Mainframe Application Modernization

Field Guide

Start →

IBM **Consulting**

Contents

Introduction
Mainframe in the era of cloud computing

For businesses today, disruptive change is happening faster than ever. Accelerated by the pandemic, we're seeing customer demands continue to rise, security threats expanding into new areas like national infrastructure, and an ever-changing web of different compliance regulations around the globe. For organizations trying to navigate this shift, the need for business agility achieved with hybrid cloud has never been more important.

Why hybrid cloud?

At a basic level, a hybrid cloud combines a mix of public and private clouds and on-premises infrastructure. At IBM, we take the hybrid cloud approach one step further, allowing our customers to build once, run anywhere – underpinned by Red Hat® OpenShift®. This open container platform helps create a unifying experience to manage the complete IT estate seamlessly and in a more horizontal way. Developers can move faster with the speed and agility of cloud while maintaining the security and scalability of on-premises infrastructure - and in turn, unlock more value than a public cloud-only approach.

Take advantage of the mainframe

Power your core business.
As you begin to embrace new hybrid multicloud computing models, IBM zSystems continues to be the engine powering your core business.

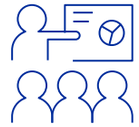
Build a hybrid cloud strategy.
Provide a comprehensive strategy including capabilities that define the role of the mainframe in the enterprise today and how it integrates into the greater hybrid cloud technology ecosystem.

Use a secure and resilient platform.
Secure and protect data with encryption everywhere and provide resilience with zero downtime.

Leverage existing skills and resources.
Adopt modern and agile DevOps practices while leveraging existing talent and resources.

What's inside?

This field guide provides a high-level overview of IBM's strategy to help you modernize applications on the mainframe.



Learn it
A summary of the concepts.

Get started
Tips to start the journey to modernize your enterprise.

Learn it
IBM can help get you there

Overcome the challenges and status quo of doing things the way you have always done them by adopting the new transformative main- frame to achieve business results, mitigate risk, and optimize work- load and cost.

Remove obstacles along the way

Lower TCO and improve maintainability. Invest in modern mainframe tools and technology, which bring new function and capabilities. Optimize how you prioritize and distribute workloads to pinpoint inefficiencies that lead to overruns of service level agreements. Reduce the overall TCO and improve overall maintainability of the application systems.

A recent study commissioned by IBM examining how different degrees of hybrid cloud adoption correlated to the overall ROI of the transformation illustrates this dynamic at work: the greater the share of workloads that are consistently deployed on a hybrid cloud platform, rather than siloed in a public cloud, the more value that is realized. Enterprises that transform both their technology and operating models stand to unlock up to 2.5 times the total business value of a public-only cloud strategy.

Drive business agility and speed to market. Mainframe applications and data are complex and tightly coupled, which make it difficult to continuously improve development quality, velocity, and efficiency. Your clients require frequent releases and updates to applications. Releasing new function frequently in a robust and timely manner requires agility, openness, and flexibility.

Unlock value to drive business transformation. Leverage data to drive business insights, react quickly to market driven changes, and improve performance to handle more transactions using the transformative mainframe.

Learn it
IBM can help get you there

Minimize business risk and disruptions.
There is complexity and risk associated with modernization because mainframe applications are often mission critical and integrated with distributed workloads. Reduce operational risk related to outages and identify potential security breaches in real time to minimize business and reputational risk.

Build new capabilities by adopting modern development practices.
Adopt new capabilities like APIs, microservices, containers, analytics, hybrid cloud, DevOps and agile methods to deliver to the market faster and optimize cost and interoperability between the mainframe and cloud technology.

Reduce technical debt and empower developers.
Attract new talent with open and modern practices and development environment and leverage new cloud-like pricing models.

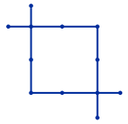
Learn about the IBM Mainframe application modernization architecture.

Learn more →

Learn it
IBM’s unique approach

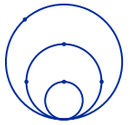
Application modernization comes in many flavors. Gain skills and experience using IBM Garage Methodology, which provides unique insights and approaches to modernize your existing application estate with speed, confidence, and reduced risk. View your development investments as an asset, not a liability.

