Field guide to application modernization

on IBM Z® and IBM LinuxONE

IBM Z

IBM

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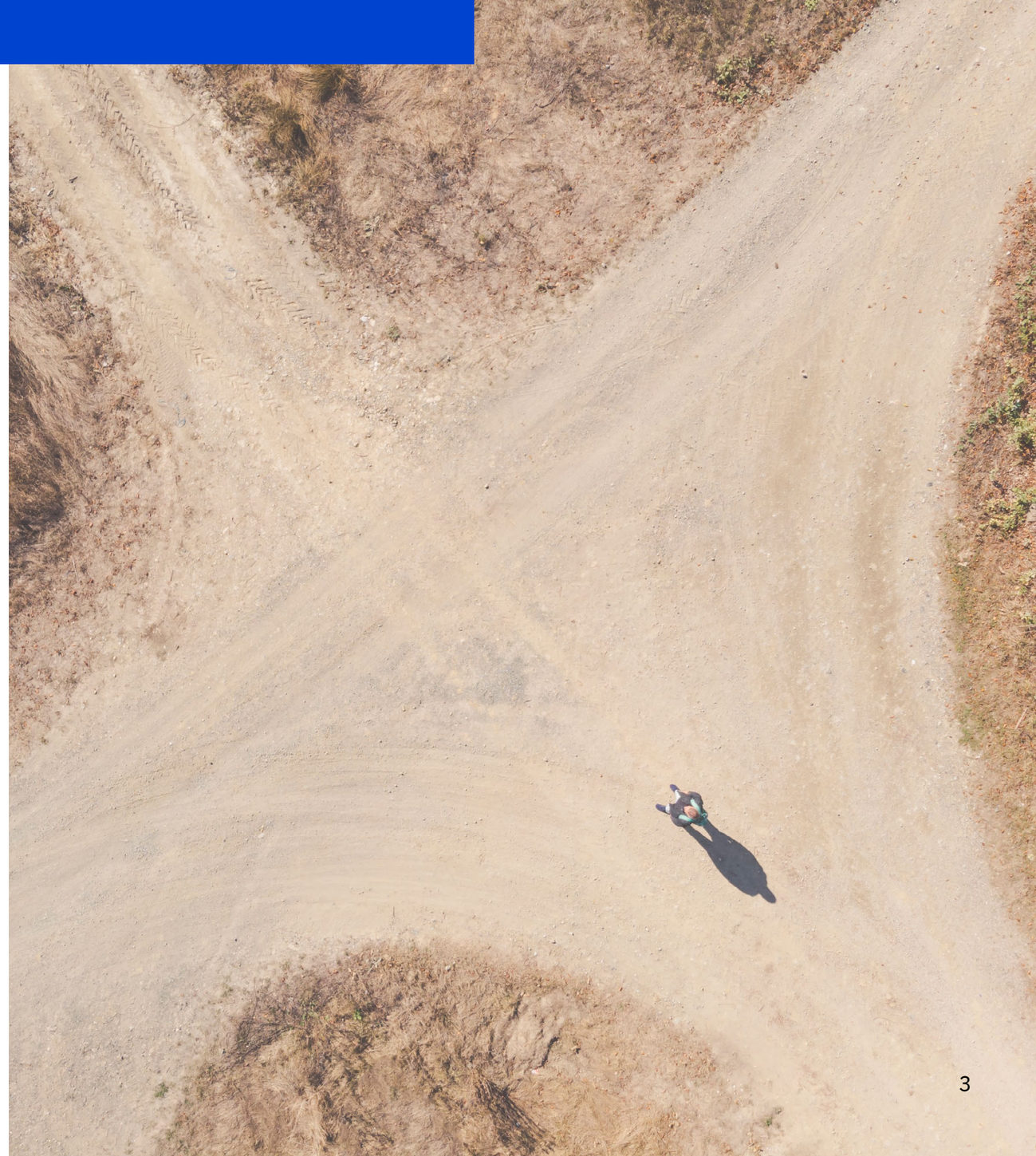
It’s time to modernize your enterprise application portfolio

Rapid changes in the world over the last two years (including COVID-19) are impacting IT in a very profound way. IT strategies are shifting to serve an increasingly always-on world, and for many organizations this 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 will describe the best practices for building modern applications in an incremental, safe and economically sound manner. We will also describe how to avoid some of the common pitfalls that enterprises fall victim to (examples include no clear business value, projects taking too long, vendor lock-in) so that you know what to keep an eye out for as you embark on this journey.



