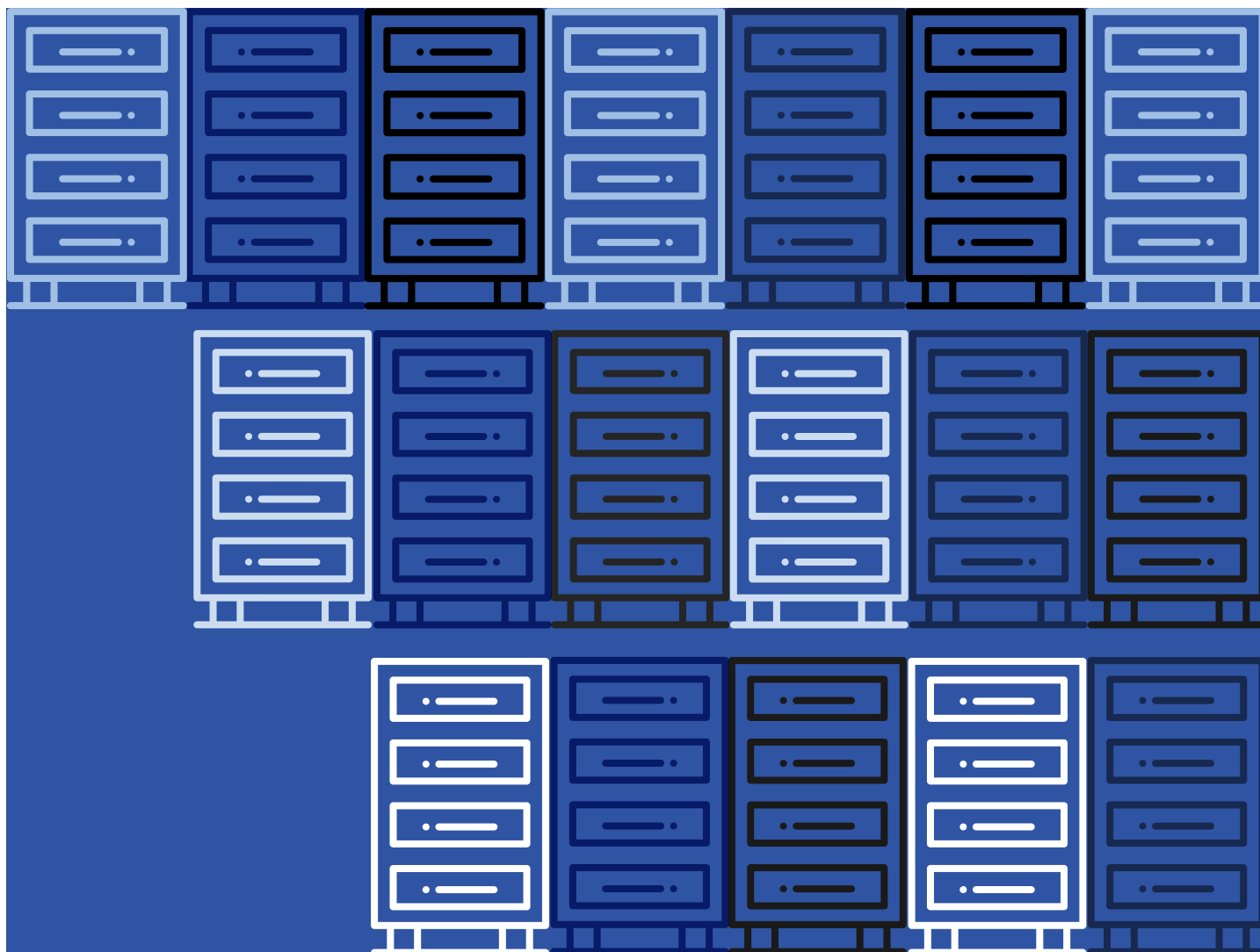




Far from a throwback to another era, mainframe technology is giving the financial sector the tools to win in the digital age.

Mainframe 2020: A catalyst for transformation



When it comes to supporting DevOps initiatives, mainframe technology – introduced in the early 1950s – isn't likely to be the first to come to mind. Yet combining the processing power of mainframe computing with one of today's leading software development techniques is precisely how mutual insurer State Farm readied itself for rapid change and increasing customer demands. The company has integrated new DevOps tools into its IBM Z servers and adopted new practices to achieve optimal performance.