Refactor what’s necessary, don’t necessarily refactor



Co-create.
Define business opportunities and drive new insight into existing ideas. Define the opportunity, prototype with your squad, and co-create a solution.

Co-execute.
Expand and create additional squads to build out your DevOps team. Then continue to develop your MVP prototype into a production ready release and launch your application into production. Define the next MVP so you can continuously improve your solution based on what you learn from your users.



Co-operate.
Scale, deliver, and operate your MVP to increase market growth. Harden your toolchains, architecture, reliability, monitoring and testing, which all leads to continuous delivery so you can continue to transform your culture.

Solve application modernization challenges with the mainframe.

Learn more →

Learn it
Drive value with continuous modernization

IBM’s approach focuses on continuous modernization of the mainframe application landscape. Achieve your end-state by developing a strategy that delivers incremental value through a hybrid cloud architecture aligned to business imperatives, agility, cost, and security. Place applications and data on the platform that best fits their requirements – without the constraint of a single cloud only architecture.

Unleash the power of IBM z Systems and cloud together

Expose core mainframe data.
Enable easy access to existing mainframe applications and data by using APIs and Data virtualization.

Modernize through Agile DevOps.
Provide a common developer experience by integrating open source tools and a streamlined process for agility.

Develop and deploy a new cloud-native applications.
Develop and deploy new cloud native applications on the mainframe. Containerize and co-locate cloud applications.

Transform core application and data.
Continuously transform mainframe applications by refactoring and enhancing them using modern development approaches.

Learn it
Adopt an iterative approach

Use an iterative approach to integrate new and existing environments. IBM factors in your industry and workload attributes to co-create a business case and roadmap that meets your strategic goals.

There is no one-size-fits all application strategy

Map the values.
Define an outcome using a Garage-based approach using design thinking, agile, DevOps practices. The practices prescribe a new way of working using an iterative and incremental fail-fast approach to achieve early business value.

Accelerate value and reduce risk.
IBM's interoperability approach accelerates transformation using patterns to modernize legacy components while using APIs and improved data access to deliver business value faster.

Innovate to operate a future-ready business
Align IT and the business on optimization and innovation strategies. IBM's Garage Methodology fosters a new IT culture through proven operating models, processes, and best-of-breed DevOps tools that increase developer productivity and optimize operational costs.

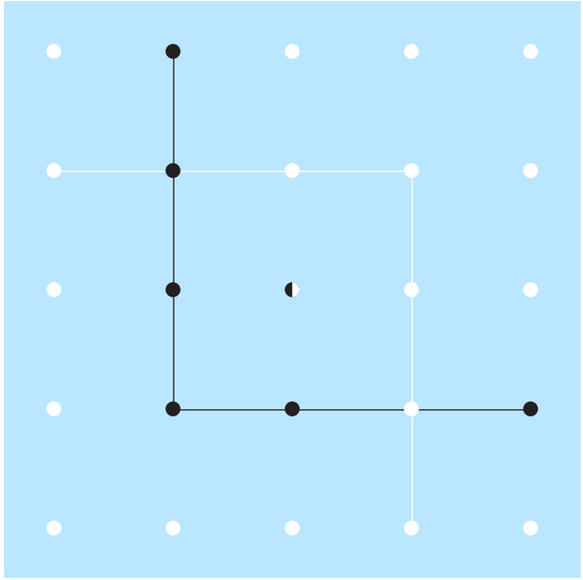
Effective workload placement.
Ensure that your applications are running in the right place to meet your business needs.

Blend mainframe power into the cloud computing landscape.

Learn more →

Co-create

- Map the values
- Accelerate value
- Effective workload placement
- Reducerisk



Meet your strategic goals using a Garage-based approach.

Learn it
Assess your portfolio

A core activity in your journey to mainframe application modernization is the IT portfolio assessment, which includes disposition, cloud affinity, and estimation. Determine your people, processs, and technical readiness. Then build a business case and roadmap that includes migrations to cloud, application modernization, rationalization and decommissioning, target environment provisioning, security, data optimization, storage optimization, and – ultimately – the realization of the business objectives such as increased speed and a shift to variable cost models for IT from platform to managed services.

