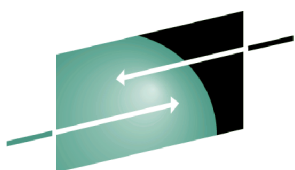# Don't Believe the Myth-Information About the Mainframe

by Janet L. Sun, Immediate Past President, SHARE Inc.

S H A R E

Technology · Connections · Results

When I heard about the **HuffPost article** highlighting a video debunking the myths that Hollywood has been repeating about the mainframe, I was cautiously optimistic. Unfortunately, the writer chose to use only one reference book, and focused on the negative points.

Here at SHARE, we believe the mainframe is the most secure, lowest cost and best performing mixed workload computing platform on the planet. SHARE continues to serve the mainframe community, helping to show our members the best practices for managing the mainframe environment and optimizing the value that the mainframe delivers.

"Most companies don't use mainframes," they said – Seriously? SHARE, the mainframe community, represents more than 20,000 individuals from nearly 2,000 companies. Those companies include: state and federal government agencies, universities, retail, energy, manufacturing, banks, and insurance companies. More specifically:

- 96 of the world's top 100 banks, 23 of the top 25 US retailers, and 9 out of 10 of the world's largest insurance companies run System z

- Seventy-one percent of global Fortune 500 companies are System z clients

- Nine out of the top 10 global life and health insurance providers process their high-volume transactions on a System z mainframe

- Mainframes process roughly 30 billion business transactions per day, including most major credit card transactions and stock trades, money transfers, manufacturing processes, and ERP systems

This doesn't exactly sound like a technology that's no longer in use, or even going away anytime soon. So, what are the other most common myths about the mainframe?

1. Mainframes are old
2. Mainframes don't run modern applications
3. Mainframes are expensive
4. The skills to manage mainframes are not available or you need more people

Mainframes are Old?

Well, the mainframe is celebrating its 50th birthday next year. But, there have been generational differences between the mainframe that was introduced in 1964 and today's mainframe. The automobile is more than 100 years old, but no one suggests that automobiles are old out outdated technology.

Are the cars of today different from the cars of 1964? Absolutely. Well, today's mainframe is faster, has more capacity, is more reliable and more energy efficient than the mainframe of the 60's, 70's, 80's, or even those delivered three years ago in 2010.

The new mainframe delivered in 2010 improved single system image performance by 60 percent, while keeping within the same energy envelope when compared to previous generations. And the newest mainframe which shipped in 2012 has up to 50 percent more total system capacity, as well as availability and security enhancements.

It uses 5.5 GHz hexa-core chips – hardly old technology. It is scalable to 120 cores with 3 terabytes of memory. Clearly larger (more capacity) and faster than anything available in the 60's, with a smaller physical footprint and better energy consumption characteristics.

IBM has a corporate directive 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, and concurrent maintainability are characteristics of the mainframe that are lacking in many other systems. The integration of mainframe hardware, firmware, and the operating system enable the highest reliability, availability, and serviceability capabilities in the industry.

Mainframes Don't Run Modern Applications?

Mainframes have been running Linux workloads since 2000 and the Linux workloads on the mainframe are growing. From IBM's 2012 Annual Report – "The increase

in MIPS (i.e. capacity) was driven by the new mainframe shipments, including specialty engines, which increased 44 percent year over year driven by Linux workloads."

The mainframe also has a specialty processor that is specifically intended to run Java workloads. How about Hoplon Infotainment running their TaikoDom game hosted on System z?

You say that green screens are ugly? There are graphical interfaces and even iPhone and Android apps that put a pretty face on the green screens for those who those who are trying to use business applications. More and more, interfaces that the general public is familiar with and comfortable with are being utilized even in business contexts to make access to the mainframe easier and more transparent (how many people are accessing a mainframe on a regular basis today and don't know it? - most of them!)

Those who manage the mainframe often prefer the green screens. These are incredibly fast interfaces that can deliver sub-second response time. When is the last time you clicked your mouse and got sub-second response from your Java application?

What about "cloud"? The "cloud" is actually an online computer environment consisting of components (including hardware, networks, storage, services, and interfaces) in a virtualized environment that can deliver online services (including data, infrastructure, storage, and processes), just in time or based on user demand. By this definition of Cloud Computing, System z has been an internalized cloud for decades.

