

# Application modernization on IBM Power



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# It's time to modernize your enterprise application portfolio

## What's inside?

- Best practices for building modern applications in an incremental, safe and economically sound manner
- How to avoid some of the common pitfalls when modernizing applications

Rapid changes in the world over the past few years are impacting IT in a profound way. IT strategies are shifting to serve an increasingly always-on world and, for many organizations, it has meant accelerating digital transformation efforts. Managing and modernizing critical processes and operations remain top priorities for IT leaders like you who want to find new ways to gain advantage and opportunity in a fluctuating environment.

The question for your business, then, is how do you know when it's time to modernize an application? Where do you start, and what are the best ways to make a business case for the investment in modernization? In this ebook, we'll describe the best practices for building modern applications in an incremental, safe and economically sound manner. We'll also describe how to avoid some of the common pitfalls that enterprises fall victim to, so that you know what to keep an eye out for as you embark on this journey. Examples include no clear business value, projects taking too long and vendor lock-in.



# Drivers and immediate benefits

Application modernization is the process of updating an application so that it can be maintained, extended, deployed and managed in a way that allows the application to meet your current and future needs. Application modernization opens the door to several business and technical benefits for your organization. Let's take a closer look at some of them.

On IBM® Power®, you can continue running your existing applications ... while you start surrounding them with new cloud-native applications.

## **Accelerate digital transformation**

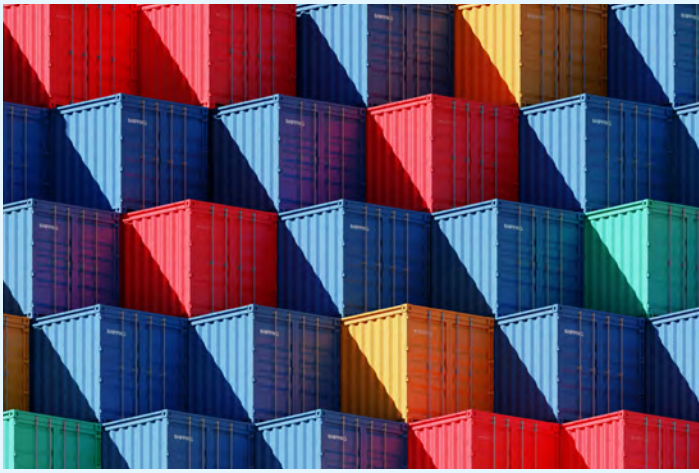
More than ever, organizations need to find new ways to provide innovative, engaging experiences that satisfy existing customers, attract new ones and gain a competitive edge. A Forrester Consulting study—commissioned by IBM—on the business value of modernizing applications with IBM and Red Hat® solutions found that modernization efforts help accelerate release frequency by up to 10 times, improving customer engagement, time to market and operations.<sup>1</sup>

## **Gain a superior developer experience**

Your organization's most valuable assets are its people. When it comes to uncovering hidden competitive advantages through IT, you want to ensure your application developers always have the right set of technologies—and the most up-to-date applications—at their fingertips to unleash their creativity and build truly amazing customer experiences.

## **Deploy enterprise applications across your hybrid multicloud**

As enterprises further embrace a hybrid cloud strategy, it's critically important that applications have the flexibility to be deployed anywhere across this landscape to reap the full benefits. This flexibility allows you to use the continuous innovation that's happening across public cloud providers along with the security, data privacy and reliability of your own data center. This level of choice and flexibility is paramount for successful competitive differentiation in today's market.



# Building a business case for modernization

One of the biggest challenges your enterprise will likely encounter before its modernization journey even begins is securing a budget. Build a business case by demonstrating how application modernization will not only pay for itself but will generate additional savings over time.

Consider these quantified benefits reported by IBM IT Economics in the September 2023 publication, *Cost savings from running Red Hat OpenShift on IBM Power servers*.<sup>1</sup>

## Infrastructure savings

↓ 69%

Reduction in TCO of transactions per second over 3 years

↓ 45%

Lower total solution cost

\$1.27M

Savings over 3 years, compared to x86

## Enhanced business outcomes

↑ 3.6×

More transactions per second per core, compared to x86

# Four actions to modernize your applications



## **Action 1. Assess current applications**

Identify traditional, composite and cloud-native applications.

