

# The Mainframe: Myth versus Reality

Mainframe Myth	Mainframe Reality
<p><b>Myth 1:</b> The mainframe is old and lags behind distributed servers in technology innovation.</p>	<p><b>Reality 1:</b> Consider this analogy: What do you think of the latest Corvette, Mustang, Porsche, or Ferrari? Would you agree that these are technological marvels? However, their roots also date back 50 or more years. They are all cars, and at the basic core, they have a steering wheel, brake and gas pedals, and a shifter. If you could drive the first Corvette in 1953, then you can drive the latest model today. Yet, everyone understands that the latest model has advanced over the years and now includes air bags, seat belts, performance traction management systems, and far superior performance.</p> <p>Consider another analogy: Do people think buying a new plasma or LCD TV is foolish? After all, it is just a color television. It is a simple evolution from the black-and-white sets that people had in the 1950s. Televisions today are still televisions, but they have much higher resolution, colors that pop, and a much, much bigger picture!</p> <p>The mainframe is more than 50 years old, but the technology of the latest IBM mainframe, the z13™, is leading edge. Over the past 50 years, IBM has evolved the mainframe into the industry-leading z Systems server with best-of-class functions and features for reliable and affordable enterprise computing. Today, the mainframe can process Java™, Linux®, XML, and web services. With co-located data on the mainframe, DB2® on z Systems is capable of performing queries at "the speed of thought." Did you know that z13 is the perfect platform for Cloud Computing? (That is just part of the mainframe's DNA.) In the mobile world, users are expecting to access critical account information and data in real time. Where does this data exist? On the mainframe.</p> <p>The z13 has three times the memory capacity of zEC12. With more memory, new cache design, improved I/O bandwidth and data compression, the z13 offers a smarter, more efficient design to serve up more data for analytics when compared to previous generations.</p> <p>As with previous generations of mainframes, IBM has a balanced system design that improves processor, memory, and I/O sub-systems to minimize potential bottlenecks to performance. This is in stark contrast to distributed systems that rely on the Intel® roadmap for performance, which does not address all sub-systems. With z13, the industry-leading dynamic workload management can include Power® workloads and System x workloads with Windows® using the Unified Resource Manager® with the z Systems Blade Extension (zBX), Model 004. This is one of the many reasons that z Systems is called the "system of systems."</p> <p>Twenty-five of the world's top 25 banks, 23 of the 25 top US retailers, and 9 out of 10 of the world's largest insurance companies run DB2 on z Systems. Ninety-five percent of the Fortune 1000 enterprises use Information Management System (IMS™), and 490 of IBM's top 500 customers run Customer Information Control System (CICS®). In addition, IBM CICS handles more than 30 billion transactions a day, which is more than the number of page hits on the Internet!</p>
<p><b>Myth 2:</b> The mainframe is too expensive.</p>	<p><b>Reality 2:</b> Because the mainframe is a large, highly visible server that is shared by multiple departments and business units, it might seem expensive. The hardware costs more than several distributed servers. However, z Systems hardware, software, and labor costs are decreasing 17.3% per year, while delivering economies of scale, especially as the workload grows.</p> <p>z Systems delivers higher utilization, lower overheads, and the lowest total cost-per-user of any platform. When all cost factors are considered fairly, the mainframe is often the lowest cost alternative. This subject is covered in greater depth in Module 4 of this</p>

