kyndryl

Perspectives on the modern mainframe

How to drive increased value
with mainframe at the core of
your cloud strategy

Contents

Executive summary

The mainframe remains the best platform for many mission-critical applications and workloads and belongs at the core of a successful cloud transformation journey. Mainframe supports nearly every tool, language, and process any other platform can and typically does so at a lower cost, with less complexity and a smaller carbon footprint. When integrated with other platforms, IBM Z is often the right platform for these applications as part of a robust hybrid cloud strategy.

Kyndryl™ advisory, implementation, application, and management services for IBM Z can help your enterprise define a mainframe strategy based on your unique business and technical requirements and realize that strategy every step of the way. This includes augmenting in-house expertise for individual projects, selective outsourcing of specific tasks, and full outsourcing, as well as our tried-and-tested offerings and hosting models designed to meet your needs wherever you are on your transformation journey.

Platform choice is not an all-or-nothing decision

Many IT managed services providers (MSPs) and hosting companies try to reduce a customer's choice of platform—and really, anything technology-related—to a simple question: Do you want to modernize and move forward, or do you want to stand still? The main modernization option offered for mainframe is getting off of it, transitioning away from the mainframe altogether.

But these choices are not necessarily simple and don't always represent a fork in the road that requires an all-or-nothing, choose-a-single-path decision. Much like life in general, it's complicated.

Some choices are false choices. For example, it's very hard to find a single application today that isn't somehow already part of the hybrid cloud. So, when an MSP says, *"move to the cloud,"* what they really mean is, *"let us host you."*

Similarly, the term *"modernize"* has too often been used as code for *"let us move everything you do to a new platform, rewrite your working applications, and charge you a lot for doing that—as well as fixing them when they break."*

So, why choose to modernize at all?

Modernization vs. transformation

The concept of a mainframe has been part of the IT vernacular for so long that many people hold the belief that it is outdated—and, therefore, that the mainframe itself is not modern.

In 1964, a popular, German-made, four-door sedan had a 109-horsepower engine and could get from 0-100 KPH in about 10.5 seconds. The 2021 model of the same car has a 473-horsepower engine and gets to 100 KPH in about 3.77 seconds[1]—a 434% improvement in power and about a 64% reduction in the time it takes to accelerate. In short, the modern machine is both more powerful and much faster than the 1964 version.[2] And while driving a 1964 sedan may not be that much different than driving a 2021 sedan, you would not likely rely on a 1964 sedan for your daily commute.

Similarly, the first standardized personal computer had a 4.77 MHz chip and 256K of onboard memory.[3] Today, a mid-priced, commercially available PC shows an astonishing 96K% improvement in processing power and a whopping 6.3M% increase in memory.[4] That's a lot more games of Pong.

Back to the modern mainframe: A major driver that leads enterprises to move away from the mainframe is the mistaken perception that the platform is closed and archaic, a spinning tapes and blinking lights version with just JCL, batch Jobs, COBOL, and green screens. If development of the IBM Z platform, which we will use interchangeably with the term "mainframe" throughout this paper, had stopped in 1964 when it was first released, then it absolutely would be outdated by today's standards.

But development did not stop. Today, if you compare the first, 1964-released S/360 with a z15, the latest IBM Z release, you'll see a 531M% increase to the Million Instructions Per Second (MIPS), while on-board memory has increased by a staggering 63B%. These comparisons are not necessarily fair, since they can't account for the expandability of IBM Z with special processors, increased memory addressability, multiple network cards, multiple operating systems, full enablement of old programming languages (such as 26-year-old Java and 30-year-old Python), containerization, open tools, Node.js, and more. But the principle is the same as the sedan: The code that was written for the S/360 may still run virtually unchanged on a z15, but it is unlikely there is any of that old code left. Enterprises don't rely on 1964 mainframes anymore.

