

Bring containers to the enterprise with Red Hat OpenShift

Welcome to the world of containers

Worldwide, organizations are creating more personalized customer experiences in order to retain and grow their customer base and revenues. They accomplish this by adopting [containers](#) and [Kubernetes](#).

By turning to containers and Kubernetes, they can quickly deliver new applications and migrate existing apps to the cloud for more agility. Increased agility helps propel the innovation cycle whether it is rapidly building and deploying new applications or improving the customer experience (CX). For example, an [airline carrier](#) migrated their legacy system to a hybrid cloud environment using [Red Hat OpenShift®](#), increasing code deployments to over 200 per day.

Starting with containers is more than just downloading Kubernetes. There are sets of solutions that can be packaged together to provide a platform for building, deploying, monitoring, and managing containerized workloads. Security and automation are at the heart of the decision when choosing a platform because platforms need to be able to scale, heal, and constantly evolve.

To improve security, a platform needs to be architecturally designed around immutability to limit the potential attack vectors. This type of immutable architecture will also allow for simpler updates so operations teams can quickly respond to patches that address new vulnerabilities. [Increased automation](#) will support scalability and stability to help promote a more consistent and more secure experience.

Once a business chooses a platform, its ideas for digital initiatives need to become reality. For example:

- Retailers can provide a personalized omnichannel or channel-less CX.
- Manufacturers can give their shop floor employees a safer and more productive work environment.
- Healthcare organizations can move beyond tracking medical devices and have prescriptive analytics running on their equipment to improve patient outcomes.

How do containers create change?

The evolution in developing and deploying containers has accelerated change. [DevOps](#) tooling connects operations and developers to help deploy new applications faster. With the container model, each application can more easily be deployed on a number of infrastructure targets, from on-premise to [multicloud](#) or [hybrid cloud](#).

One of the first steps toward [digital transformation](#) involves migrating monolithic applications into a cloud-ready, containerized architecture. In a monolithic application, each of the functions that comprise the application have been written and tested as a single, large package. With a move to a containerized deployment, each individual function can be delivered in its own container and scaled independently. The migration is often done one function at a time, ensuring that each individual function, as well as the remainder of the application, are running correctly before moving on.



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One prevalent use case for [cloud-native application design](#) occurs when delivering a brand new application. A new application allows the build and deployment model to center on containers. New application development efforts are likely building a microservices-based app and are looking to [integrate with continuous integration and continuous delivery \(CI/CD\)](#) build methodologies that allow for more frequent release cycles. In this case, the core of the development workflow would be an automated build process designed to rapidly test code iterations for quality. As code changes pass testing, they can be released as independent updates to the application in their own containers. Each individual containerized function can scale to address performance delays or reside on different infrastructures that support specialized services.

From training the model through real-time analysis, the ability to introduce AI/ML solutions has become a critical initiative for many organizations, whether your project is focused on business process automation, cognitive insights, or engagement. Additionally, to enhance performance-sensitive AI/ML workloads, it is critical to optimize the access and efficiency of specialized hardware resources such as graphics processing units (GPUs), field-programmable gate array (FPGAs), and Infiniband. When a solution is built in a containerized environment, it offers additional flexibility and portability to better adapt these workloads for use. Customers have a range of choices in Kubernetes solutions, including do-it-yourself (DIY) platforms built on upstream projects, managed services on public clouds, and other self-hosted platforms. Red Hat OpenShift stands out as a leading choice for customers who want a more secure, supported Kubernetes platform guided by deep expertise.

Why Red Hat OpenShift?

Regardless of how you are moving to containers, the right platform offers additional features beyond deploying and managing container environments, and Red Hat OpenShift supports the needs of growing container environments. Red Hat OpenShift adds value to Kubernetes with built-in authentication and authorization, secrets management, auditing, logging, and an integrated container registry for granular control over resources and user permissions.

Supported Kubernetes with trusted expertise

The Linux® operating system is the foundation for [deploying containers and Kubernetes](#). Red Hat is a community leader and builder in Kubernetes and container projects, building on our [open source expertise](#) to drive significant innovation in upstream projects. [Red Hat OpenShift 4](#) architecture is based on Red Hat Enterprise Linux CoreOS, enabling a tighter level of integration and security for Kubernetes environments. [Red Hat Enterprise Linux CoreOS](#) can be managed and run at a massive scale, with minimal operational overhead.

