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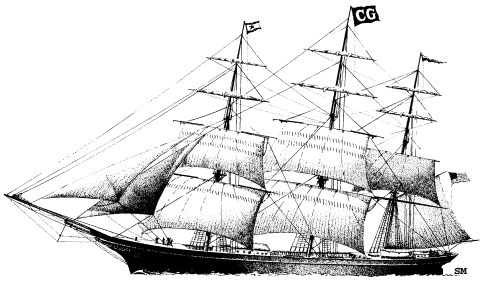

Navigating Information Technology Horizons℠

Published Since 1993 | Report #TCG2009009 | February 28, 2009

The Mainframe at 45 Delivers Thirteen Dimensions of Excellence

Analyst: Mike Kahn

Getting Older, Yet Wiser and Better

True confession: I recently turned 60. *A milestone?* Yes, as I have lost some peers along the way and I reach this round number in good health. *A significant milestone?* Well, maybe, *but which one?* That's where this story gets personal, as it is all so relative to other facts beyond just my years of existence. For me, maybe with some mild delusion, I have decided to label my recent birthday as my *mid-life milestone*. *Am I saying that 60 is the new 45?* For me, the answer is yes. When I was 45, I had no time for a mid-life crisis, or even recognition that, under the best of assumptions, I had completed the first half of my journey. In 1994, I had two kids ten and younger and Clipper was in its second year. Everything seemed overwhelming, physically and mentally. I didn't have time to reflect on what I had or hadn't accomplished, or fret about what was or what might never be. Now, with my children grown up and independent and Clipper having recently made it to *Sweet Sixteen*, I have the time to reflect. I could chronicle my journey, with the details of each forward and backward step, but that isn't the important metric. Really, it is about where I am today, what I am contributing, and where I am headed.

The same is true for IBM's mainframe, which soon will celebrate its 45th anniversary. As far as computers go, it is, rightly, the oldest surviving general-purpose computer architecture. Like so many old dogs, many presume that it has to be *over the hill*, just as I can personally attest when I enter a room filled with young computer engineers. I've seen the looks many times: *what can you possibly know that is relevant, old man?* With this assumption come a slew of accusations: *you must be generally unaware of what's new, you must be generally out-of-date technologically, you must be generally unwilling or unable to learn new tricks, etc.* This might be described, colloquially, as *stuck in the past*, the often-matching bookend to *being over the hill*. *Am I talking about me or the mainframe?* The answer is both, but the mainframe has the better story to tell at its 45th anniversary.

Five years ago, I wrote a *Captain's Log* focusing on the mainframe's 40th anniversary entitled *The Beginning of I.T. Civilization — IBM's System/360 Mainframe*.[1] Therein I reflected on my interesting journey with the mainframe, beginning with my first encounter with a System/360 in 1966. Since 1994, I have written many times about the mainframe, and in each I have explained, and repeated, why it seems to be misunderstood by many, mostly younger folks, who have presumed that it must be *over the hill, out of touch,* or *dead as a dinosaur*. I will spare you from what has become a standard set of sermons from my pulpit here at Clipper (but I will provide links to some of them, and some other Clipper reports, at the end of this paper). The bottom line is always the same – *don't criticize what you haven't taken the time to understand*.

In human years, 45 is mid-life, but the mainframe isn't human. While it isn't biological, the mainframe has taken on a life of its own, with many interesting twists and turns over ten generations, but without the biological parameters of aging. This is the most important statement in this paper. Everything else that follows supports this premise. Unlike living organisms with a biological clock ticking down from its

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[1] Available at http://www.clipper.com/research/TCG2004028.pdf.

birth, the mainframe gets better with each passing year. **After 45 years, it is safe to declare that the mainframe is not getting older, it keeps getting better.** Not only is it getting better with respect to it's prior generations, it remains the paramount computer system, when compared to others. Read on to find out why.

The Origins of Species

IBM's mainframe, whether the current generation of *System z10*s or one of its earlier incarnations, is different from most other servers. Some critics would suggest that it is antiquated. Others might say that it is an oddity, just because it is not like that with which they are familiar, whether referring to its different vocabulary (e.g., MIPS, DASD, FICON, "engines", and so many more), operating systems (z/OS, z/VM, etc.), or unique pricing algorithms. Regardless, in numerous important ways, it is unlike most of the more-familiar computer systems.