Drivers and immediate benefits

What exactly is “app modernization”? In its simplest form, it’s the process of updating an app so that it can be maintained, extended, deployed and managed in a way that allows the app 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.

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 give them 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 can help accelerate release frequency by up to 10x, improving customer engagement, time to market and operations.[1]

Gain a superior developer experience

Your organization’s most valuable assets are its people. When it comes to gaining a competitive advantage through IT, you want to make sure your app 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 anywhere in the hybrid cloud

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 will allow you to leverage the continuous innovation across your hybrid cloud with the security, data privacy and reliability of your own data center. Secure access to your core mission-critical apps and data, with a common set of tools, brings greater value to clients. This choice, flexibility and accessibility 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. Consider these quantified benefits Forrester has illustrated in their Total Economic Impact™ study of both IBM and Red Hat solutions together.[1]

Infrastructure savings

4%

Reduced top-line TCO by up to 4%.

44%

Decreased hardware costs by up to 44%.

30%

Optimized resource utilization by up to 30%.

50%

Reduced licensing costs by up to 50%.

Workforce productivity and acceleration

33-90%

Reallocated infrastructure administration labor.

66%

Accelerated development cycles by up to 66%.

Enhanced business outcomes

10x

Increased release frequency by up to 10x (signifying more features and patches reaching customers more quickly).

2x-10x

Accelerated workload processing speed by between 2x and 10x.

Virtually eliminated
user-impacting downtime.

Four actions to modernize your applications

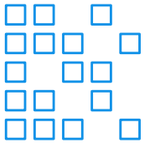
When you modernize your existing enterprise applications, you can ease your transition to a hybrid cloud environment by gaining the flexibility to run your apps wherever you want, whenever you want. Embracing a cloud-native microservices approach will allow you to capitalize on the scalability and flexibility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

Modernizing on IBMZ® and IBM LinuxONE enables new cloud-native applications to coexist and connect with your existing enterprise applications and investments, while still leveraging the inherent performance, reliability and security of the Z and LinuxONE platforms. You can thus remove barriers to productivity and integration in order to create new user experiences, develop new applications and ultimately unlock new business opportunities.