Start with a lightweight Linux operating system distribution that includes just the essentials: the operating system and basic userland utilities stripped to their bare minimum and shipped as an integral unit. By standardizing each installation of Red Hat OpenShift on Red Hat Enterprise Linux CoreOS, the foundation for a lasting platform is established. Updates to the full stack can be managed from the operating system through the application stack, so continuity between each platform instance enhances.

Red Hat OpenShift adds a comprehensive, continuous focus on security to upstream Kubernetes. The platform integrates tightly with Jenkins and other standard CI/CD tools for security-focused application builds. Users can further extend the security of applications on Red Hat OpenShift from independent software vendor (ISV) solutions validated through our expansive partner network.

Stateful applications built and deployed using containers also need storage that is easy to use, highly available, and flexible. [Red Hat OpenShift Container Storage](#) was created specifically for container-based environments and is highly integrated with Red Hat OpenShift Container Platform. OpenShift Container Storage allows application portability, helps customers make the most of their investment in containers and hybrid cloud technologies, and encourages faster development cycles for stateful applications and services.

Monitoring and management in a hybrid ecosystem becomes very complex. Without visibility, projects can quickly spin out of control, so cloud.redhat.com provides a consolidated view into Kubernetes clusters across all infrastructures.

A cloud-like experience, everywhere

Routine platform and service maintenance takes time away from building critical services and customer experiences. To give teams more time and freedom to innovate, Red Hat OpenShift automates life-cycle management from the container to Linux and helps decouple workloads from infrastructure.

Red Hat OpenShift 4 supports [Kubernetes Operators](#) to streamline and automate installation, updates, and management of container-based services. Imagine deploying or updating a database, monitoring a service, or building a system across an entire cluster with the same ease of installing a smartphone application. Operators enhance the delivery of services to include configuration settings that enable consistent deployment of services across multiple instances.

Operating system updates and security patches can be regularly pushed to machines without requiring intervention by administrators. With this foundation, Red Hat OpenShift 4 automates the installation of the full stack—from the underlying infrastructure (e.g. Amazon Web Services, vSphere, Microsoft Azure, [Red Hat OpenStack® Platform](#)), to the Linux OS (Red Hat Enterprise Linux CoreOS), to the Kubernetes platform and integrated services (Red Hat OpenShift). When applications are distributed across hybrid multicloud environments, these automatic updates with Red Hat OpenShift dramatically improve security without causing service downtime. The result is full-stack continuous focus on security from the operating system to the application and throughout the software life cycle.

When designing Red Hat OpenShift 4, attention to improving the installation experience for the Kubernetes cluster was built into the platform. With the unique Red Hat OpenShift management model extending down to the operating system, an installation is simply treated as an upgrade. By thinking this way, the initial installation is simply an update from nothing to the initial state. The installer is required to bootstrap certain minimal default values of the cluster but embraces the available operators starting with the initial configuration.

For many containerized applications, the initial installation is simple. However, when these applications need to be configured, updated, or backed up, specific operational knowledge and business logic is required to make sure these more complicated tasks are handled correctly. At scale you further multiply the knowledge required to manage these applications, often requiring large amounts of IT coordination, from network permissions to systems allocation, to backup, logging, and service updating.

To deliver applications in a consistent and straightforward manner, you need a way to package the business logic with the application in an automated and repeatable way. When delivering a new containerized application that is built to scale on-demand, each discrete instance must be configured

identically. All the business logic for configuration and operations needs to be included with the core service or application to deliver this consistently. Red Hat OpenShift combined with Kubernetes Operators provides this out of the box.

When services are deployed across a number of containers, each service needs to talk to each other. The challenge of managing the complex interactions between containers in highly distributed [microservices environments](#) would consume too much time from developers. A [service mesh](#) takes the logic governing the service-to-service communication between containers out of the individual services and abstracts it to a layer of infrastructure. Red Hat OpenShift uses components from open source projects [Istio](#), [Jaeger](#), and [Kiali](#) for the service mesh. By integrating these together in a single package, the Red Hat OpenShift Service Mesh delivers the interconnect, tracing, and visualization of the service mesh in action. This provides rapid troubleshooting of the service mesh and allows operations teams to quickly react to any changes in application delivery.

