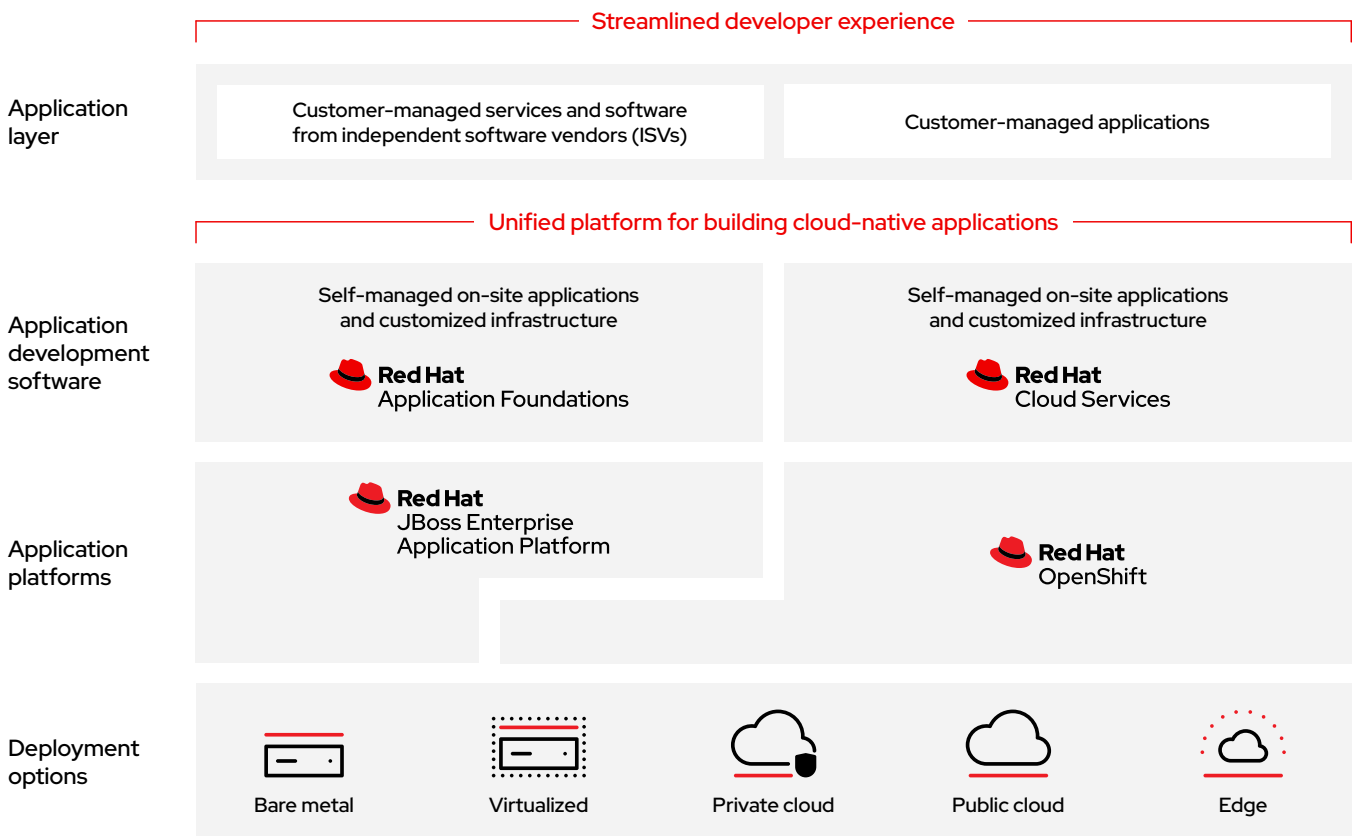
Red Hat
OpenShift

Red Hat OpenShift® is a unified, enterprise-ready application platform for cloud-native innovation. Powered by containers, Kubernetes, and DevSecOps capabilities, it provides a foundation for rapidly building, deploying, and managing existing and new applications at scale and with security. Red Hat OpenShift runs consistently across hybrid and multicloud environments, giving you the tools, services, and capabilities you need to be successful today and in the future.

You can deploy and manage Red Hat OpenShift yourself or use a cloud service. Red Hat OpenShift cloud services are available on AWS, Microsoft Azure, Google Cloud, and IBM Cloud, so you can choose the option that best fits your needs. Each service provides a complete, full-stack environment with all necessary services, simple self-service options, and expert 24x7 support via stringent service-level agreements (SLAs).