Build a roadmap to meet your business objectives

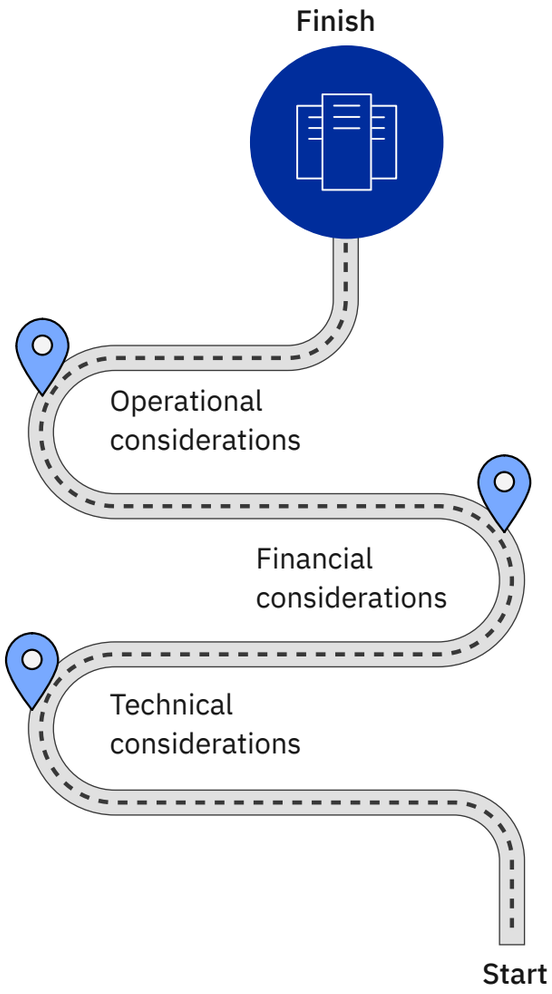
Technical considerations.
Deep analytics provide precise topography of the current mainframe landscape. Automation reduces risk and accelerates the mapping of findings to business priorities and values.

Financial considerations.
Ensure your objectives and requirements are met while reducing costs. Emphasize a TCO-driven operating model and the selection of modernization patterns and technologies.

Operational considerations.
The target solution architecture is underpinned by a co-existence approach as well as performance, availability and security considerations, which are supported by the right skills and culture to improve delivery.

Learn about IBM Services for Enterprise Cloud Strategy.

Learn more →



Get started
Build your roadmap and plan

To understand where you need to go, you need to first assess your current state.

You need an application modernization strategy

Understand your current business state
Understand your business objectives and modernization strategy and create a current portfolio summary, cost baseline, and current state operating model.

Assess your current technology state
Understand your current architecture to identify opportunity areas for modernization and develop an operating maturity model.

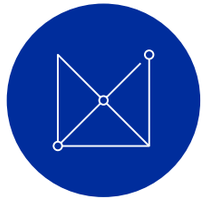
Create options.
Identify your target state service model, deployment options, and readiness assessment. Create a target architecture, workload placement, target cost estimation and operating model focus areas.

Develop the course of action.
Recommend a portfolio and application disposition and prioritization. Develop a co-existence approach, financial scenarios and simulations, and target operating model blueprint.

Create the plan.
Develop your modernization strategy and deliver a target state roadmap and plan.

Increase agility with application modernization.

Learn more →



Modernization Strategy

- Undrestand current business state
- Assess your current technology state
- Create options
- Develop the course of action
- Create the plan

Get started
Optimize existing applications and data

Define your modernization approach using Enterprise Design Thinking principles. Be sure to consider application insights derived through advance data science techniques.

Retire. Retain. Replace. Refactor. Rewrite.

Retire or decommission the application.
When your application has reached the end of it's useful life, is of limited value, or offers duplicate capabilities, retire it.

Retain the application.
When your application is still of value, address immediate problems and shift development and test to DevOps to increase agility.