These differences run deep (i.e., they go beyond the vocabulary) and are grounded in the DNA of the architecture and principles of operation conceived in the first generation of *System/360*, which has been extended, enhanced and improved over the last 45 years. Unlike industry standard servers that are first defined on the hardware compatibility that they must deliver (e.g., Intel "x86" 32- or 64-bit compatibility), the mainframe's hardware architecture and principles of design and operation have been different, have been evolving in different ways, and will continue to evolve while marching to the beat of a different drummer. **While there is a long history of backward compatibility on the mainframe, its instruction set and its purpose have been enhanced and extended along the way to meet evolving needs.** This is like new genes being added to the DNA of its ancestors, in order to deliver an improved, more useful, and more sustaining organism. [2]

Using this month's celebration of Charles Darwin's 200th birthday and, later this year, with the 150th anniversary of the publication of his *On the Origin of Species* as a backdrop, it is appropriate to talk about the origins of today's computer systems and about Darwin's principle of *natural selection*, more commonly recognized as *Survival of the Fittest*.[3] Clearly, the mainframe has survived and thrived. Clearly, it has evolved and has morphed, many times and in many ways. **The mainframe's superior capabilities represent what may be the pinnacle in the evolution of this species.**

However, just like on Planet Earth, systems diversity is everywhere. **Diversity is good, in biological species and for computer systems. Those most fit for specific purposes will survive and continue to evolve and prosper.** Those that can't find their special niche in which to survive (and prosper) eventually will be relegated to history.

Biological evolution depends on diversity. So does enterprise IT infrastructure. If the idea of *survival of the fittest* implied absolute dominance to the exclusion of all others, there would be many fewer species on Planet Earth. **However, a species can survive and thrive if it is clearly fit for specific purposes. This is true for computer systems, as well.**

In Search of Excellence

What makes a species particularly fit for specific purposes? The answer is *excellence, where it counts most.* The effects of anomalies and flaws are minimized when excellence dominates.

In order to explain the survival of the mainframe (from 1964 to the current *z10*), we need to examine its dimensions (characteristics) of excellence. To limit the length of this paper, only thirteen dimensions are discussed below. You might say that each represents a point in *The Law of Systems Excellence*. An excellent system is:

- *Energetic*
- *Efficient*
- *Enforcing*
- *Embracing*
- *Enduring*
- *Effective*
- *Economical*
- *Expanding*
- *Evolving*
- *Encompassing*
- *Elegant*
- *Exceptional, and*
- *Extraordinary*

Clearly, as you will see, these dimensions are intertwined and the parameters of excellence are multiplicative.[4] Do all of these well and you've got a winner! So let's move onto exploring each one and discussing how the mainframe measures up.

The Excellent Mainframe

As you will quickly conclude, this paper is not about the features and functions of System z10.

[2] The biological analogies used in this paper are intended to help the reader understand what makes a mainframe different, and better. It is not intended to be scientifically indisputable from all perspectives, especially since there are many opinions regarding the nature and evolution of biological organisms.

[3] For more information on Darwin and the anniversary celebrations, see http://www.darwin200.org/.

[4] And, as you probably noticed, the parameters of excellence all begin with the letter "E"!

While I will discuss many of them, they will be used as examples. For more detailed explanations, please consult IBM's web site and documentation, earlier Clipper publications[5], or contact me. Read on to understand how the mainframe excels in each of these thirteen critical dimensions, and let's begin with an equine analogy.

1. z10 is Energetic

These days, we all seem to be obsessed by *performance*, which might be described as *achieving a goal with speed*. Of course, most of us really are obsessed with *high performanc*e, so we begin by looking at the *energetic mainframe*.

A horse that runs the fastest or the longest or carries the greatest load demonstrates superior fitness for its specific purpose. Let's call this being the best at being *energetic*, where the output of the fittest is the greatest. I am not talking about energy consumption here, as in how many bales of hay did the horse consume (energy efficiency will be discussed later, under *Efficient)*. Here I am talking about *doing more work*.

