WHITE PAPER

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Sustaining and Modernizing Mainframe Systems in the Global Economy

Executive Summary:

Mainframe computers are the backbone of many global industries, and integral to industry sectors such as finance, healthcare, transportation, and government. However, the personnel trained to manage these systems are aging out of the workforce while mainframes are not – they continue to provide unmatched reliability, resiliency and security. The resulting and growing challenge is thus twofold: ensuring the continuity of expertise while managing escalating software licensing costs due to vendor practices.

This white paper explores:

- The ongoing relevance of mainframes,
- The role of managed service providers (MSPs) in cultivating new talent and offering flexible opportunities for second-career or late-career professionals and retirees,
- Strategies for overcoming software licensing challenges, and
- Ways to modernize mainframe applications to unlock valuable data and reduce costs.

The Importance of Mainframes in the Global Economy

Mainframes have been instrumental in driving the core processes of global economies, primarily in key industries that rely on stable, scalable, and secure computing infrastructures.

- **Finance:** Mainframes process trillions of dollars in daily transactions, supporting core banking systems, stock exchanges, and payment processing platforms. Nearly all major banks and financial institutions depend on mainframes for real-time transaction processing, fraud detection, and managing massive databases of customer information.
- **Transportation:** The aviation industry relies heavily on mainframes for real-time scheduling, booking systems, and logistics management. Railways, shipping, and trucking industries also depend on mainframes for coordinating large, complex transportation networks, ensuring smooth operations and reducing downtime.
- **Healthcare:** Healthcare organizations trust mainframes to manage sensitive patient data securely and efficiently. Hospitals, insurance companies, and pharmaceutical firms use mainframes for tasks ranging from health records management to drug discovery, clinical trials, and large-scale data analysis.
- **Government:** Governments around the world utilize mainframes for critical services such as social security, tax systems, and defense. Mainframes ensure secure data management, processing, and storage for national databases that require high levels of security, reliability, and scalability.
- **Utilities and Energy:** Utility companies rely on mainframes for mission critical applications including tracking real time customer energy consumption and billing. Mainframes remain critical for energy exploration and processing vast volumes of seismic data.

While the emergence of AI and cloud provide other systems of engagement and insight, those systems are complimentary to – and not a replacement for – the iron-clad systems of record on the mainframe. The global economy's reliance on mainframes has cemented them as vital infrastructure for handling mission-critical tasks that demand low-latency, high-volume, and high-reliability computing.

The Aging Mainframe Workforce and the Role of Managed Service Providers (MSPs)

The Challenge of an Aging Mainframe Workforce

The workforce that manages and maintains mainframe systems and applications is aging rapidly, with many professionals nearing retirement. These experts, often with decades of specialized knowledge, have become essential to the smooth operation of critical mainframe environments and applications across industries. This demographic shift presents significant continuity risks, particularly as enterprises face the looming threat of a talent shortage in mainframe technology.

Problems Enterprises Face When Operating Alone in Recruiting and Retaining Talent

Many enterprises, especially those that operate in sectors where the mainframe is still central or critical to their operations, find it increasingly difficult to address this talent gap when managing recruitment and retention efforts on their own. The following challenges highlight why this problem persists:

- **Decline in Specialized Skill Set:** Mainframe technology requires highly specialized skills in languages such as Assembler, COBOL, JCL, and REXX, as well as in areas like systems programming, capacity planning, and performance management. These skills are not widely taught in most computer science programs, making it difficult for enterprises to source new graduates with relevant mainframe knowledge. Furthermore, younger generations are often more attracted to newer technologies like cloud computing, AI, and mobile development, rather than learning about legacy mainframe systems.
- **Perception of Legacy Systems:** Mainframes, though integral to many industries, are often perceived as outdated or less exciting by younger tech professionals. Many IT workers prefer to work on cutting-edge technologies or pursue careers in emerging fields like machine learning, cybersecurity, or software development for cloud platforms. This perception issue creates a barrier for enterprises attempting to recruit new talent into mainframe roles.