System z has been "in the clouds" for more than 40 years! Whether you are thinking cloud computing (e.g Infrastructure-as-a-Service) or simply server virtualization, System z is a great platform. Instead of running dozens of virtual images, a mainframe can run hundreds. And besides Infrastructure-as-a-Service, you could also implement Platform-as-a-Service or Software-as-a-Service.

Starting in 2007, IBM embarked on its own server consolidation project called "Project Big Green". They consolidated 3900 servers onto 16 mainframes decreasing energy and floor space by more than 80 percent.

The electrical power ($600/day vs $32/day), floor space (10,000 sq ft vs 400 sq ft), and cooling costs for those mainframes were less than those of distributed servers handling a comparable load. In addition, those

mainframes required 80 percent less administration/labor (>25 people vs <5 people); "Mean Time Between Failure" measured in decades for mainframe vs months for other servers.

Need more? Ask City and County of Honolulu about their cloud implementation on System z. They had issues with planning, deployment, and maintenance of hardware and services in a Windows environment which took weeks. They created a mainframe cloud environment and offered 'Software as a Service' to other departments.

They saw immediate benefits:

- Planning, deployment and maintenance of hardware and services can be done in **hours vs. weeks**
- Lower costs enable the expansion of database services for a **fraction of the distributed costs**
- **Improved performance** and response time to end users
- **Sharing of resources** with other state wide jurisdictions

Mainframes are Expensive?

Think that mainframes are expensive? That depends on what you're looking at.

If you are looking at acquisition hardware costs, certainly a single mainframe costs more than a single server or even several servers. But, you would certainly need more individual servers to match the compute capability of a mainframe. Add to that the idea that software and labor costs for servers grows linearly – the more servers you add, the more software licenses and the more system administrators are needed. And yet, the mainframe 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 usually the lowest cost alternative.

Often when considering the cost of the mainframe, we only look at the initial hardware purchase and overlook the on-going maintenance costs. If you have a hundred servers, that's a hundred times more chances that something is going to break, so you need an army that has to be ready at any time to fix hardware.

Each of those servers has an operating system on it, and all of them need patches, upgrades, and applications

deployed to them on a regular basis. So, you need another army doing all of that.

Then your applications are spread all over the place, so when the software fails or gets overloaded, it takes an army of people to monitor the applications and figure out where the problem is. Servers are cheap to buy, but then your savings get totally blown away by needing all of these people to run and monitor them.

And don't forget electrical and air conditioning costs also increase when you add servers. Then, you need to make sure that you count ALL the servers?

There is a story of one company that thought that it had only 24 UNIX servers. On further examination, it turned out those were just the production servers. Adding development, test, and failover servers more than doubled the count yielding 49 servers. So, the hardware, software, energy, and labor costs were higher than originally calculated.

The Skills to Manage the Mainframe are not Available or You Need More People

As we have already seen, it takes fewer people to manage a mainframe than it does a set of servers delivering comparable capability. Do you need specialized skills to manage a mainframe? It depends.

If you are managing Linux on the mainframe, you will find that Linux is Linux regardless of platform, so if you can manage Linux on Intel, you can manage Linux on the mainframe. This means those students coming out of universities that know Linux can, with very little additional training, manage a Linux on the mainframe environment.

In addition, IBM has been investing in increasing the available skills. The IBM System z Academic Initiative ensures that a System z and z/OS skills shortage does not happen. Since 2004, the program has worked with 1,000 schools to educate more than 50,000 students worldwide! Many people in the mainframe community are using the System z Academic Initiative to assist and enable schools to teach mainframe skills.

Then there is SHARE's zNextGen community that

connects more than 900 young mainframe professionals from over 24 countries. And don't forget the two annual SHARE conferences and year-round webcasts, which offer hundreds of hours of mainframe skills training and numerous opportunities for peer networking.

There is plenty of access to the skills required to manage a mainframe and scores of experts who are happy to share their knowledge and experience. Being well-versed in mainframe technologies is looking like a pretty good career choice for those looking to make a valuable contribution to any one of a number of industries or even society in general.

Why Attack the Mainframe?