Is there any commerce-focused *scale-up computer system*[6] that can do more work than a mainframe (e.g., carry a larger transaction load)? You might frame this question in terms of total system throughput (say a 64-core solution dedicated to one application) or you can frame it in terms of the number of I/Os that can be processed by a single core.

There are many parameters of load-carrying ability. One is the speed (frequency) of the object, whether horse or CPU. If the horse (but also the CPU) can lay down more "steps" in a given period of time, s/he likely will get to the goal faster, assuming that the stride is competitive. If the horse has a longer stride (i.e., s/he can do a greater distance per step), s/he also will have an advantage. Put them together, frequency and stride, and you have the qualities of a thoroughbred. Add to that the ability to carry a heavy load (like a pack mule) and you've got a genetic goldmine.

Today, the mainframe has a higher frequency (the z10 runs at 4.4 GHz, far faster than *Xeon* or *Opteron* servers), longer stride (gets more work done per cycle because of superior memory-to-memory operations and additional cores dedicated to accelerating I/O and systems management), and carries a mixed workload better than any other scale-up platform. **The mainframe exudes excellence and superiority through its most energetic DNA**.

[5] See the index to Clipper's many articles on servers and operating environments at http://www.clipper.com/Clipper_Server_Index.htm.

[6] For a tutorial on scale-up computing, see *Perceiving the Dark Side of the Moon - Knowing When Scale-up Computing Makes Sense* in the September 23, 2008, issue of Clipper Notes, available at http://www.clipper.com/research/TCG2008048.pdf.

2. The Mainframe is Efficient

Here is where the horse's care and feeding come into play. A horse that does the same amount of work with less care and feeding is more efficient than one that consumes more and, thus, is superior. Because of its architecture, component design, policy-driven automation and, most importantly, the very-high utilization levels for its resources (usually greater than 85% and often higher than 95%), **System z10 is more efficient than is any other scale-up server**. It consumes less energy per business transaction and requires less staff attention (for the same workloads) than any other server.

Consolidation is a hot subject, these days. Reducing the number of servers in the data center is critically important, as long as money and energy are saved as a result of the consolidation. So, what makes more sense: consolidating, say 100 Linux applications, from 100 older, less energy efficient under-utilized servers to 10 industry standard servers (using, say, *VMware*) or to a single mainframe IFL (Linux) engine. It doesn't take much calculating to determine that the mainframe consumes less energy. Most likely, it also costs less for the hardware and software and consumes far less staff time for systems administration. **In so many ways, the mainframe exudes excellence and superiority through its efficiency.**

Then there is System z's *shared-everything architecture*, with protection, of course, and intelligence, as well. In this era of consolidation through virtualization, most systems do not offer the elasticity of the mainframe, which allows *overprovisioning*, of several sorts. Here's how this works. In a typical server, the virtual partitions are fixed and rarely change prior to termination (or moving to another server). This means that the resources (CPU share, memory, etc.) are allocated (i.e., reserved), even if the application is not using all of them all of the time. Because there is a tendency to overprovision for the worst-case business scenarios, a lot of resources may be idle (i.e., not really being used).

With the mainframe, these unused resources are put to work on other applications until they are needed. In effect, System z is provisioned to more than 100%, with the defined policies determining what to do when real workloads approach the physical capacity of the machine. Additionally, for a short period of time (up to four hours), Systems z will allow the actual workloads to exceed the allocated cores (assuming that a spare core is available). When this happens, the system alerts the administrator that capacity is being reached or exceeded and that if it continues for more than four hours, the system will either limit access to licensed number of cores (a.k.a., "engines") or, if authorized, allow the enterprise to acquire or lease an additional core (typically for less than a month).

3. The Mainframe is Enforcing

Way back in 1964, the System/360 was the first general-purpose computer, i.e., it was conceived and designed to run multiple applications, of both commercial and scientific nature. To make this bold idea acceptable to the business community that had been comforted by the isolation of its single-purpose business computers, the S/360 architecture had to promise and deliver segregation and isolation of applications. This was part of the brilliant alchemy that the original IBM architects, designers, and engineers had to build into the S/360's DNA. It's been there ever since. (No random or malicious "buffer overflows", if you know what I am implying.) Mainframe hardware and flagship operating environments have been at the highest commercially-available security levels for decades. Security is based on policies, which are managed, enforced, and tracked from a single point of view, the way that it should be done. Enforcing the rules and regulations is baked into the mainframe's DNA. Accordingly, **the mainframe's enforcing ways and frameworks of security demonstrate excellence and superiority.** Its EAL5 security certification (the highest for a commercial system) and a design point of 99.999% (or higher) application availability, put it exclusively in its own class. **While other servers may claim to be *mainframe-like*, System z *is* the mainframe.**