- **Knowledge Gaps:** Mainframe applications are complex and often poorly documented, the result of monolithic architectures and years of patchwork. With many original experts retired, newer teams are now tasked with managing systems where they often "don't know what they don't know." Bringing in fresh talent without that institutional knowledge or industry expertise creates a high risk of losing critical insight and disrupting continuity.
- **Lack of Formal Education and Training:** Many universities and technical institutions have gradually phased out comprehensive courses in mainframe technology. As a result, enterprises must invest heavily in internal training to get new hires up to speed. However, many companies lack the resources, expertise, or long-term training programs required to bridge this skills gap, leading to recruitment and retention issues.
- **Competing with Modern Tech Fields:** Enterprises operating alone often struggle to attract talent in a competitive IT job market. The high demand for professionals skilled in cloud computing, data science, and mobile app development makes it difficult to attract candidates willing to focus on mainframe systems. These more modern fields are often perceived to offer higher salaries, faster career growth, and a more dynamic work environment, making recruitment even more challenging for companies with a mainframe-centric infrastructure.
- **Cost of Talent Acquisition and Retention:** The cost of recruiting experienced mainframe professionals has escalated due to the limited talent pool. Enterprises operating alone face the financial burden of offering high salaries and comprehensive benefits to attract and retain this niche talent. Retaining employees is equally costly, as organizations must offer competitive salaries, ongoing training, and a clear career path to prevent talent poaching from competitors.
- **Burnout of Existing Employees:** With the workforce aging and new talent scarce, many companies are left to rely on their shrinking pool of experienced mainframe experts. These employees are often overworked, leading to burnout and earlier-than-expected retirements. When employees leave abruptly, it creates knowledge gaps that can disrupt business continuity, delay projects, and increase operational risks.

The Role of Managed Service Providers (MSPs) in Solving the Talent Challenge

Managed service providers (MSPs) play a vital role in mitigating the challenges enterprises face in recruiting, training, and retaining mainframe talent. By offering scalable workforce solutions, MSPs can provide continuous access to experienced mainframe professionals, ensure knowledge transfer between generations, and support enterprises through a flexible, cost-effective model.

- **Scalability and Flexibility in Talent Management:** MSPs are often able to offer late-career professionals and retirees flexible work arrangements and part-time roles that enterprises may not be able to offer its workforce. This allows MSPs to utilize an experienced bench of professionals and pool resources as necessary to recruit, train, and retain mainframe professionals at scale. Enterprises benefit from this shared services model, accessing talent as needed without the full burden of recruitment and training costs.
- **Structured Training Programs for New Talent:** MSPs invest in mainframe-specific training programs and certifications in collaboration with educational institutions. By offering practical, hands-on learning, MSPs can cultivate new talent and close the skills gap. For example, boot camps or accelerated training courses help more junior IT professionals acquire the expertise needed to manage and maintain mainframe systems.
- **Mentorship and Knowledge Transfer**: MSPs establish formalized mentorship programs where experienced mainframe professionals late in their careers and/or nearing retirement can mentor more junior professionals. This ensures the transfer of institutional knowledge and critical technical expertise that can help enterprises maintain business continuity.
- **Plugging Knowledge Gaps**: MSPs use structured, repeatable processes and automated knowledge management tools to capture and preserve critical system expertise. By retro-documenting mainframe environments, MSPs help enterprises close knowledge gaps today and prevent future loss of institutional insight.
- **Simplifying and Optimizing Mainframe Portfolios**: Because MSPs are accountable for delivering ongoing efficiency gains, they bring cross-functional teams and modern toolsets to streamline complex mainframe environments. Rather than letting systems accumulate more patchwork, MSPs are incentivized to methodically modernize and optimize portfolios while ensuring stability. By applying a "first, do no harm" approach, they balance innovation with risk

management, simplifying operations without jeopardizing business continuity.