In other words, the mainframe is, in fact, very modern and capable of supporting your most challenging requirements. So, rather than modernization, what we're really talking about is transformation—transformation of tooling, transformation of ways of working, and transformation of mindsets about what the mainframe can do and where it fits in.
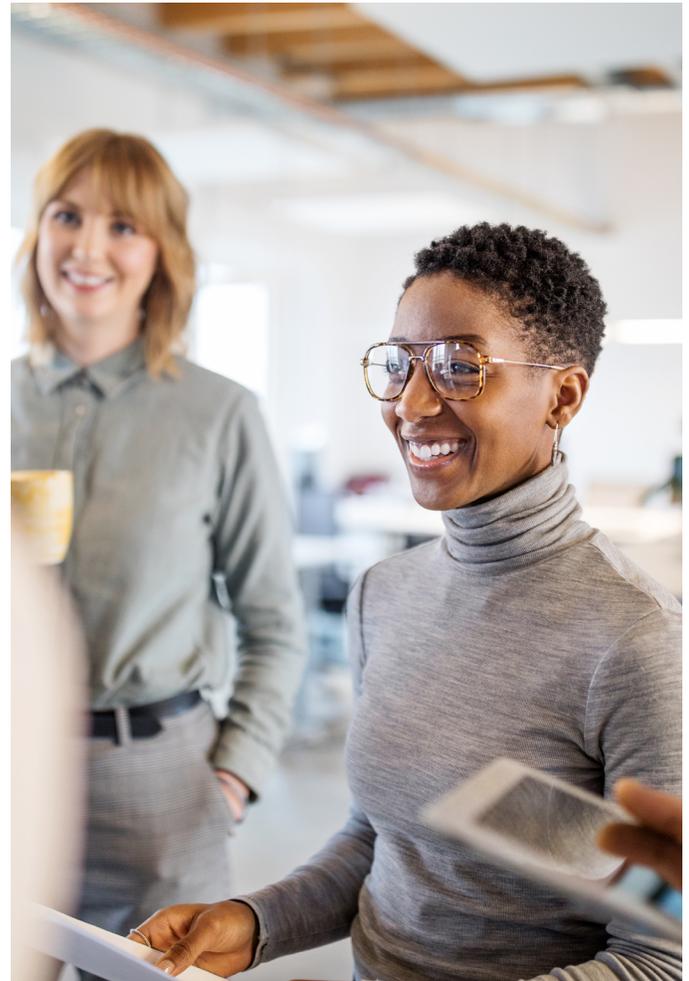
Mainframe and moving to cloud by the numbers

Nearly all large-scale technology projects, including digital transformation projects, fail at rates of **70%**

Nearly all large-scale technology projects, including digital transformation projects, fail at rates of **70%**

90% of technology projects in general fail to deliver any measurable ROI
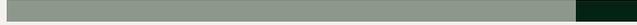
71% of executives say mainframe-based applications are central to their business strategy

90% of respondents indicated that the mainframe was a platform for growth and long-term applications
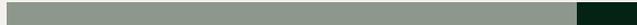
63% expected their IBM Z compute capacity to continue to grow

How does the mainframe fit into an increasingly cloud-based strategy?

The hype around leaving the mainframe and moving to cloud peaked in 2018 and has been declining ever since, driven by realizations about security, complexity, performance, availability, cost and failure rate of digital transformation projects, and examinations of the true total cost of ownership (TCO) between platforms.

In a recent Forbes article, startling observations from several studies indicated that nearly all large-scale technology projects, including digital transformation projects, fail at rates of 70% or more, while 90% of technology projects in general fail to deliver any measurable ROI.[5]

Excessive optimism about the business case in anticipating ROI can be a major problem, especially since the reality is that ROI typically doesn't emerge until two years after the three to six years it takes to replace or decommission the company's existing systems.[6] This divide between expectations and reality has contributed to a change of focus from leaving the mainframe to integrating the mainframe as a key component of the overall technology strategy.

A study from the IBM Institute for Business Value (IBV)[7] found that mainframe and cloud are not either/or propositions. Integration of IBM Z with other platforms, across the entire application and data lifecycle, is the key to delivering security-rich operations with simplified application and data exploration. It is not about staying or going; it's about optimization.