Embrace a DevOps culture acrosss the board

Discover and analyze

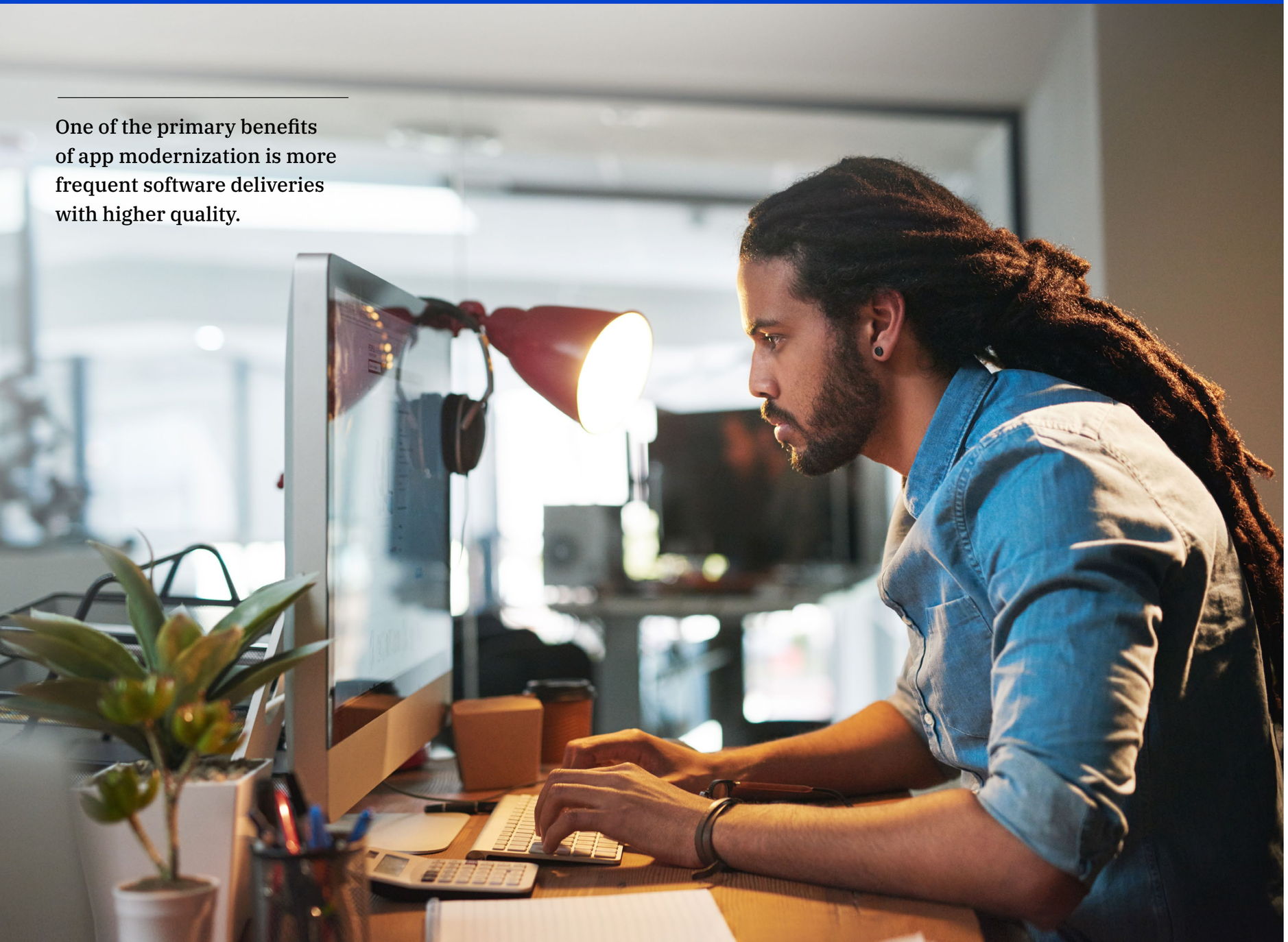
Assess traditional applications and understand impact of changes.



Modernize incrementally

Innovate while minimizing complexity and step through a common modernization approach.

Deploy and operate traditional apps and cloud-native apps seamlessly



One of the primary benefits of app modernization is more frequent software deliveries with higher quality.

[1] 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 app modernization is more-frequent software deliveries with higher quality. This can be achieved through an effective DevOps and automation strategy. For example, as organizations increasingly embrace 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 app platform (for example, Red Hat OpenShift®, Kubernetes).

Technologies such as Jenkins, 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 can also increase quality by doing everything in a repeatable, reliable fashion.

Explore DevOps technologies →

[2] Discover and Analyze

Begin your application modernization journey by assessing what you have. You can't change or reuse what you don't understand. It is common for an enterprise's business critical applications to have been written and modified over time with only manual documentation or no documentation at all. IBM's Application Discovery and Delivery Intelligence is an analytical platform for application modernization. It uses cognitive technologies to analyze mainframe applications and quickly discover and understand interdependencies of changes.

You can use this intelligence to:

- Transform and renew applications more efficiently and productively
- Capitalize on time-tested mainframe code to engage the API economy
- Accelerate application transformation of your hybrid cloud environment

Transform and renew applications more efficiently and productively

You can reduce development time and cost by using accurate code analysis to see relationships between applications and correlate run-time metrics with static code to determine the impact of changes. With graphical flow diagrams a user can understand application complexity and quality across platforms, environments and languages to anticipate issues and cut application and development costs.