Part-Time and Consulting Opportunities for Late-Career Professionals and Retirees

One of the key advantages MSPs bring to the table is the ability to retain the valuable knowledge and expertise of late-career and retired mainframe professionals through flexible work models. Retirees often possess decades of experience, but many prefer to work on a reduced or flexible schedule. MSPs are uniquely positioned to offer retirees part-time and consulting roles that provide value to both the organization and the professionals themselves.

- **Part-Time Roles and Flexible Work Arrangements for Late-Career Professionals and Retirees:** MSPs can offer part-time positions or tailor roles to retired or semi-retired professionals who wish to continue contributing without the demands of full-time employment, through options such as remote work, flexible hours, or project-based assignments. This allows late-career professional and retirees to work fewer hours in accordance with their lifestyle needs while still providing veteran talent and critical support to enterprises during high-demand periods or on special projects. These roles often involve application and system maintenance, troubleshooting, or technical oversight – areas where the late-career professionals' and retirees' extensive knowledge is invaluable.
- **Consulting Opportunities:** Consulting roles for late-career professionals and retirees allow them to work on a project basis, providing specialized expertise when needed. MSPs can engage these professionals for specific initiatives, such as system upgrades, performance tuning, or compliance audits. Consulting arrangements allow late-career professionals and retirees to focus on tasks where their experience is most valuable, offering flexibility in their schedules while maintaining continuity for enterprises.
- **On-Demand Expertise:** MSPs can deploy retired or semi-retired experts for short-term, high-impact engagements. This is particularly beneficial during critical periods such as a system migration, a major software upgrade, or a security incident. The ability to call on late-career professionals or retirees with deep domain knowledge helps enterprises mitigate operational risks as needed without having to hire professionals long-term or full-time.
- **Strategic Advisory Roles:** In addition to having them provide hands-on consulting, MSPs can place late-career professionals and retirees in advisory roles, where they can help guide an enterprise's decision-making on complex issues like application and system modernization, vendor negotiations, or infrastructure scaling. Their experience is particularly valuable in helping businesses navigate the complexities of mainframe systems and avoid costly pitfalls.
- **Mentorship and Knowledge Transfer:** Late-career professionals and retirees can play a pivotal role in training and mentoring the next generation of mainframe professionals. MSPs can facilitate structured mentorship programs where retirees impart their knowledge to more junior engineers, ensuring that institutional expertise is not lost when these veterans fully retire. This arrangement also allows late-career professional and retirees to remain connected to the workforce in a meaningful and lower-stress capacity.

Retaining Critical Knowledge and Reducing Risks

Part-time and consulting opportunities through MSPs provide enterprises with continuity in mainframe applications and operations, ensuring that critical expertise remains accessible even as the full-time workforce evolves. This model helps mitigate the risk of losing institutional knowledge, which can occur when late-career professionals exit the workforce completely. By keeping late-career professionals and retired experts engaged, enterprises can:

- **Reduce Operational Disruption:** Retired or semi-retired professionals working part-time or as consultants can assist in preventing service disruptions caused by staff shortages or sudden retirements. They provide institutional memory that can help resolve complex issues quickly.
- **Support Long-Term Projects:** Many mainframe modernization projects, such as cloud integration, re-platforming, or performance optimization, require ongoing technical oversight. Retired or semi-retired professionals in consulting roles can provide critical guidance during the lifecycle of these projects, ensuring successful implementation.
- **Enhance Knowledge Transfer to Younger Staff:** Through mentorship programs, late-career professionals and retirees can ensure that their specialized knowledge is passed down to the next generation. This approach helps bridge the skills gap and accelerates the learning curve for new mainframe professionals.

MSPs as Strategic Partners in Workforce Transformation

MSPs are uniquely equipped to facilitate this workforce transformation, offering a blend of scalability, flexibility, and continuity that most enterprises cannot achieve on their own. As the global reliance on mainframes continues, MSPs will be critical in ensuring that both existing and emerging talent pools are available to support these systems well into the future.