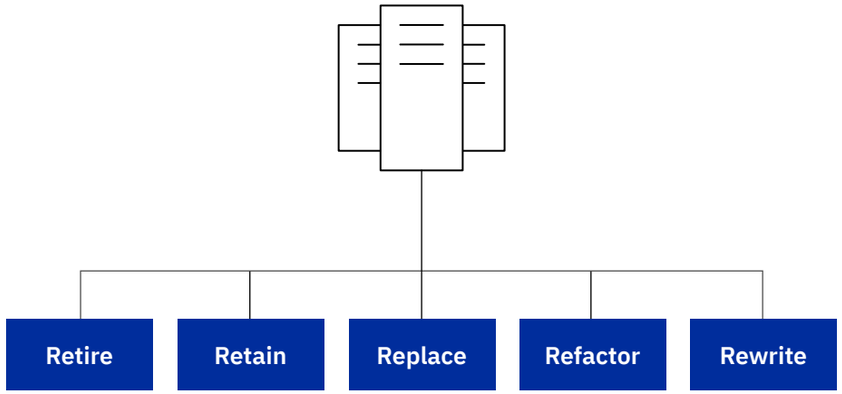
Replace the application.
Meet current and future needs by migrating to packaged software or SaaS. Migrate or modify existing data.

Refactor to a microservices.
Rearchitect business strategic applications to microservices to take advantage of cloud velocity and flexibility. Use modern languages (e.g. Java) to leverage a larger skill base. Containerize for portability. Redesign and normalize the current data state model.

Rewrite and restructure for agility.
Address operational and non-functional concerns by rewriting or restructuring current state applications to cloud-native design.

Lab Services for IBM z Systems and LinuxONE.

Learn more →



Create a modernization approach that takes advantage of your existing investments.

Learn it
Expose core mainframe assets

Leverage existing applications and system of record (SOR) and develop new capabilities for digital transformation and other initiatives. Enable easy access to mainframe applications and associated SOR data by using APIs. Enhance your client experience by enabling real time interactions in delivering both existing and new innovative composite services.

Build smarter solutions

Expose APIs.
API's can be transformative to reinvent business processes. Expose assets as OpenAPI Specification-based APIs for ease of consumption by cloud and mobile applications, leveraging your existing investment without the time, cost and risk of deep changes to core systems.

Evolve service-oriented architecture (SOA) services to APIs.
Streamline API development based on the OpenAPI Specification. Simplify currently accessed methods that use SOA-based services and result in runtime hops and complex development steps to enable APIs.

Extend or replace core system function with cloud-native applications.
Extend an SOR application to call an external API to invoke functions that are supported by cloud-native applications.

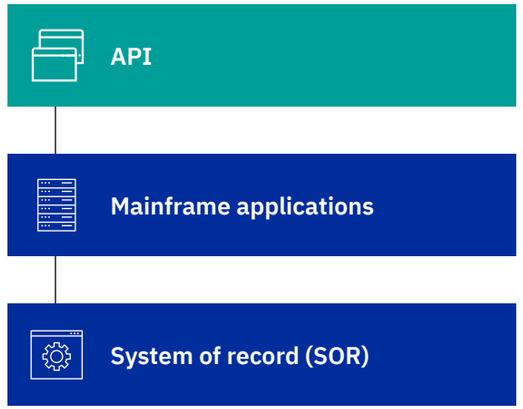
Provide on-demand access to mainframe data
Use APIs zAPI to support agility and ease of access to mainframe data for consumption by cloud-native applications to meet marketplace needs.

Simplify access to mainframe data for analytics.
Provide ease of access to mainframe data for consumption by analytics applications to meet marketplace needs with agility.

Reduce latency and mainframe workload through data caching.
Identify the integration points that can be redirected from core SOR data to alternative data sources with different cost and performance.

Learn about the IBM Mainframe application modernization architecture.

Learn more →



Get started
Expose core mainframe assets

Tools and accelerators

IBM has a unique set of tools and accelerators to streamline main- frame application modernization tasks including analysis, disposition, risks, target environments, and security, availability and resiliency of workloads.

Power to the developers!