	<p>course.</p> <p>As a result of an internal study, IBM initiated Project Green to consolidate many distributed systems onto Linux on z Systems. IBM is in the process of consolidating 3900 servers onto 16 z Systems servers running Linux on z Systems, decreasing energy and floor space by more than 80%. The electrical power, floor space, and cooling costs for a mainframe often are less than those of distributed servers working a comparable load. Automation and cross-functional staff can manage many Linux images. The incremental increase in staff to handle additional work is much lower than the additional staff required for typical distributed systems.</p>
<p><b>Myth 3:</b> Mainframe legacy applications are inflexible.</p>	<p><b>Reality 3:</b> Competitors like to say that the mainframe is a dinosaur, cumbersome and slow to adapt to survive. Bad analogy: dinosaurs ruled the earth for 160 million years. By this standard, IBM mainframes have a very long future ahead of them.</p> <p>More importantly, mainframe applications written for CICS, IMS, VSAM, and DB2 represent a very significant IT investment for many enterprises. COBOL, now a 55-year-old language, remains of critical importance. New COBOL code continues to be written. With five billion lines of new COBOL developed every year, 80% of daily business transactions are processed in COBOL and 15% of all new application functionality will be written in COBOL. Wow! Does anyone still think of these technologies as a dinosaur?</p> <p>If you were competing against the mainframe to get the client's business, wouldn't you say the same thing? But, that does not make it true.</p> <p>Consider the following real-life customer cases:</p> <ul style="list-style-type: none"> <li>• The world's largest known peak database workload (1.1 billion SQL statements per hour at a leading international package shipping company) is all driven by COBOL. This number grew significantly in the last few years.</li> <li>• COBOL was the driver for the largest banking benchmark ever at one of the largest banks in China: a record 9445 transactions per second (TPS), almost 300,000 SQL operations per second!</li> <li>• One of the largest credit card companies in the world runs 10,000 TPS. The company also runs transactional credit evaluation analytics on every one of the transactions.</li> <li>• A very large American bank runs COBOL at about 5000 TPS. Ironically, this bank's IT leaders have been considering modernizing core systems, and their view is that COBOL is the only environment that will scale to their requirements.</li> </ul> <p>Customers can actually leverage their existing investment on mainframe applications with the latest technologies to their business advantage. For example, CICS Transaction Server 5.1 supports many modern standards and technologies, such as the following:</p> <ul style="list-style-type: none"> <li>• Cloud</li> <li>• Mobile</li> <li>• Web 2.0</li> <li>• Enhanced service-oriented architecture (SOA) support</li> <li>• Business event detection and transmission</li> <li>• CICS Explorer for better system management</li> <li>• Broader and deeper interoperability with other IBM software products, such as the bidirectional WebSphere® Optimized Local Adapter for connecting between</li> </ul>

	<p>WebSphere Application Server (WAS) and CICS, and support for WebSphere Service Registry and Repository to publish and read web service descriptions.</p> <p>Furthermore, many z Systems customers are not taking advantage of development tools for z Systems. Almost all distributed system customers use some form of modern development tools. z Systems also has some very modern development tools available for developers to use. For instance, from the application development lifecycle perspective, Rational® Developer for z Systems (RDz) is a great tool for facilitating and speeding mainframe development, which lowers the skills barrier to getting started. The development and initial testing of the application can be accomplished on the developer's workstation. Production builds and the testing of the builds still have to be done on the mainframe. This is an example of "Fit for Purpose," which results in potential cost savings for customers.</p> <p>Often, new versions or enhancements to mainframe applications are tested side by side with the existing application using logical partition (LPAR) technology. Different versions can run simultaneously. The ability to cut over to a new application and still have the "golden" old version available as a backup is flexibility at its best. No new server or servers have to be configured, just the LPARs.</p> <p>Some mainframe applications can take advantage of specialty engines. This flexibility can add performance without additional software costs.</p> <p>Last, but not least, is the ability to "soft cap" applications at a defined Millions of Service Units (MSU) level to manage software costs. The mainframe's soft capping capability uses a four-hour rolling average, so minor peaks can still be serviced. Soft capping provides the flexibility to run an application to an agreed-upon level of service and fix a "no greater than" cost associated with the cap. This is like having an intelligent car that enables a driver to accelerate onto a freeway, pass other cars safely, and coast downhill at a sustained speed without traveling over the speed limit.</p>
<p><b>Myth 4:</b> Security on distributed systems is equal to or better than security on the mainframe.</p>	<p><b>Reality 4:</b> With increasing scrutiny on security, it is important to note that the mainframe has the highest security rating in the industry.</p> <p>Security on the mainframe is accomplished by a combination of software and built-in hardware functions, such as cryptography. For example, a component of z/OS works with the hardware to prevent one user from any possible contamination or overlay of another user's work. In addition, user authentication and authorization are provided with IBM and other vendor software.</p> <p>Common Criteria Evaluation Assurance Level (EAL) 5+ certification of IBM Processor Resource/Systems Manager (PR/SM) LPAR for the IBM zEnterprise® BC12 was received on February 19, 2013. EAL5+ certification provides assurances that many different applications running in different operating environments in different LPARs on one zEnterprise are secure and distinct from each other. The IBM zEnterprise BC12 now joins the IBM zEnterprise EC12, z196, z114, z10 BC, and previous IBM mainframes as the world's only servers with the highest level of hardware security certification, Common Criteria EAL 5.</p>
<p><b>Myth 5:</b> The mainframe labor pool is shrinking.</p>	<p><b>Reality 5:</b> The truth about the z Systems skills shortage is that while there is not a crisis, there is constant pressure – but no more than any other skill requirement in the industry.</p> <p>The IBM Academic Initiative ensures that a z Systems and z/OS skills shortage does not happen. Since 2004, the program has worked with 1000 schools to educate more than 68,000 students worldwide! Many people in the mainframe community are using the IBM</p>