Capitalize on time-tested mainframe code to engage the API economy

Your core foundational applications are often your competitive advantage. By rapidly identifying API candidates and exposing them as RESTful APIs you can unlock the power of your business data and assets without doing major rewrites that may take time and create potential security risks.

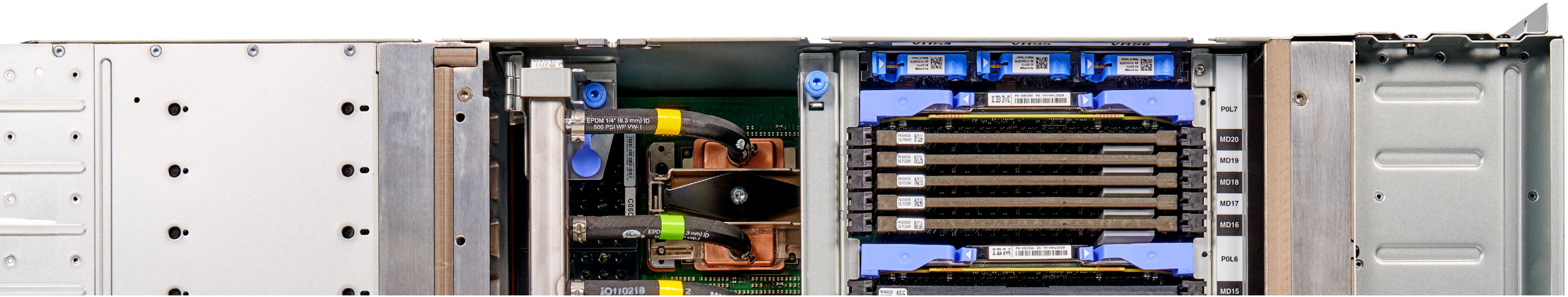
Accelerate application transformation of your hybrid cloud environment

How do you accelerate the digital transformation required to meet the opportunities and disruptions facing your market? Organizations that have modernized their traditional applications deliver these benefits and are driving tangible business results.

A key component of a successful modernization project is accurate planning and impact estimates. Armed with application and data insights, developers are able to accelerate digital transformation using productive cloud native approaches with reduced risk.

With a cloud native approach, they are able to take full advantage of a microservice-based architecture and leverage containers and a corresponding container orchestration platform (likely Kubernetes or Red Hat OpenShift, 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 apps 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 know that you are fully leveraging hybrid cloud management capabilities and DevOps automation pipelines for app deployment, configuration and updates. This will help ensure that everything on the app is done in a reliable, repeatable and secure manner.

Explore cloud-native development on IBM Z and LinuxONE →



[3] Modernize incrementally

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

Innovate while minimizing complexity

App 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 are "done." They all revolve around one common thread — managing complexity relative to the innovation and business value being extracted.

That's what makes IBM Z and IBM LinuxONE the best platforms for modernizing your enterprise applications. You can minimize risk and expense while maximizing value on a platform that lets you develop, run and manage apps and workloads in a consistent way across a hybrid cloud environment. You can continue running your existing apps on IBM Z and IBM LinuxONE — eliminating risk and drastically lowering expenses — while you start surrounding them with new cloud-native apps at your own rate and pace. Not only are you then able to leverage your existing investments, but you also reap all the innovation, technology and economic benefits of the IBM Z platform as you modernize your technology stack.

A common modernization approach

Step 1: Empower developers with BYO IDE and shift left testing

By **providing a developer experience for IBM z/OS that is consistent and familiar**, developers can build or modernize applications using the integrated development environment of their choice (BYO IDE). With IBM Wazi Developer for Red Hat CodeReady Workspaces developers can edit, build, and debug using their preferred modern IDE — VS Code™, Eclipse®, or Red Hat CodeReady Workspaces. IBM Wazi Developer is portable across any cloud or hybrid platform and is optimized to run on OpenShift.

IBM Wazi Developer supports development and testing z/OS applications using an insulated, containerized z/OS sandbox. Unit testing and application integration testing integrate seamlessly into a standard, Git-based open tool chain to deliver CI/CD.