Expose and integrate.
Exploit existing assets via RESTful APIs to and from IBM zSystems and cloud modernization stack

Real-time and flexible information flow between core systems and cloud applications is crucial for digital transformation.
IBM zSystems Digital Integration Hub provides efficient information flow on-demand to cloud applications with reduced complexity — resulting in faster ROI for cloud transformation & greater market agility.

Learn about Enterprise DevOps.

Learn more →

Integrate mainframe applications to leverage your existing investment without the time, cost, and risk of deep changes to core systems.

Learn it
Modernize through DevOps

The current practices for the development, testing, deployment, and monitoring of mainframe applications aren't always integrated or automated. Instill modern methods and practices through the IBM Garage Methodology to unify mainframe and cloud investments for seamless innovation and new ways of working.

Modernize using devops tools and practices

Provide a common developer experience
Integrate standardized processes and open source tools into your DevOps toolchain as an accelerator to DevOps transformation.

Automate builds & tests.
Early in the DevOps process use self- provisioned test systems to support continuous delivery and integration.

Facilitate rapid feedback.
Deliver continuously and actively seek feedback from your stakeholders.

Analyze mainframe applications.
Use cognitive technologies to analyze mainframe applications, discover dependencies, understand the impact of changes, and plan for optimal performance.

Monitor and manage a solution.
Use consistent and integrated processes to manage and monitor development and testing on mainframe and cloud systems.

Power transformation with IBM Garage.

Learn more →

Learn it
Deliver continuously

IBM Garage Methodology combined with a hybrid cloud approach enables you to iteratively deliver business value while modernizing legacy components, which results in a more effective and efficient end state for your organization.

Iteratively move toward your target state

Modernize iteratively.
Break large changes into smaller, well-bounded parts to move faster with less risk.

Map data and interfaces.
Provide rules for transforming data between current state application and modernized application.

Use a squad model to reach your target state.
Integrate squads with multi-platform skills to scale support that provides faster time to market.

Integrate your operational model.
Identify and setup integrated operations for monitoring end-to-end visibility of application workloads.

Create an interoperability model.
Develop transformation rules for current state data model mapped to a modernized data model to support your incremental data modernization roll out.

Get started
Modernize through DevOps

Tools and accelerators

IBM has a unique set of tools and accelerators to streamline main- frame modernization tasks including analysis, disposition, risks, target environments, and security, availability and resiliency of workloads.

Power to the developers!

See interdependencies.
Quickly analyze IBM zSystems® applications to understand code, data structure, complexities, risks and impact of change using IBM Application Discovery and Delivery Intelligence.

Increase velocity.
Orchestrate and analyze DevOps maturity to optimize the value stream with UrbanCode® Velocity.

Plan and collaborate.
IBM Engineering Workflow Management helps you to manage plans, track tasks and link requirements to deliverables.

Build once, deploy anywhere.
Develop and deploy cloud native apps faster with Red Hat® OpenShift® and IBM Cloud Paks™ on IBM zSystems.

Develop hybrid apps.
Build and test IBM z/OS® application components in a containerized virtual environment optimized for Red Hat OpenShift with IBM zSystems and Cloud Modernization Stack

Deliver at speed.
Automated CI/CD pipeline leveraging a GIT based workflow with Gitlab Ultimate

Read about IBM zSystems and Cloud Modernization Stack

Learn more →

Get started
Modernize through DevOps

Build as you like.
Develop z/OS apps with programming languages such as COBOL, PL/I, HLASM, Java® and C/C++ using IBM zSystems and Cloud Modernization Stack

Develop and test faster.
Develop, integrate and automate apps and data using WAZI VTP. Develop and test mainframe applications IBM Cloud with Wazi as-a-service.

Freedom of SCM choice.
Dependency Based Build provides a framework and better tracking for automated z/OS® builds.

Shift-left testing.
Run application integration testing earlier to transform software development lifecycles using IBM zSystems Virtual Test Platform.

Automate testing and deployment.
Use Open Unit Test for batch and CICS® programs. Leverage rapid feedback, continuous delivery and audit trails via UrbanCode Deploy.

Simplify complex releases.
Plan, execute and track a release through all stages of the delivery lifecycle with UrbanCode Release.