## **Action 2. Modernize incrementally**

Innovate while minimizing complexity and implement common modernization steps.

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## **Action 3. Embrace a DevOps culture across the board**

Embrace microservices and containers and automate your build and deployment pipeline.

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## **Action 4. Enhance heritage applications and enable enterprise automation**

Realize faster time to market, scalability and flexibility while achieving time and cost savings, faster deployments and a more secure environment.

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When you modernize your existing enterprise applications, you can ease your transition to a hybrid cloud environment by gaining the flexibility to run your applications wherever you want, whenever you want. Embracing a cloud-native microservices approach will allow you to capitalize on the scalability and flexibility inherent to cloud.

Modernizing on [IBM Power](#) servers enables new cloud-native microservices to coexist and connect with your existing enterprise applications and investments while still using the inherent performance, reliability and security benefits of the IBM Power platform. You can thus remove barriers to productivity and integration to create new user experiences, develop new applications and ultimately unlock new business opportunities.

## [Action 1.](#) Assess current applications

Begin your application-modernization journey by assessing your current applications. Identify applications that can be readily deployed in a cloud and those that will require refactoring. It's an ongoing process. As you're progressing on your modernization journey, you should complete a series of application assessments. After each assessment, evaluate where things stand relative to your organizational goals and budget and repeat as needed.





### **Identify traditional applications**

Traditional applications, sometimes referred to as monolithic applications, have served enterprises well for over 15 years. Applications of this nature typically consist of multiple services packaged and deployed as a single unit, usually running inside a virtual machine, also known as a logical partition (LPAR). For example, consider a fictitious banking application running a 3-tier architecture whose application tier provides services for deposits, withdrawals and balance inquiries. The presentation and application tiers are typically deployed and updated as a single unit in a Java 2 Platform, Enterprise Edition (J2EE) runtime, for example, IBM WebSphere® Application Server on IBM Power. Often, applications of this kind grow over time and consist of several web application archive (WAR) files bundled up into one gigantic enterprise archive (EAR) file. The underlying data tier is served by a highly available relational database (for example, IBM Db2® or Oracle Database) running inside a virtual machine (for example, IBM AIX® or IBM i), using years of proven and trusted reliability and performance. This combination is a perfect example of a traditional application that's well-poised for modernization.

### **Identify composite applications**

Composite applications are ones represented by a combination of traditional and cloud-native applications that use both virtual machines and containers. Some form of this combination tends to be the “sweet spot” for many organizations, as it lets them take advantage of new, modern software development techniques where they provide value without forcing organizations to rewrite every application. Composite applications have previously gone through some form of modernization. Aim to continue iterating on this journey as time, budget and return on investment (ROI) allow.

For example, if an enterprise application provides 10 high-level capabilities, the first few rounds of modernization may have only converted three of them to a cloud-native model because they were the services that were of greatest importance to update and provided the greatest business value. During the next software cycle, the next two most valuable services were selected, and so forth. This cycle continues until either the entire application has been converted to a fully cloud-native model or until there's no longer sufficient ROI, or budget, to continue.

### **Identify cloud-native applications**

Cloud-native applications are applications that were “born in the cloud,” meaning they take full advantage of a microservice-based architecture and use containers and a corresponding container orchestration platform, likely Kubernetes or the Red Hat OpenShift® Container Platform, or both. These applications can, generally speaking, run anywhere—either on premises in your data center or off premises in one or more public clouds. Thus, you can run these applications where you want, when you want, based on the needs of your business. While cloud-native applications likely don't require any significant architectural updates, there are still opportunities to ensure you're fully using multicloud management capabilities and DevOps automation pipelines for application deployment, configuration and updates. These tools will ensure that everything on the application is done in a reliable, repeatable and secured manner.



## Action 2. Modernize incrementally

The next stop on your application-modernization journey is to create a roadmap. This way you're modernizing a piece at a time rather than attempting to tackle your entire enterprise infrastructure all at once.

### **Innovate while minimizing complexity**

Application modernization has many benefits, but also common pitfalls. In particular, projects can take too long, become too expensive or run on without clear definitions of when they're completed. They all revolve around a common thread—managing complexity relative to the innovation and business value being extracted. When it comes to mission-critical applications, there are important benefits to modernizing on a compute platform you trust with your enterprise applications—a platform that lets you develop, run and manage applications and workloads in a consistent way across a hybrid cloud environment.