4. The Mainframe is Embracing

In the beginning, the mainframe stood largely isolated, unconnected from networks and other computers. Along the way, a number of standards came and went but some have stood the test of time. These days, embracing standards, in general, and standard applications (as opposed to custom-written applications), in particular, is the name of the game.

While the mainframe might have survived only to run legacy and custom applications, that is doubtful. Its resurgence and growth are due, in very large part, to the increasing openness of the mainframe to the outside world. The mainframe's traditional workloads and its new horizons are intertwined. The more open to external involvement the mainframe becomes, the more valuable it becomes to the enterprise. **By embracing standards and standard applications (while retaining is high levels of protection), the mainframe became more excellent.**

5. The Mainframe is Enduring

There are three parameters of endurance. First is the *longevity* of the operating environment and underlying platforms. Second is the system's ability to operate without incident and to deal with something "going wrong" (i.e., a mix of *high availability* and *recoverability*). Third is the system's ability to migrate smoothly to a successor, especially the next generation (i.e., *transferability*). Each will be discussed.

Longevity

The 45th anniversary says it all – decades of compatibility. Of course, no one has been running the same machine for 45 years but applications written decades ago are still running in production. These so-called *legacy applications* often are belittled but the return on initial investment has been outstanding. No wonder that many enterprises don't want to give up their old applications.

The mainframe's architecture, although continually improved and updated by enhancements over the years, essentially is enduring. *If it were reinvented today, might it look different or use different words to describe it?* Yes. *Would it be fundamentally different in terms of approach to providing the best enterprise system for transactions and mixed workloads?* Probably not, because it was well conceived decades ago.

Availability and Recoverability

The mainframe is the king of high availability. Many data centers go through years without an unplanned outage and planned outages, which at one time were more commonplace (really out of conservative operational habits), now are needed very infrequently. Today's mainframe is exceptionally *reliable*, at the component level, and is exceptionally *resilient*, when something goes wrong. When something fails, applications typically continue to run – on spare components – with no noticeable performance degradation to the end users. These spare components can be in the same box, in a box across a river or campus, or even a box in a disaster recovery (i.e., more remote) datacenter.[7]

Even applications that once required a mirrored server are reconsidering that need. If outages are rare and data is not lost, why spend twice as much?[8] (This is like buying twice as much life insurance as you need, especially when you know that, because of your family history and DNA, you are likely to outlive your peers. It might pay off but it doesn't represent a wise investment.)

Transferability

The mainframes enduring qualities extend beyond architecture and physical servers. Most servers are replaced on a three-or-four year cycle, largely because the newer models are faster, better, and, often, carry a lower total cost of ownership. Usually, a gargantuan, disrupting effort is required to move applications from the old servers to the new ones. While you might be thinking that this will be made easier with today's virtualization software, it might actually be more complicated with that software, because most virtualization is based on creation of

[7] The laws of physics still apply. Beyond 100 kilometers, there are distance-related delays.

[8] Actually much more, because of the mechanisms and software required for mirrored synchronization.

fractional partitions and assignment of applications thereto. Unfortunately, when the new server comes along with better performance, more memory, etc., the fractional determinations may require manual sizing and transitional intervention. With the mainframe, transition to the next generation server usually can be done without an outage. Because of this, **applications on the mainframe are also more enduring**.

6. The Mainframe is Effective

At the end of the day or end of the quarter, the elegance of a computer system gives way to how well it runs its intended applications. While infrastructure specialists, like me, may see the world from the bunker of the data center and find unlimited metrics to measure and optimize the assets and staff of the data center, that perspective is too restrictive and too self-centered. Yes, it is important. Calculating ROI on infrastructure provisioning and management is necessary. However, if you lose track of the applications and business metrics that make the enterprise go, you are unable to keep track of the real measurements of the IT infrastructure's effectiveness.