Red Hat
JBoss Enterprise
Application Platform

Red Hat JBoss® Enterprise Application Platform (JBoss EAP) is a Jakarta EE-certified platform that helps you deliver applications faster, from anywhere. It provides enterprise-grade security, performance, and scalability in any environment. You can deploy JBoss EAP directly from the AWS and Microsoft Azure marketplaces, on Red Hat OpenShift running on-site or in the cloud, or as a cloud service on Microsoft Azure.
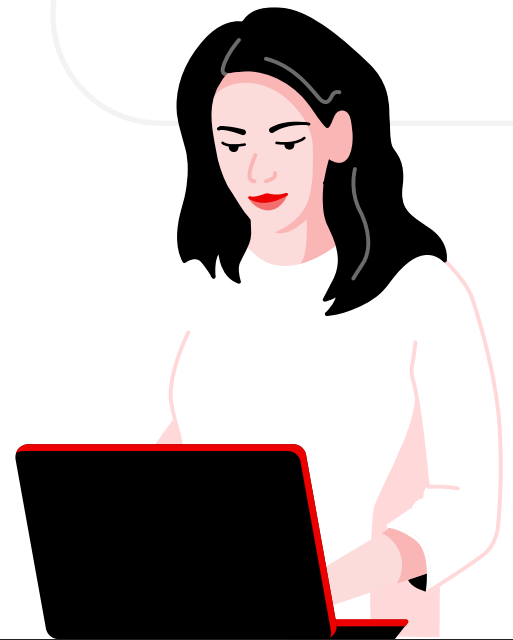
Red Hat
Application Foundations

Red Hat Application Foundations is a comprehensive set of components for developing and modernizing software. These components help you build, deploy, and operate applications with security in mind and at scale across clouds. Red Hat Application Foundations can be used with applications that run on-site or in the cloud and, when combined with Red Hat OpenShift, it creates a platform that streamlines execution across the entire application life cycle.

Red Hat
OpenShift
API Management

Red Hat OpenShift API Management is a fully hosted and managed service that provides a streamlined developer experience for building, deploying, and scaling cloud-native, integrated applications. Using an application programming interface (API) first approach, it helps you protect, share, and control access to services, applications, and systems across public and private clouds. It also allows you to efficiently update and reuse assets to boost agility and productivity.

Focus on your business with cloud services

Red Hat works with key cloud provider partners to deliver fully managed cloud services that simplify deployment and operations while saving costs over in-house construction. Take advantage of flexible pricing models and simplified procurement. Reduce support costs and downtime with access to global site reliability engineers (SREs). Streamline operations with full-stack management and built-in automation—handled by Red Hat and cloud provider experts. Free your staff to innovate with on-demand developer services and tools. And gain flexibility and portability with a consistent foundation that spans on-site datacenters and cloud providers

Gain more control over your cloud spend

Managing cloud spend is a top cloud challenge for 82% of enterprises.[4] Red Hat offers multiple purchasing options to align with your organization's budget and requirements:

▶ Purchase subscriptions directly from Red Hat and use them on-site or in the cloud via Red Hat Cloud Access.

▶ Obtain Red Hat cloud services and software instances from your cloud providers' consoles or marketplaces.

▶ Use your cloud provider committed spend programs and discounts for Red Hat cloud services and product instances in the cloud.

▶ Use the Red Hat Hybrid Committed Spend program for discounted pricing and flexible payment options across cloud providers.

The following sections discuss the rehost, replatform, and refactor modernization paths and how you can use Red Hat products to streamline your journey.
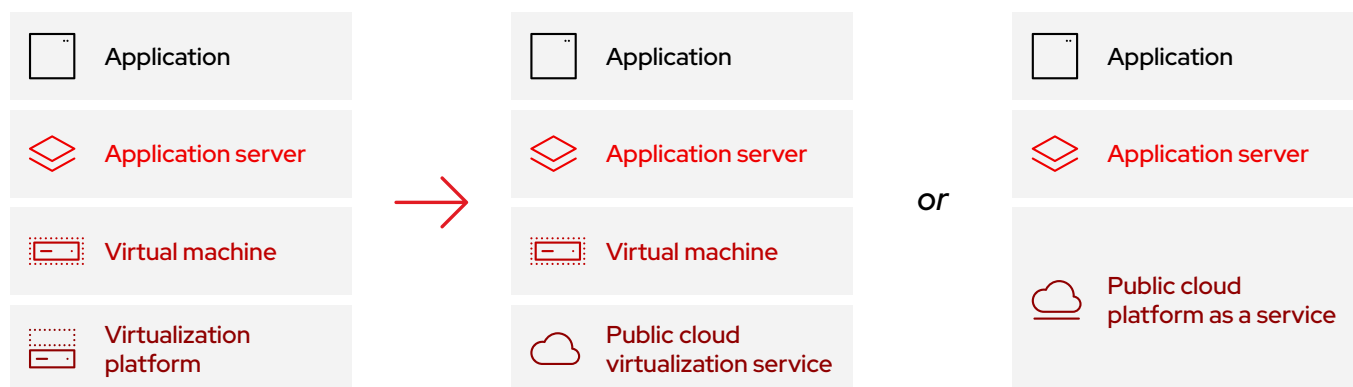
Path 1: Rehost

Lift and shift your applications to the cloud with Red Hat JBoss EAP.