In the early 90's pundits predicted the end of the mainframe, and the media piled on.

The mainframe was an easy target. It was not well understood by the general public (and still isn't, as demonstrated by the video and HuffPost article); it has many detractors and few, if any, proponents.

IBM almost stands alone defending the mainframe, and most of its arguments are dismissed as marketing hype. As the mainframe community, we at SHARE support the value that the mainframe delivers and can substantiate IBM's claims.

Are companies running from the mainframe? There are certainly a few who are contemplating or attempting to migrate off the mainframe. But the work being done by mainframes is increasing, not decreasing. Just looking IBM's Annual Reports – 2010 shows a 22 percent increase in MIPS (capacity) shipped over the previous year, 2011 16 percent increase, and 2012 19 percent.

Migrating off the Mainframe?

Moving off the mainframe is not an easy task and should not be taken lightly. It is likely a multi-year, multi-million dollar effort that is fraught with risk.

You've probably seen headlines where a CIO has announced plans to move off the mainframe. You're less likely to see a headline where a CIO admits that they made a mistake and are cancelling a project to move off the mainframe.

There's the example of the company which budgeted $10 million for a one-year migration from a mainframe to a distributed environment. Eighteen months into the project, already six months more than planned, the company had spent $25 million and only managed to offload 10 percent of the workload. In addition, it had to increase staff to cover the over-run, implement steps to replace mainframe automation, acquire additional distributed capacity over the initial prediction (even though only 10 percent had been moved so far), and extend the dual-running period (at even more cost due to the schedule overrun). Not surprisingly, the executive sponsor is no longer there.

What is the business purpose for moving? Herd mentality? Everyone else is doing it? We've already seen that many companies still use mainframes, and are continuing to invest in mainframes.

Lower costs? Which costs? We've seen that looking at Total Cost of Ownership (TCO), including on-going software licenses, maintenance, energy and air conditioning costs, and labor costs, the mainframe is often less expensive. IBM has conducted nearly 100 studies comparing costs for companies that have considered re-hosting applications on distributed servers. The average cost of the distributed alternative is 2.2 times more than the mainframe. Only 4 cases showed lower costs for distributed servers.

What about switching costs? New hardware, new software, new processes, testing, training. Not cheap. What was the reason to migrate off? What could possibly go wrong? You can't replicate the same capabilities of the mainframe versions of the applications on the distributed platform? Re-coded applications don't quite work? Other unanticipated problems? What about the other mainframe attributes that you give up?

What Do You Lose When Moving Off the Mainframe?

Efficiency

Typically, distributed servers support a single application workload. How many business applications does a typical company run? Inventory control, order entry, accounts payable, accounts receivable, HR, shipping, business intelligence, research and development (multiple projects). How many servers would be necessary to support these applications?

Distributed systems are best at handling known and expected types of work when serving a particular business application. The mainframe is better at handling different and unexpected types of work when serving various business applications for a large number of users.

Distributed servers are sized for peak demand, and additional server machines are implemented to handle failover, development work, testing, and so forth. Generally much unused capacity exists. Therefore, the average utilization of a distributed server farm is very low, usually in the 5 percent to 25 percent range.

Having this kind of unused or underused performance power and resources is not cost-effective. Dealing with large numbers of servers with low utilization on each one is a situation that most IT executives want to avoid.

The recent trend to virtualize servers, and even the cloud "movement," can be seen as an attempt to consolidate workloads, thus better utilizing capacity and reducing the number of servers. Essentially, it is trying to take a multitude of individual servers and create one giant "super-server" with sharable resources.

In other words, it is an attempt to duplicate what the mainframe already is, and has been for decades. The difference is with a mainframe you're not layering yet another technology that has to be managed and can break down at multiple points on top of the one you're already running. Also, the mainframe has been optimized for managing multiple disparate workloads. There are literally decades of hardware and software innovations that were specifically designed and implemented to ensure that the modern mainframe is the best "mixed workload" server on the planet.

Security

With increasing attention on security, it is important to note that the mainframe has the highest server security rating in the industry. The **Evaluation Assurance Level** (EAL) of an IT product or system is a numerical grade assigned following the completion of a Common Criteria security evaluation, an international standard in effect since 1999. IBM mainframes have EAL5+ certification. What does EAL5+ mean? - "The intent of the higher levels is to provide higher confidence that the system's principal security features are reliably implemented".