Giving developers choices for hybrid development increases their productivity and reduces the need for specialized skills, addressing the IT staffing needs of the modern enterprise.

This provides an approachable low-risk path that paves the way for innovation and skill development with new programming languages and development methodologies including Node.js, Python, Golang and CI/CD.

You can also leverage 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 Z and IBM LinuxONE hardware investments.

Protect and leverage your IBM Z® investments with robust and standard development capabilities that encompass IBM Z and multi cloud platforms.

Step 2: Transition to containers

As your app modernization journey advances further and you grow comfortable with the technology, tools and practices involved, you can evaluate packaging apps inside containers, paving a path to more portable applications across the cloud and more frequent software updates by leveraging DevOps practices. If your apps are based on portable technology (Java, for example), this is a fairly straightforward process. You usually do not have to make many changes to the application itself yet can reap the operational, management and monitoring benefits of containers paired with Red Hat OpenShift.

> Cloud native technologies are the new normal for application development and with IBM Wazi for Red Hat CodeReady Workspaces that now includes z/OS development.
>
> Danny Mace
> Vice President
> IBM App Platform IBM Cloud and Cognitive Software

For applications running on native IBM z/OS, containerization is a space of continuous evolution. From z/OS Container Extensions to z/OS Cloud Broker work is ongoing to maximize innovation with new technologies to enable the right-fit environment for the workload and integrate z/OS resources with the Red Hat OpenShift platform.

Step 3: Rearchitect to cloud-native, microservices and API-first architecture

As described previously, the second step to application modernization is to transition your apps into containers. That does not necessarily mean those apps 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 app into containers. With that in mind, taking an iterative approach to this process will keep things manageable.

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

[4] Deploy and operate traditional apps and cloud-native apps seamlessly

From a cloud management standpoint, effective mechanisms for both operating and observing your infrastructure are key tenets for success. In modern hybrid cloud infrastructure, applications consist of virtual machines, containers or some combination of the two. These apps can be deployed on premises (that is, in private cloud), in one or more public clouds, or both. Not only will this environment leverage IBM Z and IBM LinuxONE, but it should also have the ability to integrate with other platforms (for example, x86 and IBM Power Systems™) for maximum flexibility. Further, the ability to quickly understand resource consumption and app health, and to troubleshoot problems, is a must. As such, it is important that you establish a hybrid cloud management framework that can accommodate these new realities, such as the IBM Cloud® Pak for Multicloud Management.

Get started

Plan, prioritize and stay on track

As you begin a modernization project, make sure that you keep your efforts aligned with business priorities. This 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. **Discover and Analyze.** By leveraging cognitive tools for application and data discovery and prioritizing those applications that have the highest value with the lowest change impact, you can achieve some quick modernization successes and planning will be data driven with less complexity.

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 apps in one fell swoop 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, which you prioritize for immediate impact as you continue to iterate.

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3. **Build your business case.** Similarly, by following the guidelines in the earlier section Building a business case for modernization, create a business case. Not only will this 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 app that will provide the biggest ROI. This 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 users 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. Make sure that your own business case includes the desired outcomes and benefits from both a business perspective (that is, long-term financial savings) and a technical perspective, the estimated cost to perform the project, and the timeframe in which the project should be completed.

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

5. **Evaluate and repeat.** As you complete each project, you will 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.

Leverage the strengths and benefits of IBM Z and IBM LinuxONE

IBM Z and IBM LinuxONE provide industry-leading solutions for scalability, reliability, performance and security. Not only does the IT infrastructure provide superior compute performance for data-intense and mission-critical applications, it also provides an excellent foundation for modern container-based apps of all flavors (for example: web and middleware, cloud and DevOps, modern programming languages and runtimes, databases, analytics and monitoring). Consider the following benefits.

Flexible, efficient utilization. Manage spikes and support more cloud workloads per server with three approaches to virtualization: IBM Logical Partitions, IBM z/VM®, and KVM. The advanced capabilities of these hypervisors contribute to the foundation of the typically high utilization achieved by IBM Z and IBM LinuxONE.