Self serve provisioning.
Easily provision z/OS environments for Dev/Test with IBM zSystems and Cloud Modernization Stack

COBOL performance.
Automatic Binary Optimizer improves COBOL performance without recompiling, code migration or tuning.

Service management.
Empower your operations team with an easy-to- learn and highly customized OMEGAMON® tool set. Track transactions and monitor resources from z/OS subsystems to APM using Application Performance Management Connect.

Protect data by policy.
IBM Hyper Protect Data Controller manage and revoke access to data shared within your enterprise, even after it leaves your system, minimizing risk.

Securely build, deploy and manage apps
IBM Hyper Protect Virtual Servers protect mission-critical apps in hybrid cloud environments.

Learn it
Develop and deploy a newcloud workload

Develop and deploy new cloud-native applications on IBM zSystems and LinuxONE to extend applications with hybrid cloud solutions and with the highest quality of services that the platform provides, such as security, reliability, scalability, and performance. The business use-case scenarios span from improving the customer experience for a service to developing a new business process to gain new insights.

Unleash the power of IBM z systems with hybrid cloud

Develop and deploy cloud-native applications.
Support agility in developing and deploying secure and scalable microservices applications at a lower cost. Address data sensitivity requirements and meet the demands of applications that use services in multiple on-premises secure containers and on multiple clouds.

Enhance the customer experience.
Develop new customer-facing interaction logic to invoke applications in real time.

Integrate a solution.
Comprised of a mainframe-based applications and public or private cloud components.

Move and containerize applications that are supported by higher quality of services.
Deploy applications in the cloud without rewriting by containerizing them. Deploying containerized applications in mainframe Linux® or z/OS Container Extensions provides a platform with higher quality of services, with close proximity to IBM zSystems data..

Develop new automated business processes.
Build automation that relies on the batch processing of mainframe-based applications. Use mainframe-based business functions by invoking APIs from new cloud- based business processes.

Extend business logic based on new analytics and AI functions.
Developing analytics applications requires access to training data that is generated by the mainframe for developing learning models.

Develop blockchain-based applications.
Develop and deploy new applications, such as blockchain-based solutions, as cloud-native applications.

Keeep up with the latest Z news.

Learn more →

Get started
Develop and deploy new workloads

Tools and accelerators

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Power to the developers!

See interdependencies.
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Build once, deploy anywhere.
Develop and deploy cloud native apps faster with Red Hat® OpenShift® and IBM Cloud Paks™ on IBM zSystems.

Develop hybrid apps.
Build and test IBM z/OS® application components in a containerized virtual environment optimized for Red Hat OpenShift with IBM Wazi Developer

Build as you like.
Develop z/OS apps with programming languages such as COBOL, PL/I, HLASM, Java® and C/C++ using Developer for z/OS and IBM Wazi Developer

Automate cloud services.
Simplify configuration and resource access and streamline operations with Red Hat Ansible® Certified Content.

Expose and integrate.
Exploit existing assets via RESTful APIs to and from IBM zSystems with z/OS Connect.

Integrate cloud services.
Securely access z/OS services with platforms such as OpenShift® via IBM z/OS® Cloud Broker™.

Secure your apps.
Protect mission-critical apps in hybrid cloud environments with IBM Hyper Protect Virtual Servers and z/OS Container Extensions (zCX).

Shift-left testing.
Run application integration testing earlier to transform software development lifecycles using IBM Wazi Virtual Test Platform.

Develop and test faster.
Develop, integrate and automate apps and data using WAZI VTP. Develop and test mainframe applications on x86 with Z Development and Test (zD&T).

Learn about IBM Mainframe solutions.

Learn more →

Learn it
Transform core application and data assets

Incrementally transform mainframe applications through refactoring and a modern development approach. Adopt new DevOps processes and modern languages to engage new developers.

Transform only where you have to

Extract and externalize business rules and policies that are embedded in mainframe assets.
Enable developers to quickly change business rules, push to production, and ensure compliance. Externalize embedded business rules in your mainframe applications. Harvest rules and rewrite them in Java or a business rules engine.