Security is built into every level of the mainframe's

structure, including the processor, operating system, communications, storage and applications. Security is accomplished by a combination of software and built-in hardware functions, from identity authentication and access authorization to encryption and centralized key management. Despite the way Hollywood portrays the mainframe, in reality there has never been a reported incident of a mainframe being hacked or infected by a virus.

Reliability

The mainframe has a high "Mean Time Between Failure" – in other words how long, on average, before it fails. For the mainframe, this is measured in decades. The mainframe has unmatched reliability and security, which contribute to its 99.999 percent availability, commonly called "the five nines," or high availability.

99.999 percent availability means near continuous operation with unplanned downtime of only 5 minutes over the course of a year. Quick recovery and restoration of service after a fault greatly increase availability.

Next time you are trying to get money out of an ATM, buy stocks, reserve an airline ticket, or pay a bill online, think about how important reliability really is. How much does an unplanned outage cost? It depends on the industry, but can certainly be millions of dollars per hour. And this is not just lost sales and revenue, but also affects company image and reputation.

To enhance this reliability, the mainframe has the concept of non-disruptive hardware and software maintenance and installations. This allows installation and maintenance activities to be performed while the remaining systems continue to process work.

The ability to perform rolling hardware and software maintenance in a non-disruptive manner allows businesses to implement critical business functions and react to rapid growth without affecting availability of business functions.

Mainframe Upgrade

In addition to utilization of distributed servers and storage and workload consolidation, the hardware and maintenance TCO category also includes the reduction of the mainframe net present value costs through trade-in value. With distributed servers, companies often do not consider the asset disposal costs of aging or obsolete equipment.

Growing companies typically receive credit for existing MIPS (i.e. capacity) investments, and a full trade-in value applied to upgrade and grow MIPS.

When companies upgrade to the next generation of distributed systems, the lifetime of the system is typically three to five years, and they must repurchase the existing processor capacity, plus any growth. The long-term TCO implications of this can be significant.

One Reason to Consider

Perhaps one reason that companies are considering moving off of the mainframe is that they don't want to be held hostage by IBM. That's where the user community can help. Representing over 1,800 of IBM's largest customers, SHARE helps ensure that IBM continues to deliver value for the dollars they charge for hardware and software. SHARE also drives requirements into IBM to make mainframe hardware and software more usable and continue delivering return on investment.

Final Thoughts

Even though the mainframe concept dates back to the 1950's – with the latest generation tracing its roots back to 1964 – it has gone though many significant changes while continuing to support applications that were created decades ago. Today, mainframes support Linux and Java and many significant initiatives including cloud, mobile computing, Big Data, and business analytics. In the past, mainframes were large and had special cooling requirements; today they are not much bigger than a large refrigerator and can run anywhere. Next time you come to a SHARE meeting, look at the mainframe that we run in a hotel ballroom. It will be sitting in an approximately 10x10 corner of one of the exhibit booths.

There are certainly business concerns that should be evaluated (and re-evaluated often) as to choice of computing platform for running today's businesses. The choice of using a mainframe is not an either-or proposition.

Mainframes and servers can happily coexist. There is a role for the mainframe and a role for servers. Myths about the usability or viability of the mainframe should be ignored and the business drivers (cost, benefit, and risk) for considering switching technologies need to be carefully considered.
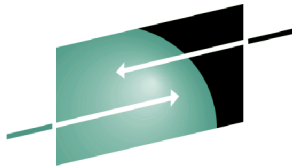
About SHARE Inc.

SHARE Inc. is an independent, volunteer run association providing enterprise technology professionals with continuous education and training, valuable professional networking and effective industry influence.

Participation in SHARE provides the opportunity to build relationships with a diverse community of IT professionals, enhances your professional development, and positions you as a thought leader in the industry.

For more information, contact SHARE Headquarters at:

SHARE Inc.
330 N. Wabash Avenue
Suite 2000, Chicago, IL 60611
312.321.5160
SHAREHQ@SHARE.org
www.SHARE.org

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