The IBV study found that 71% of executives say mainframe-based applications are central to their business strategy.[7] In another survey of executives and mainframe practitioners, 90% of respondents indicated that the mainframe was a platform for growth and long-term applications, while 63% expected their IBM Z compute capacity to continue to grow.[8]

When it comes to the question of cloud, the real answer, the cost-effective answer, is to place the right workload on the right platform—where "right" is based on application, data, and business requirements.

Mainframe value in a cloud world

The mainframe continues to be a critical component of the global economy. IBV found that 67% of Fortune 100 companies use the mainframe as their core platform, as well as 45 of the top 50 banks, 4 of the top 5 airlines, and 7 of the top 10 retailers.[7]

This reliance on mainframe isn't just limited to the world's largest and most successful enterprises. A 2020 survey of mainframe users found that only 12% of respondents represented the largest enterprises (with over 25K MIPS installed) and that 24% of respondents had less than 500 MIPS installed.[9] There's no doubt about it: the mainframe is the backbone of the world economy, not because of incumbency but because of the value that the platform provides.

The transformative benefits of mainframe can be integrated with operations and activities on other platforms, proving that the mainframe does not need to be an island in your enterprise IT ocean.

So, if the mainframe is so good, why do enterprises opt to migrate away from it? Strangely enough, this phenomenon can be traced back to the same benefits that make IBM Z such a reliable option. When something works well, it is easy to forget about until it breaks. The longer a piece of technology goes without breaking, the more human nature grows to expect that it will break. When there is an expectation that something will break, we naturally want to act to avoid the problem. Should we wait and then fix it? Replace it now? Displace it? This action is often based on incomplete information because we have not yet considered other potential solutions. We don't know what is possible, so we are left with difficult and often incomplete choices.

The biggest driver of mainframe abandonment is a declining workforce. The false choice here is the idea that the enterprise must get off the platform or end up with no one to support it, but with the continuously evolving open tools and languages support on IBM Z, that isn't the case at all. At nearly every level of the technology stack, from applications through infrastructure, the perceived complexity of the mainframe is masked by these open solutions and new platform features. And while there may be short-term or even longer-term gaps in skills, working with an experienced provider can help fill those gaps and fuel change through comprehensive hiring and skills programs.

The transformative value of IBM Z:

Availability and resiliency

- **Out of the box:** 99.999% availability or an average of 5.3 minutes of unplanned outages per year[6]
- **High availability options:** 99.99999% availability or an average of 3.8 seconds of unplanned outages per year[6]
- **Storage:** 500 immutable copies of data for analysis and restore[11]

Security

- **Cost-effective encryption:** Encryption Everywhere capabilities, including at rest
- **Access and entitlement**: Solution integration, including support for multi-factor authentication as well as IBM Resource Access Control Facility (RACF)

Automation

- **Standard automation:** Comes with decades of support for automation built into the DNA of the platform
- **Integration**: Designed to function with cross-platform monitoring and automation solutions
- **Implementation:** Emerging options for AI-enabled automation to drive further improvements

Flexibility

- **Operating systems:** Multiple options, including those exclusive to IBM Z as well as support for multiple versions of Linux® for over 20 years
- **Support:** Multiple approaches to containers—native as well as cross-platform solutions—with support for virtually any application language
- **Open:** Full open tooling support to drive DevOps and other agile processes

Performance

- **Rapid execution:** Up to 1 trillion HTTPS transactions per day on a single z15 server[12]

Another major driver that leads enterprises to move away from the mainframe is a misconception about the total cost of ownership (TCO)—the idea that the platform must be very capital-intensive and expensive. On the contrary, consumption-based models for software and for hardware capacity are available, some of which require no capital outlay at all.

TCO is an interesting concept. To truly account for the total cost of ownership, factors like the cost of migration, outages, and business impact all must be examined. Planning estimates need to be realistic, with an appropriate timeline and based on predictable costs.

"If you examine the amount of workload running the world's production for mission-critical workloads, mainframes handle about 68% of that. But the IBM Z platform is only 6% of the IT spend."