One key benefit is the ability to minimize risk and expense while maximizing value. For example, on IBM Power you can continue running your existing applications—eliminating risk and drastically lowering expenses—while you start surrounding them with new cloud-native applications at your own rate and pace. Not only are you then able to leverage your existing investments, you also reap all the innovation, technology and economic benefits of the IBM Power platform as you modernize your technology stack.

### **Implement common modernization steps**

#### **Step 1: Embrace containers and surround existing enterprise applications.**

While the concept of containers has been around for several years in various forms, it's only within the past five years that containers have become widely popular. This explosive growth was fueled by the ecosystem—that is, the concept of popular container registries, such as Docker Hub and Quay.io, as places for developers to download and share reusable container assets. With containers, you can isolate individual components, refactor and test them, redeploy and scale as needed—all without disrupting or updating the application itself. These loosely coupled microservices carry common sets of standards and security as they travel across your hybrid cloud.





Containers offer many inherent benefits. They're lightweight, quick to start and have consistent and portable application runtimes. In addition, developers can now easily share these assets, greatly reducing the time to build applications as less time is spent on the underlying boilerplate work.

To that end, an easy place to start your modernization journey is to surround your traditional applications with new and innovative cloud-native services. For example, going back to our fictitious banking application, imagine that you want to create a new mobile front-end interface or use cloud-based location services to find the nearest ATM. This process provides an approachable low-risk path that won't disrupt your existing applications, yet also paves the way for innovation and skill development with new programming languages and development methodologies, including Node.js, Python, Golang and continuous integration and continuous delivery (CI/CD).

You can also use new deployment and operational practices of modernized applications with Red Hat OpenShift Container Platform and Red Hat Ansible® Automation Platform—all while leveraging your existing IBM Power hardware investments.

### **Step 2: Transition to containers.**

As your application-modernization journey advances and you grow comfortable with the technology, tools and practices involved, you can evaluate packing applications inside containers. This will pave a path to more portable applications across the cloud and more frequent software updates by using DevOps practices. Assuming your applications are based on portable technology, for example, Java, it's a fairly straightforward process. You usually don't need to make many changes to the application itself to reap the operational, management and monitoring benefits of containers paired with Red Hat OpenShift.

For applications running native IBM AIX or IBM i (for example, RPG or COBOL), consider leaving them as is and focusing on the "surround with containers" approach. This approach provides a path to maximize innovation with new technologies while eliminating the large risk and expense of replatforming.

An easy place to start your modernization journey is to surround your traditional applications with new and innovative cloud-native services.

### **Step 3: Redesign and build to cloud-native, microservices and an API-first architecture.**

As previously described, the second step to application modernization is to transition your applications into containers. It doesn't necessarily mean those applications are truly cloud native. Each cloud-native application has a set of microservices representing each logical capability. Each microservice also has a well-defined API that sits on top of it to expose its capability. Because this approach typically requires changes to the application, it can take longer to complete than just moving your applications into containers. With that consideration in mind, taking an iterative approach to the process will keep things manageable.

Using these approaches as part of your modernization journey will open doors to tremendous benefits. Benefits include a quicker time to market, increased developer efficiency, application-deployment flexibility, seamless integration with DevOps automation and access to the latest technology innovations.

### Action 3.

## Embrace a DevOps culture across the board

As you embark on your modernization journey, a culture of DevOps and automation is crucial for success. Recall that one of the primary benefits of application modernization is more frequent software deliveries with higher quality. This result can be achieved through an effective DevOps and automation strategy. For example, as your organization increasingly embraces microservices and containers, an industry best practice is to completely automate your build and deployment pipeline. No direct human involvement should be required when building or deploying applications to your application platform, for example, Red Hat OpenShift and Kubernetes.

Technologies such as Jenkins, Travis CI, Red Hat OpenShift Pipelines and Tekton can be used to create these types of DevOps-style build and deployment processes. A DevOps culture will not only save your team precious time by automating boilerplate tasks, it will also increase quality by doing everything in a repeatable, reliable fashion.