By combining DevOps, which bridges the divide between developers and IT operations, with the power and scalability of the mainframe, State Farm is speeding up the development and delivery of essential applications. For example, it shortened the time it takes to test new versions of its claims system, which lets insurance agents handle claims anywhere in North America, from two months to two weeks. "We strive to deploy solutions at a very fast pace to meet digital transformation needs," says Krupal Swami, State Farm's technology and architecture director.

State Farm isn't the only financial institution relying on the mainframe for greater speed, innovation, and agility. For many of today's financial institutions, embracing innovative tools and agile approaches is more than smart strategy – it's a means for survival. Customers now expect personalized experiences that cater to their banking preferences and anticipate their unique needs. Nimble and innovative competitors, including fintechs and digital banks, are redefining the sector. More organizations are moving to the cloud, expanding the security threat landscape. And fast-advancing technologies, such as artificial intelligence (AI) and blockchain, are requiring financial institutions to operate with unprecedented speed and scale.

Key takeaways

- 1 Financial institutions traditionally looked to mainframes to process massive amounts of information quickly. Now they're relying on them to harness innovative technologies such as artificial intelligence and blockchain and agile software development approaches such as DevOps.
- 2 With more organizations adopting a hybrid approach to their infrastructure, many are putting some applications in the cloud while keeping the most sensitive data in systems on-premises. Modern mainframes have enhanced encryption capabilities to invigorate the security of hybrid environments.
- 3 Modern mainframes have the power and capacity to handle ever-growing amounts of data flowing into organizations and avoid costly system outages.

Still making history

Enter the mainframe, the go-to platform for some of today's largest financial institutions. Case in point: mainframe computing accounts for nearly \$8 trillion in annual credit card payments, 29 billion annual ATM transactions, and 12.6 billion transactions a day. A staggering 92 of the world's top 100 banks rely on mainframes to support their cost systems.¹ State Farm alone runs an average of 1.3 trillion transactions on its mainframe system.

The technology is getting more sophisticated. For example, the z15, the latest model in IBM's long line of Z mainframe computers, has encryption capabilities that protect data as it travels across multiple platforms and computing environments. Other innovations include the ability to revoke access to data that leaves the mainframe and travels through the business; tighter integration with Red Hat technology for fast application

“There is no platform that can conduct the same number of transactions per second with the high availability and security that mainframe supplies.”

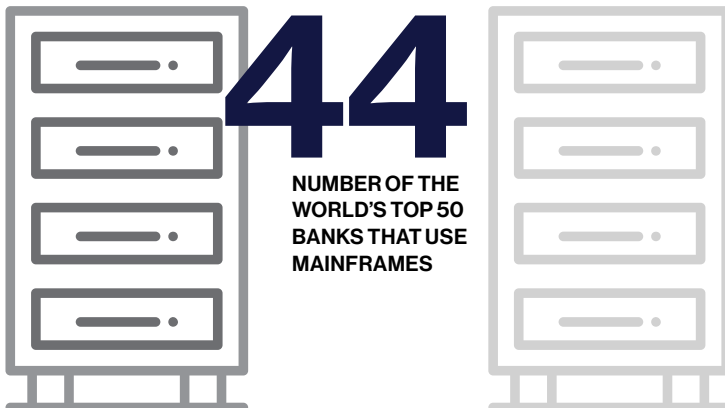
Peter Rutten, Research Director, IDC

deployment and delivery; on-chip compression for lower storage, transporting, and processing data costs; and the ability to run open-source software.

For Peter Rutten, a research director at market research outfit IDC, the mainframe is the prime technology for the massive amount of data generated and collected today. “There is no platform that can conduct the same number of transactions per second with the high availability and security that mainframe supplies,” says Rutten. “There really isn’t much else other than the mainframe.”

But today’s financial institutions are looking for more than unmatched processing power and unwavering security capabilities. Rather, by coupling modern mainframe technology with innovative initiatives, such as DevOps, hybrid cloud – public plus private cloud implementations – and data analytics, financial institutions are betting on the mainframe to address their evolving business needs.