	<p>Academic Initiative to assist and enable schools to teach mainframe skills.</p> <p>The program works because of the following three-way collaboration among IBM, universities, and businesses that need mainframe skills:</p> <ul style="list-style-type: none"> <li>• Companies drive the need for mainframe-educated students at local universities.</li> <li>• IBM contributes resources, including educational materials, training of professors, ambassadors who can teach or lecture, and mainframe hardware and software.</li> <li>• Universities build mainframe courses that train students for successful careers.</li> </ul> <p>An article in <i>ComputerWorld</i> entitled "Bank of America touts mainframe work as a safe career" illustrates the three-way collaboration by outlining how IBM continues to update the mainframe with the latest technologies, how the mainframe remains a core system for Bank of America, how the mainframe is the safest place for core applications, and that there are always many mainframe jobs listed at Monster.com. The article also discusses how the IBM Academic Initiative has been very influential in turning around potential shortages of mainframe programmers by helping to develop new training programs and courses at many universities.</p> <p>Following are a few milestones of the worldwide IBM Academic Initiative program:</p> <ul style="list-style-type: none"> <li>• More than 1000 schools in 71 countries participate in the program</li> <li>• More than 68,000 students have participated in the "Master the Mainframe" contest</li> <li>• IBM Job Board (student resume database) is available</li> <li>• Entry Level Mastery Test validates student skills</li> <li>• Community involvement is encouraged (roundtables, partnerships, and hiring)</li> <li>• Access to mainframes is provided worldwide for teaching (six university hubs)</li> <li>• Fifty courses are available (foundational to advanced)</li> <li>• Ongoing faculty education is available</li> </ul>
<p><b>Myth 6:</b> Migrating applications off the mainframe makes sense.</p>	<p><b>Reality 6:</b> Total cost of ownership (TCO) studies clearly demonstrate that investing in existing mainframe infrastructure is the most effective way to get a positive return on investment (ROI) in IT technology.</p> <p>Here is a common headline you might see in the press: Corporate CIO announces project to get off the mainframe.</p> <p>Here is one you will <i>not</i> see: After three years, millions of dollars, and persistent cost overruns, corporation cancels costly "get off the mainframe" project.</p> <p>In the past, up-and-coming competitors have claimed unsubstantiated cost benefits for their platforms. When these competitors were new to the industry, few companies had enough experience to measure those claims against reality. Now, after 20 years of experience, customers can see that competitors have not really delivered on low-cost alternatives for mission-critical applications.</p> <p>The Eagle TCO team of the IBM Competitive Project Office, which specializes in helping customers understand their IT TCO, has completed hundreds of migration, consolidation, and new workload studies. Often, migrations off the mainframe have transformed into consolidations after the cost levers are identified. The ability to use specialty engines and to virtualize diverse environments with LPAR and z Systems Virtual Machine (z/VM®)</p>