[Explore DevOps technologies](#) →

One of the primary benefits of application modernization is more frequent, higher-quality software deliveries.

### Action 4.

## Enhance heritage applications and enable enterprise automation

From a cloud management standpoint, effective mechanisms for both operating and observing your infrastructure are key tenets for success. In a modern, hybrid cloud infrastructure, applications consist of virtual machines, containers or some combination of them. Not only will this environment use IBM Power, but it should also be able to integrate with other platforms, for example, x86 and IBM Z®, for maximum flexibility. Further, these applications can be deployed on premises—that is, in a private cloud—in one or more public clouds, or both.

As such, the ability to manage environments across hybrid multicloud landscapes is a must. So is the need to modernize cloud-native applications and automate end-to-end IT operations.

Modernization helps organizations convert their heritage applications to cloud-based applications. This conversion allows organizations to reap the benefits of the cloud, such as faster time to market, scalability, flexibility and cost savings. Application modernization improves process efficiency and business productivity.

Automation reduces or eliminates the manual effort organizations invest in scaling, provisioning and configuring cloud resources. Automation enables consistent enterprise performance across applications and infrastructure in the hybrid environment, resulting in time and cost savings, faster deployments and a more secure environment.



# Get started

## Tips for planning, prioritizing and staying on track

As you prepare to begin a modernization project, make sure you keep your efforts aligned with business priorities. It will allow you to clearly articulate the business value of all your efforts. It will also help you prioritize and set the scope of your technical deliverables. Let's recap some tips for keeping the project on track.

### 1. Assess your applications

Follow the guidelines in the earlier section, "[Assess current applications](#)" on page 6, and categorize your applications as either traditional, composite or cloud native. Categorizing will give you a breakdown of your application landscape so you can start making some decisions about where to focus your efforts.

### 2. Be realistic with your scope

As you prepare to build your business case, keep your scope containable. For example, it's not advisable to create one massive business case to modernize hundreds of applications all at once and to create a project timeline that spans several years. Rather, contain your initial effort to a specific application, or even a specific component of a more complex application.