The benefits of Red Hat OpenShift are available in multiple platform variants to match the consumption model that customers prefer. For teams that are prepared to manage Red Hat OpenShift themselves, OpenShift Container Platform can be installed on-premise or through the major cloud providers. Red Hat OpenShift Dedicated is a complete Red Hat OpenShift cluster provided as a cloud service and managed by Red Hat Operations. It is configured for high availability (HA) and dedicated to a single customer (single-tenant), backed by award-winning [24x7 Red Hat premium support](#).¹ [Microsoft Azure Red Hat OpenShift](#) is a fully managed Red Hat OpenShift offering on Azure jointly engineered, operated, and supported by Microsoft and Red Hat.

Empowering developers to innovate

Red Hat pushes the boundaries of what containers and Kubernetes can do, driving innovation for stateful applications, [virtual machines \(VMs\)](#), functions, and machine learning on Kubernetes.

Using operators to install and manage your containerized applications makes them easier to deploy, more reliable, and kept up to date in the security patching arms race. With services backed by operators, the development team focuses on challenges that deliver more value to your business and to your customers. The underlying service can be updated by the IT operations team to maintain system security across multiple applications without requiring each development team to stop work on their code.

Similarly, the service mesh takes issues such as service discovery, load balancing, fault tolerance, observability, security, and others out of the application. Each of these functions is enabled by the service mesh defined by IT operations teams for use by the applications developers are creating. By taking these functions out of the application-level libraries, it allows developers to focus on business logic in their code.

Developers are continually searching for alternative ways to execute their code. With [cloud-native applications](#), being able to scale to zero has become a goal to limit operational costs of running their functions. Setting up a server that runs 24x7 to host code that is not in constant use means that the vast majority of the time customers are paying for processing power that is not being used. With a [serverless](#) instance, no resources are consumed unless your code is running.

¹ "The Year's Top Ten Best Web Support Sites." *The Association of Support Professionals, 2018*, asponline.com/awards/best-web-support-sites.

To support serverless use cases, Red Hat OpenShift makes use of Knative to establish a foundation to manage serverless workloads. By targeting the serverless framework to use Knative [application programming interfaces \(APIs\)](#), it is possible to bridge serverless and Kubernetes. When deploying a service, Knative will start and stop the service as needed. It will coexist with and be mixed with alternative architectures and is part of a general trend toward simplifying the developer experience and making developers more productive when creating flexible, scalable, and robust cloud-native applications.

Once the platform can support hybrid cloud deployments, the development teams are able to focus on developing applications. By integrating directly with the existing workflow and toolchain solutions, developers can focus less on the platform and more on their code. The platform integrates tightly with Jenkins and other standard CI/CD tools, or Red Hat OpenShift's built-in workflows and tools, for security-focused application builds.

Red Hat OpenShift also allows for the use of a developer-focused command-line interface (CLI) that abstracts the infrastructure management from code management. When building with the Red Hat OpenShift platform, you can inspire innovation and get applications and services to production sooner.

Preparing for success

As a platform for innovation, Red Hat OpenShift includes everything you need to run containers and Kubernetes consistently across any on-premise, private, or public cloud infrastructure. Power business transformation and unite your teams on a cost-effective, single platform to quickly deliver the exceptional experiences your customers expect, anywhere they are. Reduce total cost of ownership for all your applications and supporting infrastructure, with service and application portability across on-premise and cloud environments.

With Red Hat OpenShift, your most innovative people can focus on what matters and continually outpace customer expectations and deliver the big ideas that change everything.

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 integrate new and existing IT applications, develop cloud-native applications, standardize on our industry-leading operating system, and automate, secure, and manage complex environments. Award-winning support, training, and consulting services make Red Hat a trusted adviser to the Fortune 500. As a strategic partner to cloud providers, system integrators, application vendors, customers, and open source communities, Red Hat can help organizations prepare for the digital future.



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