Develop mixed-language application components to extend or develop new SOR data management.
Mainframe teams traditionally have legacy technology skills – COBOL, IMS, VSAM etc. - posing challenges to attracting new talent. Support development in new languages that complement legacy skills and improve agility to extend or develop new applications that manage SOR data.

Develop a modernized data domain-based model.
Align the data domain model with the bounded context and with the microservices model for the modernized application solution.

Deploy an integration layer during the incremental transformation effort.
Create a integration layer that manages the interoperability between IBM zSystems and Cloud applications.

Transform mainframe apps to address anticipated or current skill shortages in maintaining core business applications.
Alleviate the impact of losing institutional memory of how things work and of losing technical skills in languages and platforms. Automate the conversion of COBOL code to Java while you keep data stores unchanged.

See Application Delivery Foundation for z/OS.

Learn more →

Get started
Transform core application and data assets

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Migrate from older IBM COBOL compilers to IBM Enterprise COBOL for z/OS 5.2, 6.1, 6.2, or 6.3.
Use IBM Enterprise COBOL Migration Assistant wizard to guide you though the process.

Improve the performance of already-compiled COBOL program modules.
IBM® Automatic Binary Optimizer for z/ OS® uses advanced optimization technology to generate code targeting the latest IBM zSystems mainframes to improve application performance.

Get smooth migrations from CA Easytrieve programs.
IBM® Migration Utility for z/OS® migrates CA Easytrieve Classic and Plus applications to IBM COBOL, protecting your Easytrieve investments.

Measure, report and maximize performance of systems and applications. IBM®
Application Performance Analyzer for z/ OS® can solve application and database performance issues by non-intrusively sampling reporting on how your mainframe applications are consuming resources, you are able to analyze the data to improve performance and provide an optimal customer experience.

Accelerate innovation with AI for application modernization.

Learn more →

- Analysis
- Disposition
- Risks
- Target environments
- Security
- Availability
- Resiliency

Get started
Cloud enabled approach

IBM’s approach to managing a modern mainframe landscape embeds resilience engineering principles and an automation-first mindset which are underpinned by the IBM’s Garage Methodology to assure value realization from cloud applications.

Power to the developers!

Extreme automation.
Enable a low touch automated solution to detect anomalies and unexpected behavior. Develop a standard operating procedure for an automated solution.

NextGen DevSecOps.
Provide a digital worker interface for conversation-driven development. Enable low-touch operations tools for AIOps.

Continuous testing.
Automate testing as part of the DevSecOps pipeline for continuous resilience testing. Enable environment readiness in terms of configuration and security before deployment.

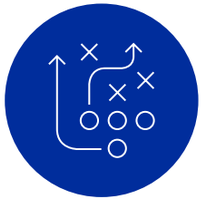
Mainframe and multicloud service integration.
Integrate seamlessly between infrastructure, containers, and applicable business processes. Externalize the pipeline and make it configurable.

Full-stack cloud squads.
Expanded the full stack squad to include mainframe and cloud skills.

Continuous improvement.
Proactively correct your course, discover patterns, and embrace opportunities. Produce early warnings for issues with automated resolution.

IBM Z Development and Test Environment.

Learn more →



Resilience engineering

Automation first

Get started
Reduce costs with managed services

Assess whether a pay-per-use consumption and delivery model that enables delivery of configurable computing Resources (MIPS, storage GBs) is right for you.

Accelerate your journey

Support new business needs.
Enable improved flexibility, scalability and access to current technology.

Control costs of hardware, software, facilities and infrastructure management
Address the loss of mainframe technical skills due to a retiring workforce.

Move to a cloud delivery model.
Gain a more agile and scalable infrastructure that supports current mission-critical workloads and new mobile, analytics, and social-driven workloads.