State Farm’s integration of DevOps is an example. A popular software development approach, DevOps lets developers make changes on the fly and deploy apps quickly by establishing a consistent, repeatable way for IT to manage its production environment. Integrating mainframe technology with DevOps practices can deliver big benefits, according to Forrester analyst Robert Stroud.



Who uses the mainframe?

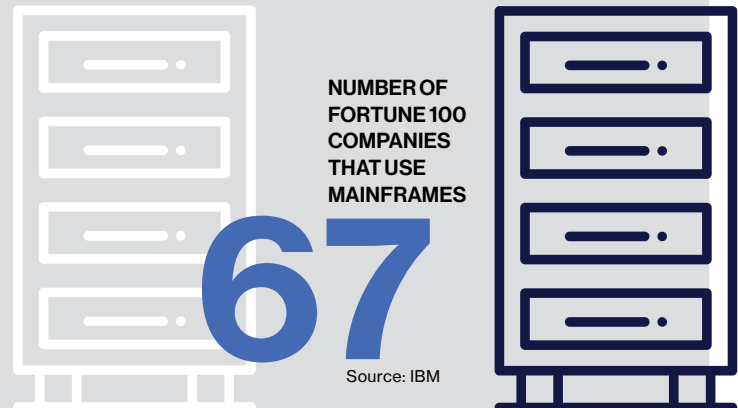
Mainframe computers, known as “big iron,” are massive machines with tremendous processing power. They are used primarily in big organizations such as banks and retailers that rely on millions of account transfers or credit card swipes.

Types of organizations that use mainframe computers:

- Banks, credit card companies, other financial institutions
- Insurance companies
- Big retail businesses
- Utilities
- Government agencies
- Manufacturers
- Airlines and other transportation companies, shipping companies

Classic applications of mainframes:

- Customer order processing
- Client information storage
- Enterprise resource planning
- Financial processing
- Inventory and production management
- Payroll management
- Reservations systems





A recent IDC survey reveals that 55% of organizations have invested in and integrated DevOps as part of a mainframe transformation initiative.

In a blog post, Stroud writes that for successful digital businesses, [DevOps is key](#) to “unleashing the data and business processes within their mainframe-based applications.”

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“You can be as agile as you want in your own space, but if the teams and processes you integrate with aren’t agile, then you won’t be able to deliver changes quickly,” says Mark Moncelle, IT architect at State Farm. “That’s the reality of being a large organization: you’ve got to get everything running faster, not just your product.”

Backbone for the hybrid cloud

Another way organizations are using mainframes to meet emerging business and technology demands is through hybrid cloud. The IDC survey shows that approximately 50% of organizations are using a hybrid cloud in a relatively advanced manner – meaning they centralize provisioning, management, and security across clouds.³ And for good reason: by moving workloads to a mix of public and private clouds, financial institutions can achieve better business agility, simplify IT infrastructure, and lower IT budgets.

At State Farm, cloud capabilities in IBM’s Z servers let teams there build apps with a “cloud-first mentality,” says Swami.

For years, though, data security and consumer privacy concerns dissuaded many IT leaders from putting critical applications into the cloud. That’s changing as modern mainframes give hybrid cloud environments much-needed security capabilities.

Today’s security threats are more sophisticated than ever. Cyberattacks, phishing attempts, malware, and ransomware not only threaten a financial institution’s data security but can lead to tarnished brand reputation,

sweeping legal liabilities, crippling regulatory fines, and a higher-than-average rate of customer churn. Technologies such as AI and machine learning only complicate matters, providing cybercriminals with innovative tools to identify an organization’s vulnerabilities. As it is, the financial services industry accounted for 62% of exposed data in 2019, according to a Bitglass report.⁴

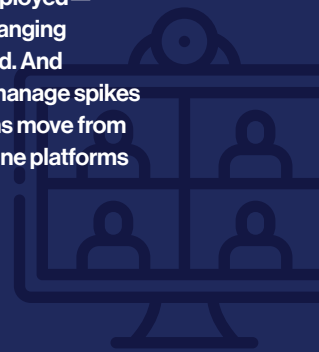
A mainframe platform in a hybrid environment can mitigate exposure, Rutten says. Pervasive encryption capabilities

Moving at the speed of crisis

Today’s covid-19 pandemic requires financial institutions to respond to surges in customer queries, process critical transactions, and flag at-risk accounts faster and more accurately than ever before. “Business today requires agility,” says Krupal Swami, technology and architecture director for State Farm. “Our customers want to be helped and informed in real time.”