The rehost path involves lifting and shifting applications running on traditional application servers into virtual machines running in a cloud environment. Monolithic applications remain unchanged on your application server and retain all existing integrations and dependencies. External data and integrations can be kept on your conventional platforms.

Rehosting generally takes a short amount of time and results in low migration costs, but delivers fewer benefits than the other modernization paths. Because your application is effectively unchanged, you may not be able to integrate with cloud-based application services, and you'll likely still face the same challenges with regards to application scalability.

Rehosting is useful for datacenter consolidation initiatives and straightforward cloud migrations. It also works well for applications with dependencies that may not be able to be moved to the cloud, applications with specific hardware and operating system requirements, and applications that are infrequently changed or updated.

Application		Application		Application
Application server	→	Application server	*or*	Application server
Virtual machine		Virtual machine		
Virtualization platform		Public cloud virtualization service		Public cloud platform as a service

ⓘ Some traditional application servers may not work in a virtual machine, requiring you to redeploy your applications in a modern runtime environment before moving them to a virtual machine. If you need to change runtime environments, consider replatforming your applications and deploying them in containers (path 2) to optimize your modernization efforts.
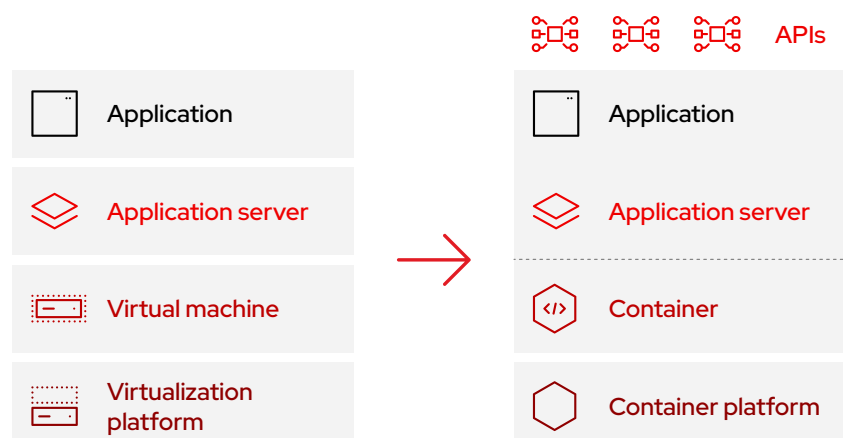
Path 2: Replatform

Move your applications into containers running on Red Hat OpenShift and complement them with application services.

The replatform path involves lifting, modifying, and shifting applications to modern runtime environments running in containers on a cloud-based application platform. Some applications require more changes than others to replatform. For example, basic JavaTM applications require few changes to benefit from a containerized Java runtime like OpenJDK. However, enterprise applications should be migrated to modern runtime environments like Red Hat JBoss EAP prior to deploying them in containers.

This path usually takes longer than rehosting, but delivers more benefits. Unifying your applications on a single hybrid cloud platform streamlines operations and allows you to deliver self-service capabilities. Replatformed applications can also take advantage of all of the native capabilities of your application platform, including automatic scaling, portability, and cloud-based application services.

Replatforming works well for applications with dependencies that are easier to move to the cloud, applications that require moderately frequent changes and updates, and applications that do not have restrictive hardware and operating system requirements. Replatforming is often the first step in larger application modernization journeys, and it prepares your application for further modernization.

Consider using **Red Hat AMQ streams** as the communication method between applications and their dependencies to streamline the replatforming process and lay a foundation for cloud services integration. You can also use Red Hat OpenShift API Management to build APIs in front of your replatformed applications for more flexible integration. Finally, you can add event-driven capabilities into your application with Red Hat Application Foundations and the **Red Hat JBoss EAP expansion pack (XP)**.