– *Tom Rosamilia, IBM Systems Senior Vice President, 2019.*[14]

Unfortunately, cloud spend can be wildly unpredictable. So much so that an entire professional discipline has emerged just to help contain unpredictable cloud computing costs. Known as FinOps, this new discipline focuses on the monitoring, measurement, and mitigation of cloud-related costs, and industry analysts predict the demand for practitioners is only going to grow.[13]

Despite the misconceptions, the modern mainframe is at the center of a successful cloud strategy, capable of virtually anything other platforms can do at comparable or lower cost. There are three main ways your mainframe can help drive value as part of your overall cloud strategy:

Improvement
Value is provided by improving what is already in the enterprise. Many of the features that enable your overall journey may be available using current hardware and software. In some cases, refreshes of the technology is required. The updates that lead to currency provide the ability to deploy popular programming languages, container platforms, automation solutions, and agile tools. Together, these resources enable a cultural shift to enterprise DevOps and all the efficiency, effectiveness, and productivity that come with it. Further improvements are made available through currency, including those focused on security and resiliency, and can be integrated and implemented across the enterprise.

Leverage
With these improvements in place, additional value can be obtained by making use of refreshed and more robust technology in your environment. This leverage includes the potential migration of Linux workloads to IBM Z to drive software cost savings, gain virtually unlimited scalability, improve availability, and reduce complexity. With an open mainframe, the network latency between Linux workloads and more traditional workloads can be driven to near-zero, particularly by hosting them on the same mainframe. This leverage also comes with predicable and typically lower costs. Additionally, achieving currency in your hardware and software stack can unlock access to cloud environments, enabling you to choose the optimal combination of application and data workloads for your unique environment.

Enablement
The third major area of value comes from enablement. The development of cloud-native applications, using containers connected to traditional applications through open APIs, can unleash your developers, making it possible for them to satisfy business requirements using newly implemented agile processes to accelerate speed to market. These enablement benefits also extend to management of your more traditional applications and environment. Implementation across the entire cloud, including on the mainframe and through integration to support applications and infrastructure on other platforms, can magnify these benefits even further.

Virtually unmatched reliability, security and resiliency

Reduced costs and improved throughput compared to distributed architectures

Modern cloud architecture that is open and portable

Build upon business evolution with increased value realization

Figure 1: IBM Z is at the core of an integrated, cross-platform infrastructure that can host the diversity of legacy and cloud applications.

The modern mainframe

DevOps & agile

Hybrid cloud

Web enablement

Mainframe as a Service

Mobile apps

Java on mainframe

API usage

Linux on mainframe
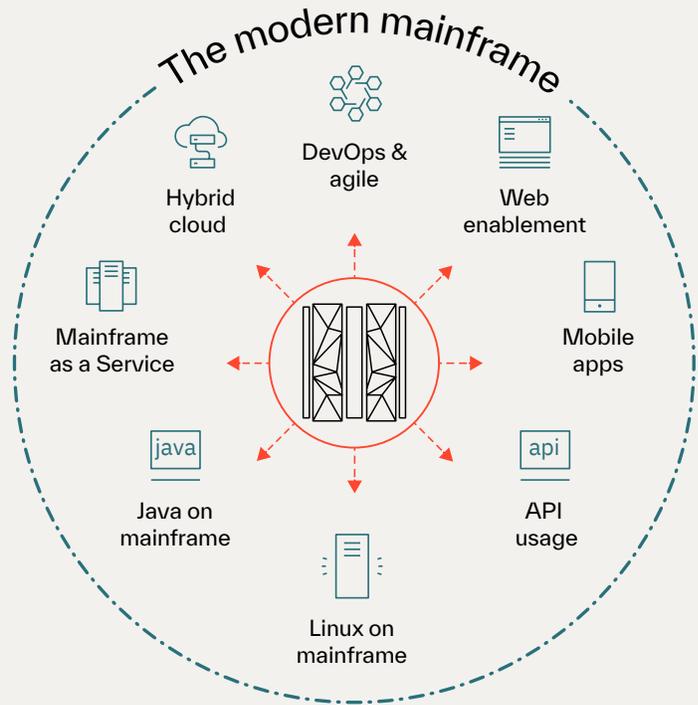
Critical pathways to obtaining value during the transition to cloud

