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Mainframes:
## Breaking Through the Cloud and Mobility Era

Mainframes are not going anywhere — they are here to stay.
But the talent pool of proficient programmers is shrinking.

The Prime Years

Before Cloud technologies appeared on the horizon, there was the "Big Iron" that revolutionized businesses during the second half of the 20th century.

The Third Industrial Revolution or the Rise of Electronics gave birth to mainframe computers, which can rightfully be regarded as one of the greatest inventions in world history. Mainframes redefined storage, speed, and performance as it was reliable, available (99.999%), and scalable. However, robust security was its unique selling point, which was needed by financial, retail, healthcare, insurance and other security-avid organizations. That's why mainframe systems are at the heart of almost every critical transaction that ordinary people rely on every day, which include bank wire transfers & ATM transactions, flight bookings, and millions of payments at retail outlets around the world.

EARLY MAINFRAMES
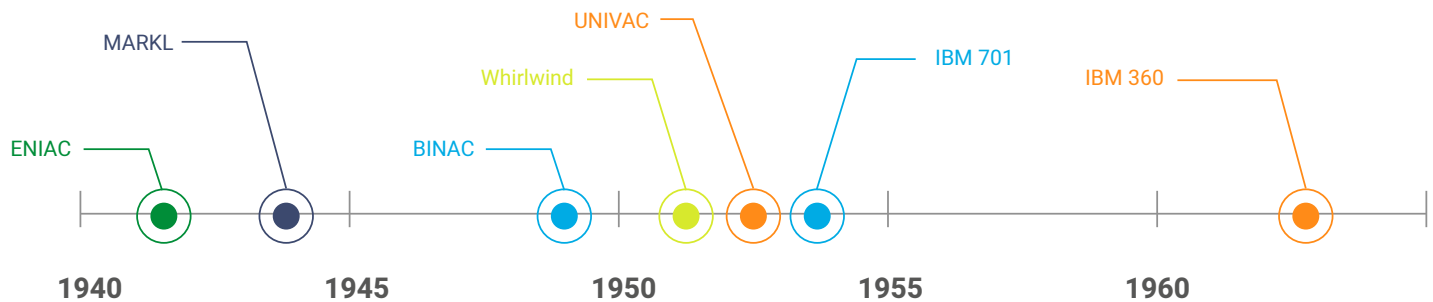
The trials and innovations for mainframes started in the 1940s. However, it was the System/360 mainframe developed in 1960s that paved the way for the ensuing computer revolution. System 360 allowed advanced levels of computation and compatibility that helped NASA to land astronauts on the Moon[1].

Are Mainframes Dead?

Just as mainframes challenged older technologies of the past, today's modern computing applications are trying to steal the spotlight. The main selling point of these newer technologies is their ability to cater to modern market demands. There have been campaigns to "rip and replace" legacy technologies (including mainframe computers) with newer technologies such as cloud and mobile computing that offer greater speed, scalability, flexibility, and portability while compromising security.

[1] https://arstechnica.com/information-technology/2014/04/50-years-ago-ibm-created-mainframe-that-helped-bring-men-to-the-moon/

Mobility has been around since the 1990s, but it was not until the 2000s that it became ubiquitous — thanks to the proliferation of smart devices. More and more employees and customers, particularly those who belong to the younger generations, wanted to transact and stay connected in real-time and without the limits of time and place. Mobility, and now with the aid of the Cloud, helped businesses make this possible.

The Cloud was put on the limelight during the early 2000s and the interest has been growing since then. The Cloud opened up various technological breakthroughs that empowered commercial businesses to cater to the omnichannel needs of today's customers.

Amidst the PC revolution of the 1990s, however, IBM introduced the System/390 family, which became the first mainframe to break the 1,000 million instructions per second (MIPS) mark. And in 2000, IBM started to roll out its eServer zSeries that offers zero downtime and 64-bit z/Architecture (against the 31-bit used in S/390).

Interest Over Time: Mainframe, down; Cloud, up (2004 to 2011)


(Generated using Google Trends)

While Mobility and Cloud were soaring high in the global market (particularly from 2004 to 2011), the interest in mainframes was decreasing over time, hurting the sales of mainframe manufacturers and distributors. Two Hitachi European distributors, for example, had to withdraw from the mainframe market. IBM mainframe sales, on the other hand, were down in the first two quarters of 2000.