APIs

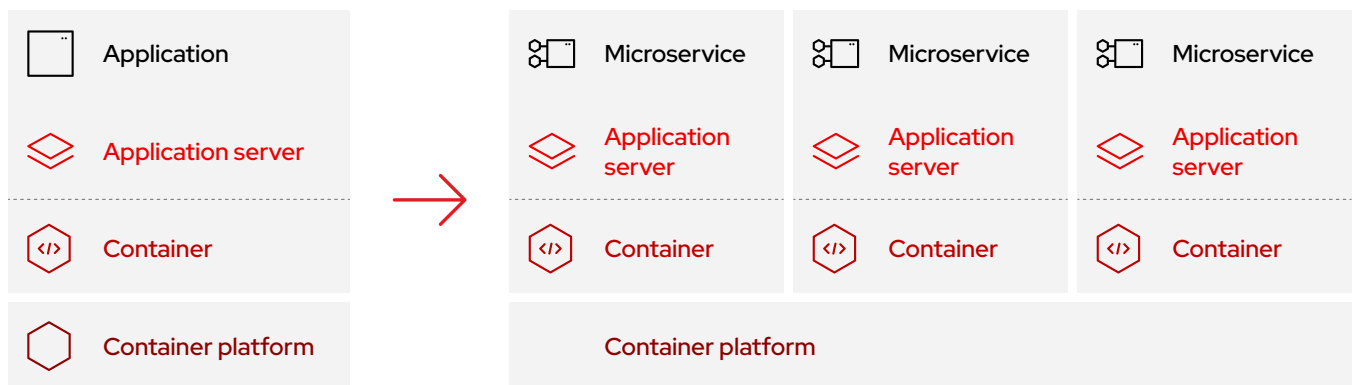| Application | | Application |
Application server	→	Application server
Virtual machine		Container
Virtualization platform		Container platform

Path 3: Refactor

Incrementally rebuild your application as microservices deployed on Red Hat OpenShift and integrate other cloud services to replace or add functionality as you modernize.

The refactor path involves redeveloping application services as microservices deployed within a service mesh on a cloud-based application platform. Services can be rebuilt incrementally over time to gradually move functionality from your old application architecture to your new one. During the redevelopment process, you can also upgrade underlying technologies and add in new cloud-native services and capabilities like artificial intelligence and machine learning (AI/ML), analytics, autoscaling, serverless functions, and event-driven architecture.

The refactor path takes the most time, but also delivers the greatest advantage. Refactoring delivers all of the benefits of rehosting and replatforming while allowing you to embrace innovative new technologies to increase development speed, business agility, and overall value.

Refactoring works well for applications that you plan to use for a long time, applications with few dependencies or dependencies that can be easily replaced or moved to the cloud, and applications that require frequent updates and changes. Refactoring also lets you add new cloud-based capabilities and services—like Red Hat OpenShift API Management and Red Hat Application Foundations—and results in a truly cloud-native application. You can also take advantage of all of the cloud-native capabilities of Red Hat OpenShift—including the Red Hat build of Quarkus, Red Hat OpenShift Pipelines, and Red Hat OpenShift Serverless—to speed application development and deployment.

Application	→	Microservice	Microservice	Microservice
Application server		Application server	Application server	Application server
Container		Container	Container	Container
Container platform		Container platform		

Plan your application migration journey

Assess your complete application portfolio to determine the best path for each application.

1 Identify

Identify the technical and operational risks associated with migrating the application from its current platform to the cloud.

2 Evaluate

Evaluate the costs, benefits, and concerns associated with each potential modernization path.

3 Choose

Select the modernization path that aligns best with your goals, budget, and time constraints for the application.

4 Validate

After each migration, validate that your application correctly delivers the required business logic.

Migrate with confidence

Red Hat offers several migration tools to help you plan your modernization journey.

Get started with the Migration Toolkit for Applications, a set of experience-based tools that accelerates large-scale application modernization efforts.

It helps you inventory, assess, analyze, and manage applications for faster migration to Red Hat OpenShift. Answer a series of questions about your application, and the tool returns an assessment of the modernization risk and a recommendation for which path to use.

It also helps you upgrade application platforms and move to cloud-native runtime environments like Red Hat JBoss EAP, Spring, or the Red Hat build of Quarkus.

Is a microservices architecture right for your application?

Many organizations plan to deploy microservices architectures for some or all of their applications. Assess each application to ensure that rearchitecting it makes sense and will deliver value to your organization. For example, the cost of rearchitecting applications with a small number of users or limited need to scale may actually be more than the benefits. The ultimate goal is to choose the architecture and environment that delivers the best return on investment for each application.

Ready to get started?

No matter where you are in your modernization and migration journey, Red Hat can help you get the most benefit from your efforts. Our open hybrid cloud foundation delivers the consistency, flexibility, and tools you need to modernize and migrate applications on your terms and schedule.

▶ **Learn more** about **Red Hat Cloud Services.**

▶ **Discover** our cloud-native development solutions.

Simplify your application modernization journey

Red Hat Consulting experts can work with you to evaluate and implement application modernization solutions that help you reduce costs, improve efficiency, and speed development. Our experts can also help you, your team, and your organization develop the practices, tools, and culture needed to rapidly build and evolve applications across your organization.

Learn about our consulting services.

Red Hat