Without question, higher-value applications tend to migrate, naturally, to the mainframe, when one is present in the data center.[9] *Why is this so?* First are the obvious reasons. The less-important applications might not be critical enough or worth enough to justify what might be seen as better qualities of service (QoS) and, possibly, higher costs. At the hardware level, it might not make any sense to run your file and print servers on a mainframe. Beyond the quasi-emotional argument of "all I need is *good enough*" comes the very practical question of "how much are you really paying for *good enough*, including the energy?" If you are now forced into deploying many print and file servers in virtual containers on multi-core servers, and have to worry about managing, updating, protecting, and sharing all of the files and printers, maybe the argument against the super-consolidating mainframe needs reconsideration.

But what about really important (i.e., mission-critical or even business-critical) applications? How important is it that they are available, scalable, protected, etc., under the realities of varying inter-dependencies and external factors? Obviously, this is most important. *Is it worth paying more for your key applications to be effectively deployed under these circumstances and assumptions, even if it costs a little more?* Yes. These applications are not about the cost of delivery but about the cost of not being able to deliver when the going gets rough. This is why z9s and z10s are running the most important business applications. You might not choose to run your web servers on z10, although you possibly could justify it on a nearness-to-data-basis, but **you would be foolish not to run your critical, high-volume, high-compliance, and highly-sensitive applications on a mainframe.**

When an auditor asks if you have done everything possible to do this right, what are you going to respond? "I thought that what we did was good enough" usually just won't cut it, especially when it may not have cost any more than doing it the *good-enough* way. **Accountability is an important indicator of effectiveness and effectiveness is a main attribute of the mainframe's excellence.**

7. The Mainframe is Economical

I bet you thought that *expensive* was going to be one of the dimensions. Well, *expensive* is in the eye of the beholder. Compared to "industry standard" systems, the z10 may look and feel expensive to many. So does getting an MBA from a top-tier business school. The issue isn't just what it costs but what it is worth. *What value does it deliver, in terms of the return on investment?*

If it does more work, does it better, requires less surround software, runs at a higher level of utilization with much less risk, and consumes less energy and staff attention, you need to include that in the denominator before you divide it by its costs to get *Bang for the Buck*. There has been significant growth in mainframe MIPS during the last five years. *Do you think that mainframe-owning enterprises would be making these kinds of investments just to keep running legacy applications?* I don't think so.

Given that the majority of the new (incremental) MIPS is delivered on specialty engines[10], with Linux (IFLs) being the most popular, it must be economical for what it delivers. The devil is in the details.

For example, with the exception of the *Integrated Coupling Facility (ICF)*[11], all of the specialty engines (cores) upgrade without additional cost. What does this mean? If you bought a Linux, Java, or database engine for a z9 and then step up to a z10, you will get a much faster and more capable Linux, Java or database engine in your new z10, without extra cost. Not only do you not have to keep paying to upgrade your processor cores every three or so years (as you rip and replace to get the latest server technology), which is common with industry-standard servers, your prior investment returns big

[9] Might this be akin to Darwin's *Natural Selection*?

[10] System z's specialty engines are cores that exclusively execute Java, Linux, or database code or allow coupling between mainframes.

[11] The ICF is used to connect different mainframe engines together, for increased capacity (more scale-up), higher availability (one or more remote targets to handle a fail over), or to share database access.

dividends via the faster engine with free additional capacity. **Rather than running out of capacity and having to throw away your prior generation of servers, you get more processing capacity at no extra cost. This is one of those *accounting anomalies* that seem to be closely held as a competitive advantage by mainframe-loving enterprises.**

While you and I may wish that IBM would run industry standard benchmarks, like *SPECint or one of the Transaction Processing Council's benchmarks*, IBM's standard response is worth repeating here. *Very few customers run a singular, standard workload on a mainframe. z10 is the master of multiple, simultaneous workloads being driven to dynamically-changing policy objectives. Running a mono-dimensional benchmark just won't demonstrate the real value of the platform.* The bottom line to all of this is that you've got to test your workloads on a mainframe to determine the benefits and the costs. If you have decimal workloads, variable-but-high I/O requirements, big databases, interdependent applications (like with SOA), lots of mashups, etc., there are many advantages to running on the mainframe. If you have them all, the benefits are even better. **This is why *the economical mainframe* is not an oxymoron. It *can* cost less**.