	<p>technology gives the mainframe an edge. Migrating workloads off the mainframe raises the cost per unit of work for the remaining workloads. In addition to higher run (operation) costs for the remaining workloads, migrations often fail because of a number of reasons, including the following:</p> <ul style="list-style-type: none"> <li>• <b>Off-loaded solutions require far more processor cores.</b> Functional separation (including production, development, test, QA, and disaster recovery [DR]) increases the number of distributed cores required. Managing for peak load versus average load increases the number of distributed cores. Segregating applications and functions onto different servers increases the number of distributed cores. Every distributed server processor does its own I/O setups, so it is unavailable for other work while performing these operations. The I/O setup is a time outage that must be planned for, especially in I/O-intensive workloads.</li> <li>• <b>Code expansion can drive high rehosting costs.</b> Conversion to Java is less efficient, typically a four or five times code expansion. Converting an IMS hierarchical database to a relational database typically forces a three times code expansion. The mainframe compiler is extremely efficient when compared to other compilers, such as Microfocus.</li> <li>• <b>Missing function can also add cost and complexity to migrating off the mainframe.</b> Typically, batch and DR are optimized on the mainframe using existing hardware or footprints. Distributed systems add more cores, systems, and complexity for batch and DR.</li> <li>• <b>Other TCO considerations.</b> Included in this category is the loss of collocation, which increases response times or resources required, or both. Increased complexity also raises management costs.</li> </ul> <p>For many reasons, mainframe migrations do not make sense. Why try to replicate what is already optimized in the mainframe environment without improving function?</p>
<p><b>Myth 7:</b> The number of applications on the mainframe is dwindling.</p>	<p><b>Reality 7:</b> The truth is that independent software vendors (ISVs) are very enthusiastic about z Systems and IBM continues to aggressively recruit ISVs for mainframe applications. Many ISV applications are packaged into z Systems Solution Editions offerings. Linux and Java have extended the mainframe's application portfolio into what was formerly distributed system exclusivity.</p> <p>IBM has always worked closely with a select set of ISVs who offer application solutions and tools to meet customer business needs. More than 1650 ISVs have enabled more than 6500 applications on the z Systems platform. For detailed information about ISV applications available on the IBM mainframe, visit <a href="#">Mainframe software for IBM System z</a> and select an operating system from the <b>ISV software</b> list.</p> <p>Consider the following facts about ISV applications that run on z Systems:</p> <ul style="list-style-type: none"> <li>• More than 4400 applications are enabled on z/OS: <ul style="list-style-type: none"> <li>○ More than 2100 applications are enabled on z/OS 1.9 and later</li> <li>○ More than 1400 applications are enabled on z/OS 1.10</li> <li>○ More than 900 applications are enabled on z/OS 1.11</li> </ul> </li> <li>• More than 3200 applications are enabled on Linux on z Systems.</li> </ul> <p>More vendors are migrating workloads typically associated with distributed platforms to z Systems, often taking advantage of specialty engines for Java or Linux to run work more economically. For example, SAP and PeopleSoft are two solutions that run on the mainframe and take advantage of many Qualities of Service (QoS), such as superior availability, powerful security, and extensive management tools and processes.</p>

	<p>Mainframes provide an excellent platform on which to run an Enterprise Service Bus (ESB). z Systems supports more than 6500 ISV applications, more than 1650 ISV developers are working on z Systems today, and more than 1000 new and upgraded applications for z/OS and Linux were added in 2013. If the "Right Fit" is AIX® or x86, z13 can also accommodate those applications within a secure private network.</p>
<p><b>Myth 8:</b> Distributed servers use less power than the mainframe.</p>	<p><b>Reality 8:</b> If comparing a single distributed server to the mainframe, this myth would be true. But, when the power consumption of all distributed servers in an IT environment is combined and then compared to the mainframe, this statement is most likely false.</p> <p>Mainframes are more energy efficient because they typically run at a 90% average utilization rate, giving them the best unit of work per kilowatt (kW) in the industry. The mainframe's ability to virtualize, share resources, and operate at high utilization rates enables it to use less power than distributed servers, which have dedicated but often underutilized processor, memory, and I/O resources.</p> <p>Mainframes actually do use more energy than small or department-sized distributed servers. However, mainframes are more energy efficient for large workloads. Comparing distributed server and mainframe power consumption is like comparing a motorcycle's fuel requirements in miles per gallon to that of a bus or freight train; it is a misleading indicator of energy efficiency and costs. (A freight train can move a ton of freight one hundred miles on a gallon of diesel fuel!)</p> <p>Most large consolidations onto zEnterprise or z13 technology use 20% of the energy compared to the latest "green" distributed servers using virtualization.</p> <p>Mainframes can do the same amount of work with fewer engines and less energy because of their energy-efficient sub-system designs, components, advanced energy-saving features, and energy management functions.</p> <p>The power supplies of the mainframe are sized for super efficiency. Many distributed servers struggle to achieve a +80% efficiency of power supplies. Mainframes, for many generations, have exceeded 90%.</p>
<p><b>Myth 9:</b> UNIX® and Windows-based systems deliver the same QoS as the mainframe.</p>	<p><b>Reality 9:</b> Compared to the latest distributed platforms, the mainframe stands out as best of breed for Reliability, Availability, Serviceability (RAS), systems management, and DR capabilities.</p> <p><b>Reliability, Availability, Serviceability</b></p> <p>IBM has a corporate instruction for every generation of mainframe: each successive mainframe model must be more reliable than the previous one. Incremental and breakthrough improvements have been made over 20 generations of mainframes. Fault tolerance, self-healing capabilities, concurrent maintainability, and embedded analytics are characteristics of the mainframe that are lacking in many distributed systems. With the current generation of mainframes, even LPARs can be added quickly and easily. The integration of mainframe hardware, firmware, and the operating system enable the highest RAS capabilities in the industry.</p> <p><b>Systems Management</b></p> <p>Gartner ranks the mainframe as best in platform and operating system workload management. z Systems has many functions and features to maximize the use of resources, whether virtualized or physical. Fault and security isolation are built into the mainframe. LPARs have been consistently certified at a rating of EAL5, the highest level of security by the US government. Fault isolation and self-healing functions have been</p>