At the same time, citywide closures, stay-at-home mandates, and social distancing protocols are forcing many employees to work from home. On April 9, Microsoft reported a new daily record of 2.7 billion online meeting minutes in one day—a 200% increase from 900 million on March 16, around the time the orders were first issued.

As customer demands evolve, and remote workforces multiply, the modern mainframe is likely to gain greater attention. Its self-checking and self-recovery capabilities ensure critical systems stay up and running while protecting against insider and external cyber threats. Mainframe apps can be easily deployed—and modified—to accommodate fast-changing regulatory requirements in a volatile world. And mainframe technology’s scalability can manage spikes in demand as more and more transactions move from bank branches and office cubicles to online platforms during these challenging times.



allow IT leaders to encrypt data at the database, data set, or disk level without changing or adjusting applications. Instead, each application contains an internal encryption-decryption mechanism, thereby protecting data without affecting service-level agreements or interrupting day-to-day operations.

The enemy within

But not all threats stem from external sources. For this reason, many organizations look for mainframe technology that can isolate workloads and authenticate access. Organizations often regard cyberattacks as the handiwork of ill-intentioned intruders, not the actions of employees. Yet employees are one of the leading causes of data breaches today, according to a study by the Ponemon Institute, a research alliance that focuses on data protection and cybersecurity.⁵

By determining who gets access to data via policy-based controls, Rutten says, financial institutions can protect applications from inside and outside threats. Better yet, because data security policies and encryption are embedded with the data, IT leaders can revoke access at any time from any location, even when the data leaves the data center and travels through the business. For example, a bank branch may wish to take away access to sensitive customer information that was shared with, say, a government agency.

Regardless of the source, a modern mainframe's enhanced security capabilities let financial institutions have both the business agility promised by hybrid cloud – swiftly innovating and getting products and services to market – and high data security for the most important applications.⁶

The data advantage

Of all the tools and techniques to integrate with mainframe technology, data analytics promises to deliver some of the greatest rewards. IDC predicts that the data universe will grow from 33 zettabytes in 2018 – that's 33 trillion gigabytes – to a whopping 175 zettabytes by 2025.⁷ The good news is real-time data

Business value of the mainframe

A recent study shows that modern mainframes, which feature software and hardware innovations, have helped organizations save money and build business.

BENEFIT	VALUE PER YEAR
COST SAVINGS Improved mainframe performance leads to mainframe and application licensing cost reductions.	\$298,000
MANAGEMENT EFFICIENCIES Staff spends less time managing mainframes.	\$284,700
DEV STAFF EFFICIENCIES Increased agility and improved performance makes development teams more productive.	\$324,500
HIGHER REVENUE, NEW BUSINESS Agility and performance gains lead to fresh business opportunities.	\$465,800
PROTECTION OF EXISTING REVENUE Modern mainframes ensure IT can meet changing business demand.	\$827,900
TOTAL QUANTIFIED BENEFITS PER YEAR PER MAINFRAME	

\$2,200,900

Source: IDC's "The Business Value of the Transformative Mainframe," based on interviews with 11 organizations in 2019

A modern mainframe's enhanced security capabilities let financial institutions have the business agility promised by hybrid cloud and high data security for the most important applications.

analysis of these bits and bytes is helping financial institutions differentiate themselves in a crowded sector. As competition grows, so too does the importance of delivering “simple, seamless, personalized products and experiences across all lines of business,” says Swami. A mainframe can help by [crunching data at record speeds](#) to provide customer insights that financial institutions can then use to design personalized product offers, from loans tailored to meet consumer spending patterns to interest rates that reflect a consumer’s credit card account activity.

Adding analytics capabilities to a mainframe platform can also improve IT operations. Oftentimes, security professionals must manually sift through system logs to identify instances of a security breach – a costly and time-consuming endeavor.