If you look at the graph below and see the flat lines that represent interest in legacy programming languages like COBOL, PASCAL, and FORTRAN from 2004 up to present, you might conclude that the "programming dinosaurs" are really extinct. But what could be the reason why many people lost their interest in these programming languages?

[2] https://www.ibm.com/ibm/history/documents/pdf/sys390.pdf

Interest Over Time: Legacy Programming Languages versus Modern Programming Languages (2004 to present)
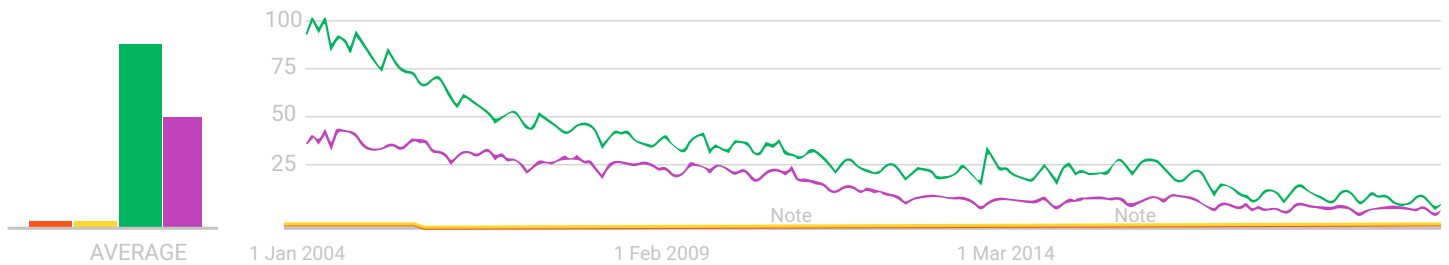
In the same way that end-users want to simplify things, younger-generation developers want to leverage less complex codes or codes that are easier to write (e.g., Ruby) and easier to read (e.g., Python). Several other programming languages have been developed to serve a specific purpose. Java can run in a particular platform or environment. BASIC enables neophytes to easily study codes[3].

But how would the world look like without the legacy programming languages?

Take "COBOL's death," for example. Melissa Burns wittingly described a world without COBOL in her LinkedIn blog post[4], which suggests that it is nearly impossible to simply retire COBOL. She wrote that it would mean an end to 70% of all business transactions. The majority of ATM transactions would fail because 95% of them leverage COBOL. Shopping would be difficult, too, because it powers 80% of all point-of-sale transactions. Its death could also result in a mobile outage because it connects 500 million mobile users every day. It could also put at risk the lives of millions of patients who depend on COBOL applications. Even booking trips could be affected because it enables over 90,000 bookings every day.

Mainframe Is Still the Mainstay

"Just as the car of today differs from the car of 100 years ago so does today's mainframe differ from its predecessors."

-- Janet Sun, IBM's SHARE member

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[3] https://www.whoishostingthis.com/resources/programming/
[4] https://www.linkedin.com/pulse/rip-cobol-melissa-burns/

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The graph below suggests that after the initial interest in Cloud subsided, the mainframe and Cloud interest gap became narrower. Experts also saw that the outlook for the mainframe market was positive in that mainframe computers remain critical for businesses and they are constantly being innovated to suit modern demands.

Interest Over Time: Mainframe versus Cloud (2004 to 2019)
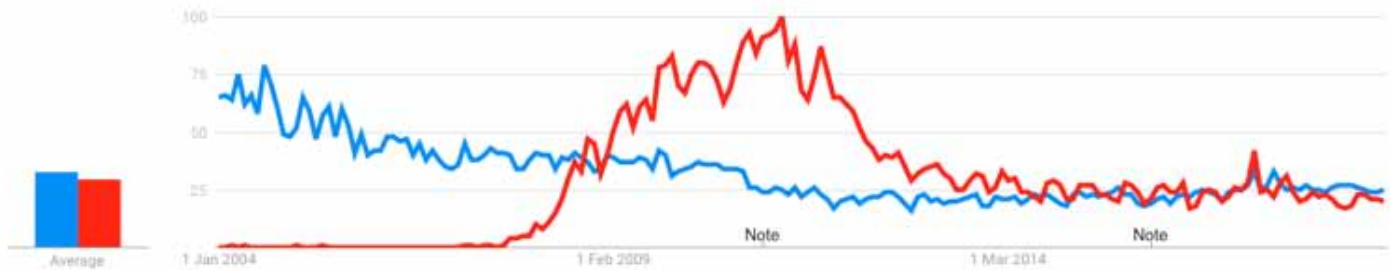
(Generated using Google Trends)

Mainframes Critical for Businesses

According to a Forrester study commissioned by Compuware, 64% of surveyed enterprises will be running more than half of their critical applications on mainframes by 2019 (up from 57% in 2018) and 72% of customer-facing applications at these enterprises are completely or very reliant on mainframe processing[7]. Similarly, the majority of Fortune 500 companies (71%) and 92 of the top 100 banks still use mainframes and run legacy programming languages on them[6].