### 3. Build your business case

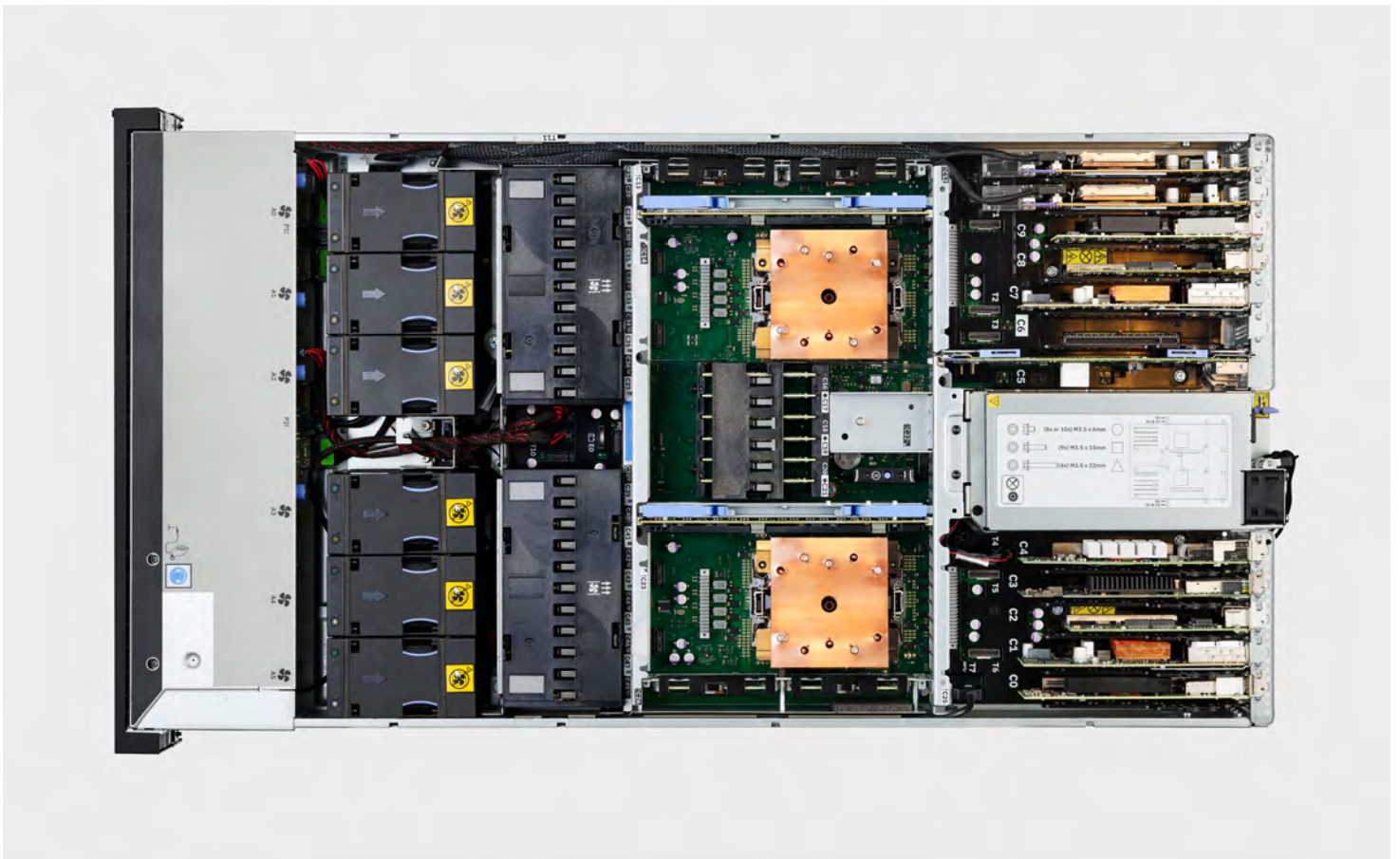
Similarly, by following the guidelines in the earlier section, "[Building a business case for modernization](#)" on page 5, create a business case. Not only will this step help keep you focused, it will, if needed, help you secure executive approval for the modernization project. Using your application assessment as a starting point, focus on the application that will provide the biggest ROI. It will vary from enterprise to enterprise, as every business has its own unique opportunities and challenges. For example, an online retailer may need to get a mobile user interface in the hands of customers as soon as possible, while a financial institution might need to release new versions of a web interface weekly instead of monthly, without sacrificing software quality.

### 4. Execute

Begin executing the project. If along the way you realize that your initial assumptions about either the business value or amount of work the project would require were incorrect, revisit the business case and adjust the scope accordingly so you don't find yourself in a never-ending project.

### 5. Evaluate and repeat

As you complete each project, you'll learn a lot about the technologies, what worked well and what didn't. You'll have more DevOps experience and can use that knowledge to inform your next modernization project.



**Ensure that your business case includes:**

- The desired outcomes and benefits from both a long-term financial perspective and a technical perspective
- Estimated project cost
- Timeline to completion

## Use the strengths and benefits of IBM Power

IBM Power is an industry leader in reliability, performance and security. Not only does the IT infrastructure provide superior compute performance for data-intensive and mission-critical applications, it also provides an excellent foundation for modern container-based applications of all flavors, for example: web and middleware, cloud and DevOps, modern programming languages and runtimes, databases, analytics and monitoring.

### **Flexible, efficient utilization**

Manage spikes and support more cloud workloads per server with the on-demand CPU capacity of the [IBM PowerVM](#)® hypervisor, and by sharing pools of CPU cores across Red Hat OpenShift CoreOS nodes. Differentiating hypervisor constructs, such as uncapped processors and shared processor pools, provide the ability to guarantee performance service-level agreements (SLAs) while donating unused processor cycles to worker nodes in need of additional capacity. These advanced capabilities contribute to the foundation of IBM's 80% utilization guarantee on an IBM Power E1080 server.<sup>2</sup>



### More performance from software with fewer servers

Enable 34.3 times more throughput per core and 48% lower 3-year total cost of ownership (TCO) by running containerized applications and databases on an IBM Power E1080 server, compared to running the same containerized applications on an x86 server.<sup>3</sup> Colocate cloud-native applications with AIX, IBM i and Linux® virtual machine-based applications and enterprise data to exploit low-latency API connections to business-critical data. Use subcapacity licensing to greatly reduce containerized software license costs—for example, IBM Cloud® Paks, using PowerVM shared processor pools, allowing CPU cores to be autonomously shared across Red Hat OpenShift worker nodes without sacrificing application performance. This method means needing to buy fewer IBM Power servers to run an equivalent set of applications at comparable throughput levels than on competing platforms.