	<p>designed into the mainframe for generations.</p> <p>Resources can be prioritized and dispatched according to class. I/O priority queuing enables meeting service levels for critical workloads. Batch times are exceptional using the mainframe. Managing CPU and having charge-back capability are important to many organizations that want to use a shared environment efficiently. With the mainframe, organizations can charge variable workload and cap resources. A four-hour rolling average is used to enable variable workload charging or charging for resource use rather than the potential maximum capacity of a server.</p> <p>IBM Integrated Service Management for z Systems (ISM for z) can transform z Systems into an enterprise-wide service management hub, delivering centralized service management, business resilience, and optimized service delivery across the business. The IBM Infrastructure Suite for z Systems, together with the IBM Cloud Orchestrator, can turn the mainframe into a fully-managed, state-of-the-art, private cloud.</p> <p>Analytics with zAware can analyze log data and predict problems before they occur, saving time and money.</p> <p><b>Mainframe Disaster Recovery</b></p> <p>Part of QoS is protection against platform or site failures. Capacity Backup Upgrade (CBU), Parallel Sysplex®, and Geographically Dispersed Parallel Sysplex™ (GDPS) provide capabilities and alternatives for DR. Mainframe DR has cost and performance advantages over distributed alternatives. Often, no new systems (footprints) are needed for mainframe DR. Engines can be enabled on alternate production and test mainframes. CBU engines are low-cost alternatives for DR when compared to redundant server footprints or capacity that many distributed alternatives need.</p>
<p><b>Myth 10:</b> Distributed database servers are as sufficient as DB2 on the mainframe.</p>	<p><b>Reality 10:</b> With DB2 on z Systems and IBM Business Analytics solutions, users can run queries at “the speed of thought.”</p> <p>For many years, IBM recommended a distributed solution for business analytics. IBM was telling its customers, “If you want to do warehousing and business intelligence [BI], do it on distributed.” Information Management teams, in particular, gave a very clear message to IBM customers that heavy-duty performance analysis and number crunching belonged in a distributed environment, which was also a better price performer. In the process, this created an environment where running BI workload on a distributed system is the default for many customers, and certainly for IBM sales teams.</p> <p>In the last few years, however, IBM has changed its strategy. One of the reasons is that customers were saying, “We have our data on System z, and we want to keep it there. We want the analysis function on the platform, rather than moving the data off.” The key reason for keeping the data on the platform is that delivering the insights back to the customer requires a platform with operational characteristics that include availability, recoverability, and security.</p> <p>IBM had not invested in the research and development for the type of functionality for DB2 on z/OS that it had on DB2 on distributed platforms. This has now changed. IBM made significant changes to DB2 with versions 8, 9, and 10, adding new applications, such as Cognos, SPSS, Query Management Facility™ (QMF™), and Information Server, and investing in new hardware strategies, such as the IBM DB2 Analytics Accelerator. The IBM DB2 Analytics Accelerator, which is built on DB2 and Netezza technology, offers lightning-fast data queries with little waiting for deeper data mining.</p> <p>Today, the data warehouse (DW) is no longer used only for back-office trend analysis.</p>

	<p>The marketplace requires the strengths of z Systems. IBM offers z Systems with its hybrid computing architecture, which shatters the perception that BI can run only on a distributed system.</p>
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