8. The Mainframe is Expanding

Once upon a time, a 3- or 5-MIPS mainframe was considered to be *giant sized*. Back then, who could have imagined the need for 10,000 MIPS and more[12], as more than a few enterprises do today? In biological terms, this is enormous growth, not in terms of the number of mainframes that exist but in the vastness and complexity of their ever-expanding neuro-network structures. **With each new generation, the mainframe has continued to expand its offering and possibilities.**

Like the ever-expanding stellar universe, bigger mainframes allow more workloads, interrelated or not, to be encompassed under its gravitational pull. But unlike a black hole, the mainframe is not a one-way street.[13] What comes in, may bounce around and interrelate, but eventually it comes out! The mainframe's domain is not limited to a singular existence, even though there are many enterprises that will never be able to consume a fully-populated z10. **With Parallel Sysplex, now enhanced with Infiniband connectivity, the resulting network of mainframes can be operationally mammoth, yet still under a single point of control, a sort of an ever-expanding hive of possibilities!**

Just a year after announcement, z10 EC's 64 engines no longer seem like a lot of cores, and more are expected in the next generations, due to certain physical limits of scalability being reached on a per core basis. **Whatever the number of cores that need to be amalgamated to serve the enterprise, the mainframe will continue to expand to meet the insatiable needs of the largest enterprises.**

The role of the mainframe has been expanding, as well. As has been shown in recent years, the mainframe has a role in hybrid systems, with front ends being serviced by industry standard services, say in a *BladeCenter*, and the backend being accelerated by high-performing *Cell* processors. **z10 exerts expansive control beyond its physical enclosure to hive proportions. Its universe of excellence is expanding.**

9. The Mainframe is Evolving

The mainframe evolves differently than the supposedly faster/cheaper industry standard servers. Yes, some aspects evolve similarly, as they both use commercially-available manufacturing processes. However, there are major philosophical differences.

If the role of evolving life is to carry the species to an extreme in order to foster domination, one might find a world where there existed a limited number of organisms, each "the top of their line". However, the more-surviving (i.e., better) organisms find ways to extend their influence and benefits to others, who repay the favor by helping them along. Birds are attracted to flowers' nectar and, in return, pollinate on the flowers' behalf, each furthering their on existence, and at the same time, optimizing the other's existence. **The mainframe works well with other servers.**

Additionally, the mainframe's domain has been expanded by the specialty engines for Linux, Java, and certain database workloads. This is a broadening of the mainframe's genetic code by incorporation of "external DNA". While originally seen as a platform for "mainframe operating systems" like z/OS, z/VM, z/VSE, and z/TPF, it is now seen also as a place to run "open applications" of the more contemporary sort, which run on Linux or execute Java.

Furthermore, many major applications have been rewritten or ported to these open vehicles, and the mainframe may be the best place to host them. A very good example is Oracle's database management system. Consolidating many databases now on many older, distributed servers to a Linux engine (IFL) on a mainframe likely will improve performance and cost less. *Who knows where the mainframe will next evolve?*

Also, since the z800 was unveiled in 2002, IBM has offered a line of "less endowed" *Business Class (BC)* mainframes to complement the high-end mainframes, most recently dubbed as *Enterprise Class* (as

[12] That's 10 billion instructions per second, faster than Congress is spending your tax dollars!

[13] Where everything gets sucked in and never is seen again except for the black hole's increased gravitational pull.

in *z10 EC*). While the smaller mainframes were originally targeted at owners of older, smaller mainframes (who lagged behind in their transitions to current generations), the *z9 BC*[14] and *z10 BC*[15] are really different. They are full-featured mainframes capable of running the primary workloads of modest-sized businesses or targeted applications within larger enterprises. One might say that the BC editions have the same DNA as the EC offerings, but just are scaled smaller. For some enterprises, the BC editions are being considered as "My First Mainframe" by those who have never ventured down this path before. IBM has had a strong reception to its Business Class mainframes in new markets, like BRICK countries[16], where growth is high, in-place infrastructure is inadequate, and centralization of operations and control are advantageous. **Scaling smaller is another aspect of the mainframe's evolution.**