### Bring gravity to your enterprise data

IBM Power houses your enterprise's mission-critical data. Running Red Hat OpenShift in a virtual machine adjacent to your AIX, IBM i or Linux virtual machines provides low-latency secured communication to your enterprise data by way of the PowerVM virtual I/O server. This method provides superior performance due to fewer network hops. It also allows for highly secured communication between your new cloud-native applications and your enterprise data stores, as network traffic never has to leave the physical server.

### Trusted security and resiliency

Use the server platform that's built to drive reliability and zero security vulnerabilities.

[Explore IBM Power for your modernization strategy →](#)

## Build on a trusted foundation

Kubernetes provides the core foundation for modernizing your enterprise applications. As the premier open-source container orchestration platform, it benefits both developers and IT administrators. Your developers have access to the latest software innovations to build software faster while your IT administrators can easily observe, operate and manage the platform and infrastructure. These benefits help you deliver high-value, high-quality software faster to your users. It's all enabled through the Red Hat OpenShift Container Platform.

### Red Hat OpenShift Container Platform on IBM Power

Red Hat OpenShift is an enterprise-ready Kubernetes container platform with full-stack automated operations to manage hybrid cloud deployments. Red Hat OpenShift is optimized to improve developer productivity and promote innovation. It's fully supported on all IBM Power servers—IBM Power8® processors or later—IBM Power is poised well for your core enterprise applications and also the next wave of digital transformation fueled by application modernization.

As previously described, IBM Power provides superior performance and economics for containerized workloads. By colocating new cloud-native applications alongside existing systems-of-record applications, you can enjoy the benefits of bringing gravity to existing data—such as lower communication latency, better throughput and superior security.

Deliver high-value, high-quality software faster to users.

### IBM Cloud Paks on IBM Power

IBM Cloud Paks provide enterprise-ready containerized software solutions for modernizing existing applications and developing new cloud-native applications that run on Red Hat OpenShift. IBM Cloud Paks have three key tenets: they're comprehensive and easy to use, they're supported by Red Hat and IBM, and they run anywhere Red Hat OpenShift runs. IBM Cloud Paks provide a bundled approach that allows you to accelerate your modernization journey by packaging everything you need to get started—including Red Hat OpenShift and the applications that run on top of it. The following IBM Cloud Paks are currently available on IBM Power.



#### IBM Cloud Pak® for Integration

Automate application and data flows to improve client experiences with an automated, closed-loop approach that supports multiple styles of integration within a single, unified experience.



#### IBM Cloud Pak for Data

Simplify the collection, organization and analysis of data. Turn data into insights through an integrated catalog of IBM, open-source, and third-party microservices and add-ons.



#### IBM Cloud Pak for Watson AIOps

Automate IT operations to deliver actionable insights. Improve your infrastructure monitoring to enhance application performance and workloads and reduce downtime on your AIOps platform.

[Explore IBM Cloud Paks →](#)



# Innovate with an extensive container software ecosystem

At the heart of any application-modernization effort is a strong software ecosystem that allows teams to innovate using the latest technologies. Now more than ever, open-source communities are playing a significant role in the modernization journeys of organizations. IBM Power can not only run your core business applications, but can run a wide range of popular open-source and commercial container software, as shown in Figure 1.

# IBM Cloud Transformation Advisor

IBM Cloud Transformation Advisor helps you analyze your on-premises workloads for modernization. It determines the complexity of your applications and provides recommendations to help you along the way. More specifically, it can analyze WebSphere, Red Hat JBoss®, Oracle WebLogic, Apache Tomcat, IBM MQ, IBM WebSphere Message Broker and IBM Integration Bus.

IBM Cloud Transformation Advisor is licensed along with the IBM Cloud Pak for Integration. Additionally, you can evaluate its capabilities with a fully functional 90-day trial license at no cost.