Why can't these companies simply abandon their mainframes?

- **Cost**. It can be more expensive and riskier to "rip and replace" than keep critical applications running on mainframes.

- **Efficiency**. IBM's z13 system can support up to 10 terabytes of processing memory and from that can be imagined how mainframes handle 30 billion business transactions each day[7].

- **Security**. Institutions like banks, healthcare, retail, and insurance companies trust that their mainframes can ensure reliability and security, which are paramount to their customers. But can the old workhorse truly cater to modern demands?

[5] https://resources.compuware.com/forrester_mainframe_workloads_increasing_staff_losses_unfilled
[6] https://qz.com/emails/quartz-obsession/1316525/
[7] https://blog.syncsort.com/2018/06/mainframe/9-mainframe-statistics/

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Mainframes are Constantly Being Innovated

Demands constantly change, and mainframes have to keep up. In 2010, new mainframes were optimized to perform better than their predecessors. They were faster by up to 50% and more scalable. They have larger memory, a smaller physical footprint, and better energy consumption characteristics.[8]

Mainframe manufacturers keep on experimenting to find out how to enable mainframes to keep pace with new demands. IBM, for one, continually innovates its mainframe products. Its IBM eServer zSeries (IBM Z) has undergone various facelifts and now offers encryption, massive scalability, more capability, and five nines reliability (99.999% uptime). IBM even spent five years to be able to roll out in 2015 the Z13 mainframe, which could process 2.5 billion transactions per day. Two years later, they launched another disruptive mainframe system — the Z14, which could process up to 12 billion transactions a day.

IBM Z mainframes are also augmented to be able to support various disruptive technologies including artificial intelligence (AI). The z14, for one, enables the application of machine learning technology from IBM Watson directly to data residing on the mainframe.[9] This means that data does not have to be migrated to the Cloud before businesses can squeeze value from it. This allows them to cut down costs, accelerate time to insights, minimize complexities, and take advantage of greater data availability in that mainframes hold tremendous amounts of data, most of which cannot be simply Googled or pulled out from the private cloud.

IBM Z mainframes, which have long been useful in handing large networks of connected devices like POS and ATM networks, are also optimized to accommodate the Internet of Things (IoT), which is a more complex, less controlled, and less secure environment because the end points are highly diverse and not known. System Z provides the security, processing horsepower, and scalability required to tame the chaotic IoT environment and obtain value from it. [10]

The modern mainframe is also being supercharged with the following technologies:

- The benefits of containers
- Support for blockchain applications
- New programming languages like Scala and Python

Although the modern mainframe supports new programming languages, various legacy programing languages remain relevant. CIO lists nine legacy programming skills that are still in demand including COBOL, FORTRAN, C, Assembly Language, Pascal, REXX, and Perl. [11] Various mission-critical processes are still reliant on old programming languages. In fact, 220 billion lines of COBOL are still in use today. Eighty percent of in-person transactions use COBOL and 43% of banking systems are built on COBOL.[12] FORTRAN, on the other hand, remains the dominant programming language for high-performance computing tasks such as weather prediction and computational physics.

[8] https://www.zdnet.com/article/with-the-world-embracing-cloud-computing-who-needs-mainframes/
[9] https://www.ibm.com/it-infrastructure/solutions/ai
[10] http://ibmsystemsmag.com/mainframe/trends/modernization/internet-of-things-degilio/
[11] https://www.cio.com/article/3243575/it-skills-training/9-legacy-programming-skills-still-in-demand.html
[12] http://fingfx.thomsonreuters.com/gfx/rngs/USA-BANKS-COBOL/010040KH18J/index.html

The Mainframe/COBOL Brain Drain

Experts think that even though the mainframe outlook is positive, talent shortages can be a major challenge because many mainframe programmers are entering retirement age. According to the same Forrester study, enterprises have lost an average of 23% of specialized mainframe staff in the last five years and 63% of those positions have not been filled.