When transforming tools, processes, skills, applications, data, software, and hardware, it is vital to move in incremental steps. Create success and then build on it to seamlessly enable dynamic innovation across the enterprise and support your chosen platform. Kyndryl is here to help, with advisory, implementation, application, and management services to help maximize business value at every step of your enterprise's unique journey.

Critical pathways to value during your cloud transition include:

– Rejuvenation of the workforce
– Core platform transformation
– Opening up the mainframe
– DevOps enablement
– Development or migration of new workloads

Rejuvenation of the workforce
As previously mentioned, a major concern for many enterprises is the availability of skilled mainframe resources. The risks associated with these resources can be mitigated with state-of-the-art tools and processes—but mainframe skills are still required.

Skills are an investment, and it is critical to define and develop specific and targeted programs to hire, train, and retain the right talent to successfully execute your enterprise's strategy. There are many educational resources available for IBM Z, including the

IBM Z Xplore Learning Platform that offers hands-on experience in multiple mainframe areas and the IBM z/OS Mainframe Practitioner Professional Certification Program for online education and testing. Another excellent source of education and knowledge is the Zowe Open Mainframe Project™— part of the Linux open-source community that provides an easy-to-use platform where experts share up-to-date materials and foster collaboration with the broader community. The digital certificates obtained through these educational resources are an effective way to gain and document skills consistently and through a trusted source.

Resource risk can be further mitigated through collaboration with a mainframe partner. With over 8300 mainframe experts worldwide, Kyndryl can fill any IBM Z knowledge gaps that your enterprise may have. Whether you need support for a specific project, a short-term staff augmentation, or ongoing management services, we can help drive workforce rejuvenation in your enterprise through a defined, specific, and targeted skills program. These programs include a focus on early professional hires, an emphasis on current knowledge, and defined career paths for our professionals.

The number of mainframe digital badges available through our programs continues to grow. We believe that continuous learning is imperative, and our own IBM Z professionals have enthusiastically embraced our skills program, collectively earning more than 50,000 badges across a broad spectrum of technologies and skills.

Our goal is to help our customers create vibrant and dynamic communities around their mainframe platforms. As a quick start option, we offer an IBM Z Experience Workshop, which offers tailored education and provides our customers with the knowledge to get started on their transformation journey, identifying additional education and transformation priorities along the way. We also offer a long-term Workforce Transformation Service, which helps enterprises recruit, develop, and retain the right people, in line with the predicted demand for services and planned retirement dates of the existing workforce.

Core platform transformation

No matter how robust your strategy is, you also have to make sure your technology can support it. Optimization of the IT estate is key.

The IBM z15 with z/OS 2.5 improved on previous capabilities for hybrid cloud, added implementation of IBM Hyper Protect Data Controller and additional data privacy features, as well as made improvements in pervasive encryption, data compression, sort acceleration, resiliency, scalability, and performance. The new OS also included improvements to the ease of installation and management as well as expanded cybersecurity enhancements for detection and analytics.

Multiple improvements to middleware and other extensions are also available with current hardware and OS, including support optimizations for z/OS Connect and Red Hat® OpenShift Container Platform (OCP). Additional solutions, such as IBM Globally Dispersed Parallel Sysplex (GDPS), continue to evolve, and the newest releases can help decrease recovery time from hours to minutes to seconds.

Kyndryl provides a variety of services that include upgrades to gain the currency required to enable an enterprise's transformation journey. These upgrades include options for mainframe as a service (MFaaS), onsite, dedicated offsite, or offsite multitenant hosting and management. Each of these options can be realized through a full outsourcing model or through selectively outsourcing only individual and specific functions.