[Take a guided tour of IBM Cloud Transformation Advisor →](#)



Figure 1. Extensive container software ecosystem on IBM Power (not intended to be exhaustive)

### References

- [Red Hat OpenShift Catalog](#)
- Docker Hub ([ppc64le](#) and [ibm.com](#))
- [IBM Power ecosystem](#)
- Entitled registries as appropriate for licensed software (for example IBM, Red Hat, others)

Note: Links reside outside of ibm.com



# Next steps to application modernization

Application modernization comes in many shapes and sizes, and it's not always easy to know where to start. Your goal is to accelerate value, deliver frequently and reduce risk. IBM's IT infrastructure experts can help.

## **IBM Technology Expert Labs**

The IBM Technology Expert Labs infrastructure services team can expedite your modernization plans. They can help you install Red Hat OpenShift on IBM Power fast and train your team. Plus, their expertise across the entire IBM Power cloud portfolio can help accelerate the implementation of essentially any cloud project.

[Explore Technology Expert Labs →](#)

## **IBM Garage™**

The IBM Garage, a central component of IBM Consulting®, is a collaborative, hands-on approach to developing innovative solutions to business challenges that can help you identify business-modernization opportunities. You can then define and build the architecture and minimum viable product (MVP) with your team, iterate on feedback and co-create a solution.

Living at the intersection of business strategy, design, technology, culture and innovation, the IBM Garage methodology is at the core of our mission to be the catalyst to make the world work better. It exists to help businesses meet the challenges of today and prepare for those of tomorrow by offering the practices, tools, technologies and expertise needed to chart their business-modernization journey.

[Visit the IBM Garage →](#)

Application modernization is a vital investment you need to make to meet the needs of your customers. IBM Power makes it easy to accomplish this modernization process, so all aspects of your business stay up to date and ready to tackle the challenges of a rapidly transforming world.

Modernize with IBM Power on hybrid cloud →

1. [Cost savings from running Red Hat OpenShift on IBM Power servers](#), IBM IT Economics, September 2023. (Registration required)
2. 80% utilization guaranteed on IBM Power E1080 Systems: 5-times throughput based on VM-to-VM transfer rate for Linux of 50 Gbit/sec versus local area network (LAN) attached server transfer to VM on same LAN of 5 Gbit/sec. When a client acquires a Power E1080 Enterprise Server and the client runs eligible workloads, IBM guarantees that the system will perform as warranted with a system utilization rate of up to 80%. Should the client not be able to achieve 80% system utilization rate, assuming there is sufficient work to drive the machine to 80% utilization, IBM will assist with the attainment of 80% system utilization rate at no additional cost.
3. Based on IBM internal testing of Red Hat OpenShift Container Platform 4.8. Two worker nodes running 80 pods each with 10 users using the Daytrader7 workload ([github.com/WASdev/sample.daytrader7/releases/tag/v1.4](https://github.com/WASdev/sample.daytrader7/releases/tag/v1.4)) (link resides outside of ibm.com) accessing AIX Db2 databases. Average CPU utilization for the OCP worker nodes is >95%. Comparison: IBM Power E1080 with colocated OCP and AIX Db2 nodes versus OCP node on Cascade Lake accessing AIX Db2 node on Power E1080. Valid as of 25 August 2021 and conducted under laboratory conditions. Individual results can vary based on workload size, use of storage subsystems and other conditions. TCO is defined as hardware, software and maintenance costs over a period of three years. Power E1080 (40 cores/3.8 GHz/2 TB memory) in maximum performance mode, 25 Gb Ethernet adapter(SRIOV), 1x 16Gbps FC adapter with PowerVM. Competitive system: Intel Xeon Gold 6248 CPU (Cascade Lake) in performance mode, 40 cores/3.9GHz/512GB memory), 25Gb Ethernet adapter(SRIOV), 1 x 16 Gbps FCA with KVM. Pricing is based on Power E1080 ([ibm.com/systems/power/hardware/linux-lc.html](https://ibm.com/systems/power/hardware/linux-lc.html)); typical industry standard x86 pricing ([synnecorp.com/us/govsolv/pricing/](https://synnecorp.com/us/govsolv/pricing/)); and IBM software pricing for Red Hat OpenShift and IBM WebSphere Hybrid Edition Monthly Subscription.

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