More performance from software with fewer servers. Enable 2.3x more containers per core on an IBM z15 LPAR versus a compared bare metal[2] x86 platform running an identical web server load, and co-locate cloud-native apps with z/OS and Linux virtual-machine-based apps and enterprise data to exploit low-latency API connections to business-critical data. This translates into having to use fewer IBM Z and IBM LinuxONE cores to run an equivalent set of applications at comparable throughput levels than on competing platforms.

Co-locate cloud-native and mission-critical data. IBM Z and IBM LinuxONE house your enterprise's mission-critical data. Running Red Hat OpenShift in logical partition adjacent to your z/OS partitions provides low-latency secure communication to your enterprise data via IBM z/OS Cloud Broker. This provides superior performance due to fewer network hops. It also allows for highly secure communication between your new cloud-native apps and your enterprise data stores since network traffic never has to leave the physical server.

Proven security and resiliency. Utilize the most reliable mainstream server platform — with the only hypervisor among its major competitors — that is certified at the highest level of EAL5+.

Explore IBM Z and IBM LinuxONE for your hybrid multicloud strategy →

Build on a trusted and proven foundation

Kubernetes provides a core foundation for modernizing your enterprise applications. As the premier open-source container orchestration platform, it benefits both developers and IT admins. Your developers have access to the latest software languages and open tools to build software faster while your IT administrators can easily observe, operate and manage the platform and infrastructure. This helps you deliver high-value, high-quality software faster to end users. All of this is enabled through Red Hat OpenShift Container Platform. Providing developers with persistent self-service storage capabilities to deliver faster, more flexible application delivery continues to be a challenge for enterprises. IBM Storage provides the infrastructure foundation and storage orchestration for a full-platform approach in your hybrid cloud environment.

IBM Storage for Z and LinuxONE

Designed to match the mission-critical capabilities of IBM Z and IBM LinuxONE, IBM DS8900F combines enterprise capabilities that provide a fast, reliable and secure storage solution for clients. It consolidates traditional and new workloads maximizing the benefits of Z and LinuxONE. In addition, IBM DS8900F supports IBM Cloud Pak solutions to enhance and extend the functionality and capabilities of Red Hat OpenShift to give organizations a fast and secured way to deploy and maintain cloud-native applications. IBM DS8900F enables a highly secure environment for the hybrid cloud by encrypting 100% of the data regardless of where it resides while protecting it to be modified or deleted due to adverse cyber events, reducing the risks of financial losses and disruption in business operations.

Explore IBM Storage for Z and LinuxONE →

Red Hat OpenShift Container Platform on IBM Z and IBM LinuxONE

Red Hat OpenShift is an enterprise-ready Kubernetes container platform and Platform-as-a-Service with full-stack automated operations to manage hybrid cloud deployments. Red Hat OpenShift is optimized to improve developer productivity and promote innovation; it is fully supported on IBM Z and IBM LinuxONE servers (IBM z13® or later). IBM Z and IBM LinuxONE are poised well for your core enterprise applications and also for the next wave of digital transformation fueled by application modernization. By co-locating new cloud-native applications right alongside existing system of record applications, you can access data with low communications latency, high throughput and make use of the IBM Z and LinuxONE security capabilities.

IBM Cloud Pak Solutions on IBM Z and IBM LinuxONE

IBM Cloud Pak Solutions provide enterprise-ready containerized software solutions for modernizing existing applications and developing new cloud-native apps that run on Red Hat OpenShift. IBM Cloud Pak Solutions have three key tenets: they are comprehensive and easy to use, they are supported by Red Hat and IBM, and they run anywhere OpenShift runs. IBM Cloud Pak Solutions 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 apps that run on top of it. The following IBM Cloud Pak Solutions are currently available on IBM Z and IBM LinuxONE.