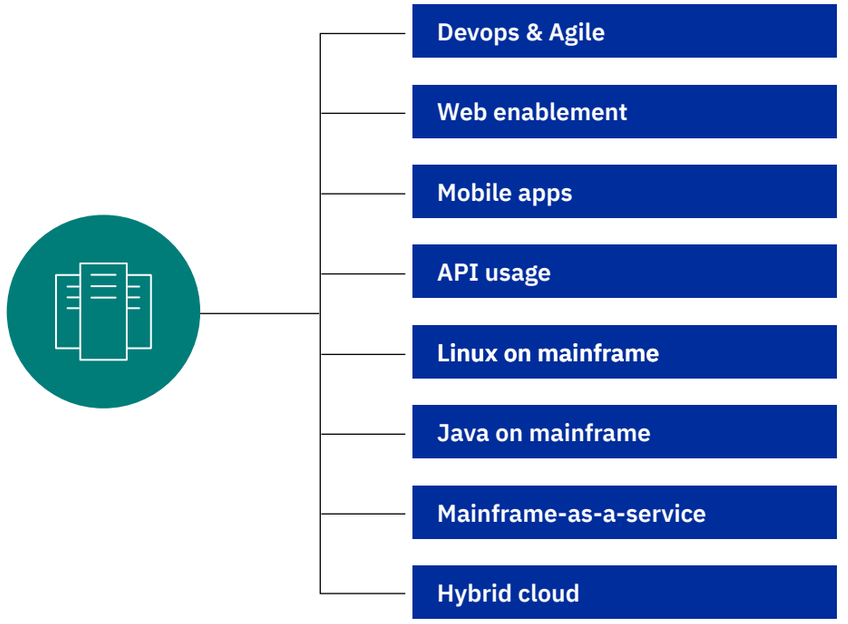
Support high availability and security.
Use a robust service design and mature delivery capabilities.

Rationalize your software portfolio.
Manage costs with a more predictable consumption-based pricing model with monthly billing.

Remove the challenge and cost of hiring and retaining talent.
Allow your staff to focus on other areas of innovation.

Learn about managed infrastructure as a service.

Learn more →



Hosted in purpose-built IBM data centers, IBM uses industry-leading virtualization technology and robust security features to deliver a security-rich, highly IaaS platform that is continually refreshed with the latest hardware and software to support innovation and reduced costs.

Get started
IBM Garage: Accelerate your journey

IBM leverages the Z platform to accelerate your transformation to an agile organization with open, portable applications and toolchains that seamlessly integrate with your multicloud environment.

We instill modern methods and practices in your organization through our IBM Garage Methodology to unify mainframe and cloud investments for seamless innovation and new ways of working and help you acquire new skills for sustained growth and success.

Untangle complexity to deliver value

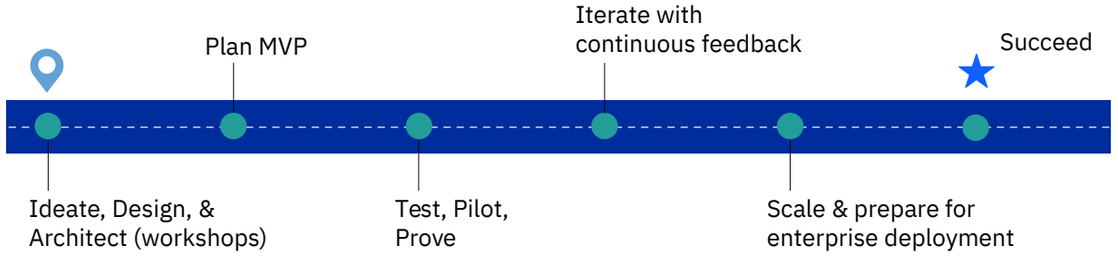
Modernize with IBM zSystems and Cloud together.
Accelerate mainframe application modernization leveraging a hybrid cloud architecture that includes IBM zSystems and public cloud. The result is lower cost and less risk than an application migration strategy to public cloud alone.

Power digital transformation with IBM Garage.

Learn more →

Engage IBM Garage!

Mainframe modernization road map



IBM Garage is a trusted partner, providing technology and prescriptive guidance to deliver immediate business value.

Important links

Read about IBM z systems and Cloud Modernization Center

Learn more →

Solve application modernization with the mainframe

Learn more →

Visit the Mainframe modernization architecture

Learn more →

Modernize on the IBM Mainframe

- Expose core mainframe asset
- Modernize through DevOps
- Develop and deploy new cloud workloads
- Transform core applications and data assets

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