AVERAGE AGE OF DEVELOPERS

On average, COBOL programmers are most likely to be between 45-55 years old.
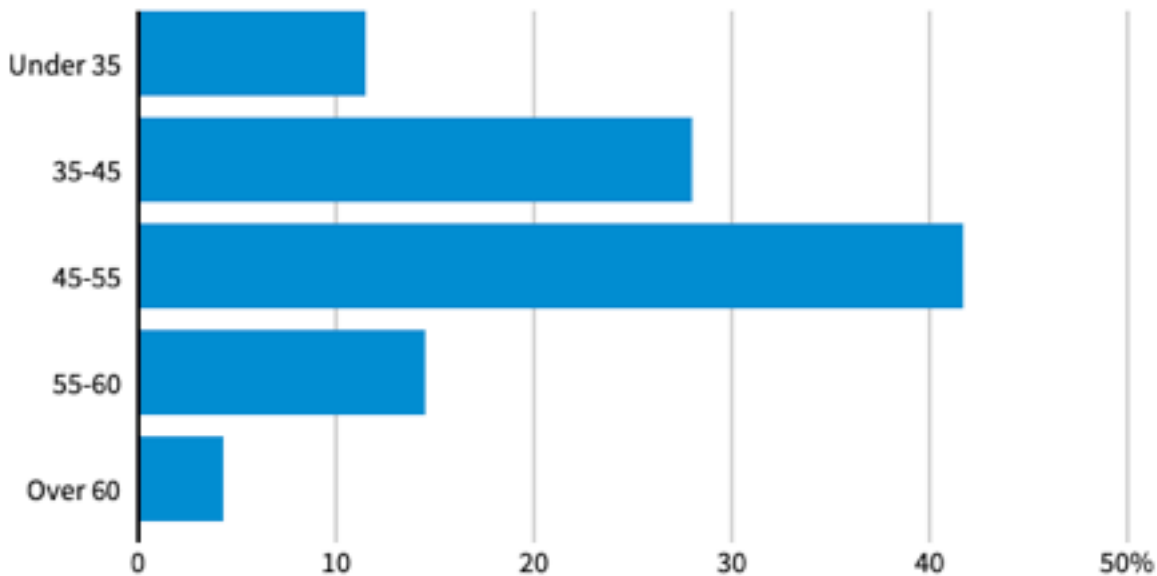

Image adapted from Reuters

Without in-house talent to run and maintain their mainframes, it can be extremely problematic for businesses to implement system fixes to accommodate new requirements. They might resort to bandage approaches that would only make things worse and more complicated.

Take one of our leading American wholesale distribution retail clients for example. They had to upgrade their mainframe to be able to handle larger order quantities and costs. They tried to add a logical layer that converted a single order into multiple orders prior to the creation of the billing amount. This resulted in inaccuracies, additional overhead costs, and lost customers.

To completely solve the problem and enhance the in-house mainframe application, they decided to resize all the required fields in all the Programs, Files, and Databases spanning all the applications. It partnered with Nsight Inc and leveraged its knowledge and expertise in Mainframe programming and Databases. The project efficiently enabled them to remove the logical layer and handle larger order quantities and costs for at least the next hundred years.

Conclusion and Recommendations

Since the latest technologies revolve around Data and considering billions of investments over mainframe, its longevity is no longer in question. However, going forward we could see change or addition in its roles and responsibilities. Also, from the trends, it is clear that mainframe continues to be the most trusted warrior when it comes to processing voluminous data and financial transactions.

We have yet to see how mainframes will be further modernized to keep pace with future technological revolutions. But one thing is certain: mainframes and legacy programming languages are not going anywhere; they are here to stay. However, talent shortages can become the main obstacle in the workhorses' journey. To alleviate the skills gap, the following are recommended:

- Ensure a sustainable pipeline of skills by training the younger generation of programmers and developers.

- To save on costs, consider hiring a partner that understands the intricacies of both legacy (mainframe) and modern (Cloud, Mobility, etc.) systems

About Nsight

Founded in May 2005, Nsight delivers best-in-class IT services,
solutions, and staffing for leading organizations. By leveraging its expertise and knowledge in mainframe programming and databases, Nsight assists global enterprises and organizations of any size in managing, optimizing, and operating their mainframe systems and services for maximum efficiency, security, and economy. Nsight also offers high-value consulting services and solutions around SAP, Oracle, Microsoft, Cloud and Mobility where it brings Big Four consulting experience and talent to deliver successful projects for its clients.

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