It's often been said that *some applications just run better on a mainframe*. Reasons aside, one might also conclude that some applications just run better on some other server. That's where the advantages of diversity (server heterogeneity), come into play. When you have mission-critical applications to host, the mainframe should always be on your short-list of servers to consider. When you have business-critical applications, you should ask whether there might be important synergy (like shared databases) with mission-critical apps hosted on the mainframe. When it comes to the non-critical apps, you need to look for operational and licensing advantages to determine whether it makes sense to run them on a mainframe. What this all means is that at the same time the mainframe is evolving, your enterprise's requirements, applications, and IT operations are also evolving. This is why you need to ask regularly the question, *Should we host this app on a mainframe?*

Encompassing diversity is another form of evolution and part of the next point, as well. Perhaps because of its longevity, the mainframe has the maturity to proliferate the ways it can meet business needs and those familiar with the mainframe are better able to take advantage of the possibilities. **The mainframe's decades of evolution are at the core of its excellence.**

10. The Mainframe is Encompassing

In the 1980s and 1990s, many saw the mainframe as the place from which to be moving applications. *Why run on a mainframe when you could run it somewhere else?* Since 2000, the winds have shifted direction. Now many enterprises are asking *what applications can I move to the mainframe?* This is due to widespread interest in the benefits of consolidation, to the evolutionary improvements and other factors discussed in this paper, and to new pricing schemes for running new workloads on specialty engines. You might say that **the mainframe has extended its arms and said, "Give me your tired, your poor applications yearning to run better with less staff caretaking…"**

The encompassing extends beyond what happens within the mainframe's "four walls". Running *IBM Systems Director* and other IBM software, **the mainframe can be the hub of control for the other servers within the enterprise**, ensuring security, maintaining auditable logs, enhancing data delivery and sharing, and controlling where and how applications are run.

Both of these encompassing characteristics remind me of the origin of the System/360 brand. The 360 referred to the 360 degrees of a compass, as the S/360 was applicable wherever you wanted to go. **It seems like it is *back-to-the-future* for today's mainframe, delivering excellence for all applications encompassed.**

11. The Mainframe is Elegant

One could spend hours describing the elegance of the mainframe's architecture, current incarnation, and operation, but I will save that for another time. There are several points of elegance worth noting here, however.

First, and foremost, **this seemingly large-sized server is elegantly designed for the specific purpose of protecting and serving applications.** The pieces of its skeleton fit together in such a way that it operates and flexes smoothly. Think about the fluidity of a ballet dancer, and compare that to a robot trying to do the same.

Second, **the mainframe is the current king of and one of the granddaddies of virtualization.** What others hope to achieve someday has been inside the mainframe for one-to-four decades. It does what needs to be done, now. It manages and optimizes more resources, in more ways, and does it better.

Third is the elegance of the conductor of a symphonic orchestra. With one baton, a good set of rules and expectations (a.k.a. policies) and a wink of the eye, the conductor can make each of the pieces and players of the orchestra come together to reach the intended goal, time and time again. If the first violinist is unable to participate, the there is another violinist to take his or her chair. The show goes on without noticeable interruption. **The mainframe's**

[14] See *System z9 BC - A Mainframe for the Not-So-Large Enterprise* in **The Clipper Group Navigator** dated May 23, 2006, and available at http://www.clipper.com/research/TCG2006040.pdf.

[15] See *Having Your Cake and Eating It, Too - Doing More with Less with IBM's z10 BC* in **The Clipper Group Navigator** dated October 21, 2008, and available at http://www.clipper.com/research/TCG2008057.pdf.

[16] Brazil, Russia, India, China, and South Korea

elegance may be the hardest characteristic of excellence to specify or quantify, but when you see that glint in a mainframer's eye, it usually has to do with the mainframe's elegance.