- **IBM Cloud Pak for Applications**. Quickly build cloud-native apps by leveraging built-in developer tools and processes, including support for microservices functions and serverless computing. This is especially important for IBM Z and IBM LinuxONE customers looking to modernize existing web app footprints, including WebSphere Application Server and JBoss®.
- **IBM Cloud Pak for Integration**. A complete set of integration capabilities to efficiently connect your applications and data across multiple clouds. Set up the appropriate organizational models and governance practices designed to support agile integration, simplify the management of your integration architecture, and reduce cost.
- **IBM Cloud Pak for Multicloud Management**. Gain consistent visibility, automation and governance across a wide range of hybrid cloud infrastructure, inclusive of several compute platforms such as IBM Z and IBM LinuxONE, IBM Power Systems™ and x86. Streamline the management of these complexities from one place.

Explore IBM Cloud Pak solutions →

IBM Application Discovery and Delivery Intelligence

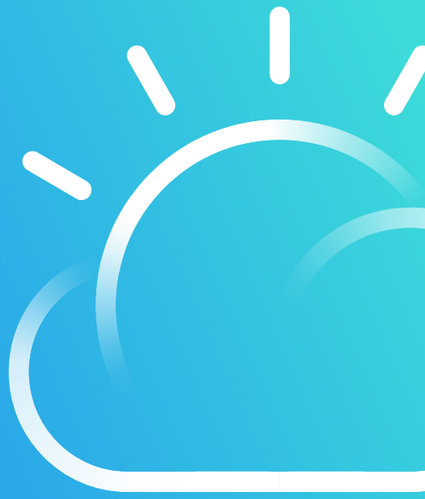
An analytical platform for application modernization, ADDI uses cognitive technologies to analyze mainframe applications and quickly discover and understand interdependencies of changes to program artifacts by providing deep visual analysis of application logic and change impact.

Learn more about ADDI →

IBM Transformation Advisor

IBM Cloud® Transformation Advisor helps you analyze your on-premises Java workloads for modernization. It determines the complexity of your applications and provides free recommendations to help you along the way. Check out the IBM Knowledge Center for further details.

Take a guided tour of IBM Transformation Advisor →



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 organizations' modernization journeys. IBM Z and IBM LinuxONE can not only run your core business applications, but also run a wide range of popular open source and commercial container software.

Resources and expertise

App 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 IT Infrastructure experts can help.

IBM Garage
The IBM Garage can help you identify business modernization opportunities. You can then define and build the architecture and minimal viable product with your team, iterate on feedback, and co-create a solution.

Visit the IBM Garage →

IBM Lab Services
The IBM Lab Services team can expedite your modernization plans. They can help you install Red Hat OpenShift on IBM Z or IBM LinuxONE fast and train your team. Plus, their expertise across the entire Power Systems cloud portfolio can help accelerate the implementation of any cloud project.

Explore Lab Services →

IBM Value Stream Assessment
IBM Value Stream Assessment is a facilitated collaborative session to help maximize the value of transformation efforts and improve your enterprise software delivery practice. Complimentary session with a recommended roadmap deliverable.

Start your DevOps transformation journey →

Conclusion

Application modernization is a vital investment that you need to make in order to meet the needs of your customers and clients. IBM Z and IBM LinuxONE with IBM Storage make it easy to accomplish this modernization process so that all aspects of your business stay up-to-date and ready to tackle the challenges of a rapidly transforming world.

For more information, contact your IBM Business Partner:

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1 A commissioned study conducted by Forrester Consulting, “Emerging Technology Assessment: The Total Economic Impact™ Of Using Both IBM And Red Hat Solutions Together.” June 2019.

2 Performance results based on IBM internal tests running dockerized NGINX web server in a z15 native LPAR compared to running them bare-metal on a compared x86 platform. Results may vary. z15 configuration: LPAR with 2 dedicated IFLs, 32 GB memory, 40 GB DASD storage, SLES 12 SP4 (SMT mode) running Docker 18.09.6 and NGINX 1.15.9. x86 configuration: 2 Intel® Xeon® Gold 6140 CPU @ 2.30 GHz with Hyperthreading turned on, 32 GB memory, 40 GB RAID5 local SSD storage, SLES12 SP4 running Docker 18.09.6 and NGINX 1.15.9.