We also offer a number of quick-start or project-based services for IBM Z transformation, including a Technical Health Assessment of the mainframe environment. This assessment is a short study that examines various aspects of the vitality of the IT environment and provides recommendations for improvement.

Opening up the mainframe

You've probably heard many mainframe applications described as mission-critical, but what does that actually mean? Mission-critical means core to your business, that the applications enable processes and business logic without which the business cannot survive.

Moving these mission-critical applications to a new platform is typically not a good option. In a lot of cases, extracting and understanding the business logic to rewrite or re-code the applications would be both expensive and time-consuming. Some of the key code may not have been touched for decades and the embedded logic and business process may not have been examined or changed for nearly as long, if not longer. It is a much more cost-effective approach to only rewrite pieces of these applications, leaving the rest of the application to run as it has always done while opening it up to integration.

But along with these applications comes data, big data comes with corresponding "data gravity," a term coined 2010.[15] Just as with physical gravity, the bigger the data, the more data gravity it has. Much of this data is critical to fueling the analytics that drive automation and help build artificial intelligence (AI) knowledge— another place where opening up the mainframe is preferable to moving to a new platform.

A great example of the value that can be realized through openness between platforms is sharing authentication and authorization capabilities—a single multi-factor authentication (MFA) solution helps fortify security while reducing cost and complexity.

IBM Z software includes z/OS Connect, designed and developed to create open APIs for popular middleware like IBM DB2, IBM IMS, and IBM CICS. Open-source solutions and interfaces interact with z/OS to provide common interfaces for web applications. Using open-source tools, such as Zowe™, allows users to mix and match tooling and technology across platforms, using the tools they prefer and are familiar with. This flexibility helps decrease the learning curve for resources not familiar with the platform. Using Red Hat OpenShift® can take this flexibility a step further by providing a container platform that is common across technology.

The z/OS Management Facility (z/OSMF) plug-in provides additional improvement by enabling a task-oriented, web browser–based user interface that supports day-to-day management and operations requirements. Emerging support for other tools, such as Red Hat Ansible®, can help drive further openness in the mainframe.

Kyndryl can be a key partner on this journey to the open mainframe. We have multiple services focused on helping customers embrace new models, migrate Linux workloads from other platforms to IBM Z when appropriate, and deploy all the tools necessary to make the IBM Z environment a cost-effective option for future cloud-native development.

DevOps enablement

It takes solid, standard, and dependable tooling to open the mainframe but the gains in efficiency, effectiveness, resource utilization, and costs can be very impressive. Opening the mainframe allows for major process changes and the implementation of DevOps—perhaps the most important transformation of all.

At its core, DevOps does many of the same things to ensure IT environment integrity that have traditionally been done across all the technology and application layers. The difference is that DevOps does those things in a way that integrates development and operations, faster, continuously, and in parallel.

Kyndryl can provide consultative and implementation services to integrate the mainframe practices into your existing DevOps infrastructure, with a focus on transforming the mainframe developer experience and enabling a CI/CD pipeline to manage mainframe assets and development. These services include helping to enable the integration of more traditional software, such as COBOL, PL/1, DB2, CICS, IMS, and MQ, into DevOps.

**Development or migration of new workloads**

Previously described mainframe benefits, such as cost savings, can be further extended by developing new cloud-native applications directly on the IBM Z platform in Linux, using containers and state-of-the-art programming languages. Now, why would you do that?

Let's return to the concept of data gravity. The bigger the data, the more it attracts applications, technology, processes, and more. It becomes hard to move the data, so instead the other objects move to the data. Data gravity, like real gravity, is very strong and hard to break away from.

Instead of fighting the data gravity, it is much more effective to recognize it and develop near it, hosting rewritten applications, written in newer languages and developed using newer, more agile processes. This approach also provides near-zero network latency without sacrificing the overarching strengths of the mainframe.

Workloads not pulled in by the data gravity can still be hosted on other platforms when appropriate, but there are many critical business processes best enabled through integration of applications on the mainframe, close to the data. Doing this work directly on IBM Z provides all the benefits, described throughout this paper, that the modern platform can provide.