12. The Mainframe is Exceptional

The word *exceptional* has multiple meanings. One is akin to being *extraordinary*, which will be discussed as the next point. Another definition might describe the way that it *handles exceptions*. In the latter case, **the mainframe is better at handling exceptions because it has been designed that way for 45 years.**[17]

The mainframe hardware and software environment has evolved into the most policy-based and policy-driven operating environment. It's really about preparing in advance for something to go wrong and then improving the organism so that this very rarely happens. As organisms age (i.e., live long enough), there is an inevitable breakdown in cellular processes. On the contrary, **the mainframe gets better with time and is better able to respond in a preplanned manner when things go awry.** This allows an MTBF of thousands of years, if you are measuring unplanned outages. They just don't happen very often either, because handling a partial failure almost always can be handled transparently. **Excellence in resilience makes the mainframe exceptional.**

13. The Mainframe is Extraordinary

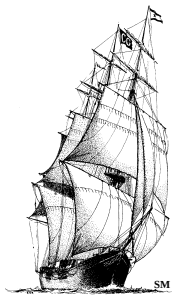
This thirteenth characteristic is the most important. It is the sum of its existence. As we all have learned along the journey of life, being ordinary may have its advantages, if the goal is to hide in a crowd. However, if you want to stand out, you need to be more than ordinary; you want to be *demonstrably extra-ordinary*. The strongest and fittest get to pass on their DNA, their better design, and better ideas. Most "enterprise class" servers strive, continually, to become more *mainframe-like*. They want to be more *extra-ordinary*. **The overarching question is *wouldn't you rather have the DNA of the fittest player on the field, rather than those who strive to become like the fittest?***

In the past, this question seemed to be answered economically and not biologically. It was not that the mainframe wasn't extraordinary; it was that it wasn't affordable for many applications. Cheaper was supposed to be better, in that *good enough computing* was (obviously, but not necessarily) less expensive and, well, good enough. Well, **in these days of hyper-consolidation, hyper-virtualization and huge budgetary pressures, good-enough computing may be more expensive.** The more we learn of about the non-biological organism that we call the enterprise, the more we come to realize that doing more of something isn't always the right answer. It's always about doing things smarter.

[17] While all computers handle exceptions in terms of the handling of errors, the mainframe (with *look ahead* and *look back* capabilities built into its architecture) operates on the assumption that things will go awry and that preparations must be made to handle those occurrences most gently.

Conclusion

Eight pages later, you have transitioned from my mid-life crisis regarding middle age, to the mainframe's 45th anniversary, to Darwin and DNA to the survival of the fittest, and finally, to a review of why the mainframe remains young and contemporary and continues to excel. This interesting story is without an ending[18], as the mainframe's evolution continues and the story broadens as more business and IT folks become mainframe aware, as you have just done by reading this far. *Spread the word!*



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[18] Check back for an update in five years when the mainframe reaches *Big 50* and I hit the *Big 65*!

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The Clipper Group, Inc., is an independent consulting firm specializing in acquisition decisions and strategic advice regarding complex, enterprise-class information technologies. Our team of industry professionals averages more than 25 years of real-world experience. A team of staff consultants augments our capabilities, with significant experience across a broad spectrum of applications and environments.

- ***The Clipper Group can be reached at 781-235-0085 and found on the web at www.clipper.com.***

About the Author

Mike Kahn **is Managing Director and a cofounder of The Clipper Group.** Mr. Kahn is a veteran of the computer industry, having spent more than four decades working on information technology, spending the last 16 years at Clipper. For the vendor community, Mr. Kahn specializes on strategic marketing issues, especially for new and costly technologies and services, competitive analysis, and sales support. For the end-user community, he focuses on mission-critical information management decisions. Prior positions held by Mr. Kahn include: at International Data Corporation - Director of the Competitive Resource Center, Director of Consulting for the Software Research Group, and Director of the Systems Integration Program; President of Power Factor Corporation, a Boston-based electronics startup; at Honeywell Bull - Director of International Marketing and Support; at Honeywell Information Systems - Director of Marketing and Director of Strategy, Technology and Research; with Arthur D. Little, Inc. - a consultant specializing in database management systems and information resource management; and, for Intel Corporation, Mr. Kahn served in a variety of field and home office marketing management positions. Earlier, he founded and managed PRISM Associates of Ann Arbor, Michigan, a systems consulting firm specializing in data management products and applications. Mr. Kahn also managed a relational DBMS development group at The University of Michigan, where he earned B.S.E. and M.S.E. degrees in industrial engineering.

- ***Reach Mike Kahn via e-mail at Mike.Kahn@clipper.com or via phone at (781) 235-0085 Ext. 121. (Please dial "121" when you hear the automated attendant.)***

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