But a mainframe’s ongoing monitoring and analytics capabilities can flag system anomalies that may indicate a data breach – without human intervention. Rapidly uncovering root causes and acting on these insights in real time safeguards systems and their data and allows employees to focus on more critical tasks.

The upside of downtime

But for all its benefits, a mainframe is only as valuable as its proven performance and reliability. In today’s always-on economy, financial institutions can’t afford moments of

unanticipated downtime. A single system outage can have a catastrophic impact: lost revenue, damaged reputation, and regulatory penalties. Worse yet, it can take weeks, if not months, to recover from a breach.

A modern mainframe offers high levels of resilience and availability. Synchronous disk replication, workload balancing, automated recovery procedure – they are all features that ensure data remains available, IT infrastructure stays operational, disruptions are minimized, and service levels are restored quickly. Consider this: organizations that invest in modern mainframe platforms experience reduced levels of unplanned downtime by an average of 43%, according to IDC.⁸

Even planned outages for bug fixes and security updates can wreak havoc on the bottom line, with a Forrester survey pegging planned downtime costs at \$1.5 million in the first quarter of 2019.⁹

But with the right mainframe technology, “banks can expedite the restart and recovery of their planned outages,” says Maura Schoonmaker, program director for banking, financial markets, and digital assets at IBM. “That’s huge for them.” A mainframe with instant-recovery capabilities can get systems back up and running in no time. The result can be up to seven-nines availability, consistent performance, business continuity, and greater adherence to service-level agreements.

The disruption of downtime

When technology services are unavailable to a company’s employees or services, the business costs can be severe. IT directors rank the top three challenges to their business operations:

53%

LOST REVENUE

47%

LOST PRODUCTIVITY

41%

LOST BRAND EQUITY OR TRUST

They would invest in technology that help decrease downtime. Here’s what they say about the following capabilities:

79%

FASTER RESTART AND RECOVERY

77%

PROCESSING BACKLOG

75%

BRING-UP TIME



As financial institutions embrace disruptive technologies to meet emerging market demands and consumer expectations, their reliance on mainframes will most likely increase.

Banking on the mainframe

As financial institutions embrace disruptive technologies to meet emerging market demands and consumer expectations, their reliance on mainframes will most likely increase. Blockchain technology, the basis for digital currencies such as bitcoin, promises to aid financial institutions in identifying customers, automating online lending processes, implementing credit scoring, and even issuing digital tokens to serve as collateral for peer-to-peer lending.

But while blockchain can spur innovation, it is highly resource-intensive, [making it a good fit](#) for the processing power of the mainframe. The mainframe can also minimize the compliance risks inherent in blockchain by allowing financial institutions to hold data locally to meet industry regulations.

AI is also having a growing impact on the finance industry, helping financial institutions detect and prevent payment fraud, such as unauthorized credit card transactions. Machine learning, the subset of AI that gives systems the ability to learn and improve, is also making headway. Sophisticated fraudster schemes make it increasingly

challenging for financial institutions to rapidly identify, predict, and counteract cyberattacks – and recover from them. But by deploying machine-learning applications on a mainframe platform, organizations can rely on deep learning and advanced analytics to move from [fraud detection](#) to real-time prediction.

Finally, early adopters are building internet-of-things capabilities into their mainframes to enhance customer experience, cut costs, and detect fraud. Initiatives range from using beacons to deliver customers customized offers the moment they step into a bank branch to analyzing machine usage data to determine the best location for ATMs.

Ultimately, exploiting blockchain, machine learning, and the internet of things requires unprecedented levels of speed, security, and reliability. Once a powerhouse for high transaction volumes and data-intensive workloads, the modern mainframe is now a conduit to agile practices such as DevOps and innovative technologies – provided, advises Swami, financial institutions exercise equal amounts of “patience, focus, and forward thinking.”

Mainframe 2020: A catalyst for transformation is an executive briefing paper by MIT Technology Review Insights. It is based on research and interviews conducted in March and April 2020. We would like to thank all participants as well as the sponsor, IBM. MIT Technology Review Insights has collected and reported on all findings contained in this paper independently, regardless of participation or sponsorship. Jason Sparapani and Laurel Ruma were the editors of this report, and Nicola Crepaldi was the publisher.

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Footnotes

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Illustrations

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