Kyndryl can work collaboratively with your internal development shop to create a proof-of-concept. Once it meets business, technical, and financial requirements, we can enable the move of multiple Linux and Red Hat OpenShift container workloads to mainframe.
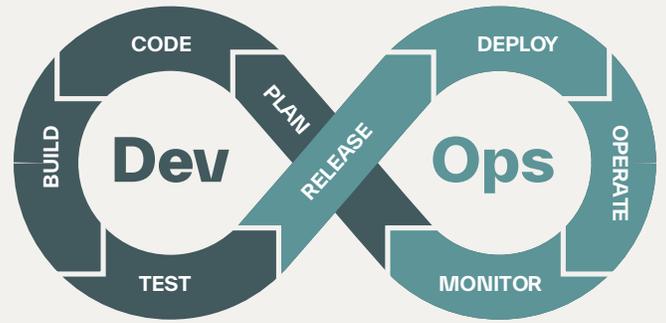
ZOWE & z/OSMF

SCM, code quality, editors and IDEs

– Git
– Github
– Bitbucket
– Gitlab
– SonarQube
– IBM ADDI
– VSCode
– IBM developer for z/OS
– Eclipse
– ISPF Editor

Task runners

– NPM
– Gulp
– Bower
– Gradle
– Maven

Test automation

– Mocha
– JUnit
– zUnit
– Jest

CI/CD

– Jenkins
– TravisCI
– CircleCI
– IBM UrbanCode product family

Configuration and Automation

– Ansible
– Chef
– z/OSMF workflows

Containerization

– Docker
– Kubernetes
– Red Hat OpenShift

Mainframe automation

– IBM System Automation
– CA OPS/MVS

Planning Tools

– Kanban

Performance monitoring and visualization

– Grafana
– IzODA
– MOI
– Splunk
– OMEGAMON
– CA SYSVIEW
– IBM Z APM Connect

Figure 2: Examples of tools integrated to enable DevOps on the mainframe

Why Kyndryl?

Kyndryl has deep expertise in designing, running, and managing the most modern, efficient, and reliable technology infrastructure that the world depends on every day. We are deeply committed to advancing the critical infrastructure that powers human progress. We're building on our foundation of excellence by creating systems in new ways: bringing in the right partners, investing in our business, and working side-by-side with our customers to unlock potential.

For more information

To learn more about Kyndryl advisory, implementation, application, and management services for IBM Z, please contact your Kyndryl representative or Kyndryl Business Partner, or visit kyndryl.com

kyndryl.

1   https://www.automobile-catalog.com/car/1964/77315/bmw_1800_ti.html

2   https://www.carscoops.com/2021/04/2021-m3-competition-hits-62-mph-faster-than-bmws-official-quote/

3   https://www.pcmag.com/news/the-golden-age-of-ibm-pcs

4   https://www.dell.com/premier/us/en/rc1378895/?gacd=9620985-1071-5763017-266477999-0&dgc=st&ds_rl=1277860&ds_rl=1282807&msclkid=2f9fd4a227731e61b217b504104a3046#/deals/premierselect

5   3 Main Reasons Why Big Technology Projects Fail – & Why Many Companies Should Just Never Do Them, Forbes, March 2021

6   Prevent These 5 Mainframe COBOL Cost Reduction Project Mistakes, CloudFrame, September 2021

7   Application modernization on the mainframe, IBM Institute for Business Value, July 2021

8   2020 BMC Mainframe Survey Results, BMC, October 2020

9   The 2020 Mainframe User Survey, Arcati, 2020

10 Availability of a mainframe network, IBM Documentation, December 2021

11 Resilient server solutions, IBM, December 2021

12 Get started with IBM Z, IBM Developer, January 2021

13 Cloud computing 'sticker shock' is on the rise, and containing it may be a new career path, ZDNet, February 2021

14 IBM Infrastructure's Role in Cloud, AI and Security, TechChannel, March 2019

15 Data Gravity – in the Clouds, Dave McCrory, December 2010