- By offering flexible opportunities for late-career mainframe professionals, MSPs help create a more sustainable workforce model. They provide enterprises with the ability to access critical expertise when needed, reducing the pressure to immediately find and hire replacement talent. Additionally, these arrangements create value for late-career professionals and retirees, allowing them to contribute to the workforce on their own terms while helping the next generation of professionals step into mainframe roles.

Overcoming Mainframe Software Licensing Challenges

Vendor Pricing Practices and Barriers to Exit

Mainframe software pricing has become a point of contention for many organizations. Certain software publishers have capitalized on high barriers to exit, such as system entrenchment, unique licensing models, and the complexity of migrations. These practices often result in escalating software licensing expenses, further constraining the IT budgets of enterprises that rely heavily on mainframes.

Common challenges include:

- **Complex and Opaque Licensing Models:** Many mainframe software publishers adopt licensing structures based on usage metrics like MIPS (Million Instructions Per Second), which can be difficult to optimize. Increases in business processing or system load often result in significant cost escalations, as licensing fees scale with usage rather than the actual value delivered.
- **Lack of Negotiation Leverage:** As enterprises become more dependent on a particular vendor's software, they may find themselves locked into long-term agreements with limited price protections that are difficult or costly to exit. This lack of competition within the market leads to limited negotiating power and, as a result, increased costs.
- **Vendor Lock-In:** Mainframe environments are often heavily customized, making it challenging to switch vendors without significant effort and expense. The proprietary nature of many mainframe applications reinforces this lock-in, as migrations to alternative platforms can be prohibitively complex and risky.

Strategies to Overcome Barriers and Control Licensing Expenses

While vendor practices create high barriers to exit, enterprises can take several proactive steps to manage and reduce their mainframe software licensing expenses:

- **Workload Optimization:** One of the most effective ways to control software costs is to optimize workload placement. By reassigning specific processes to less expensive environments or utilizing specialty engines, organizations can reduce MIPS consumption, thereby lowering software licensing fees.
- **Vendor Management and Negotiation:** Establishing strong vendor management practices is critical for mitigating rising software costs. Enterprises should regularly evaluate vendor contracts, renegotiate terms where possible, and explore alternative solutions. Many organizations leverage independent software reviews and comparisons to strengthen their negotiating position.
- **Diversification of Vendors:** To avoid vendor lock-in, enterprises should explore alternative software options. By diversifying their software vendor portfolio, companies can enhance competition and minimize reliance on any single vendor. This also helps mitigate the risk of price hikes by giving organizations greater leverage in negotiations. In extreme cases, such as substantial price increases, shifting to alternative software solutions can be time consuming (12-18 months in some cases), but can produce a reasonable ROI depending on the price increase.

- **Software Asset Management (SAM) Programs:** SAM programs are essential for tracking software usage and identifying inefficiencies in licensing. These programs help organizations align their software usage with actual business needs, eliminating underutilized licenses and ensuring compliance with licensing agreements.
- **Exploring Open-Source and Modern Alternatives:** In some cases, open-source solutions or modern off-mainframe alternatives may offer viable cost-savings opportunities. Organizations can evaluate the feasibility of migrating select workloads or functionalities to open-source tools or off-mainframe alternatives, which might provide similar functionality at a lower cost.
- **Managed Services and Outsourcing:** Partnering with MSPs can further help enterprises contain costs. MSPs can assist with optimizing mainframe operations, negotiating with vendors on behalf of clients, and leveraging economies of scale to reduce licensing costs. By transferring responsibility for certain aspects of mainframe management to an MSP, organizations can also gain access to specialized cost-control strategies without needing to invest in internal resources and expertise.

Modernizing Mainframe Applications to Unlock Data and Reduce Costs

The Need for Mainframe Modernization

While mainframes remain indispensable for large-scale transactional processing, many enterprises are recognizing the need to modernize their mainframe applications. The legacy nature of these systems, combined with the high cost and long development cycles associated with mainframe applications, drives organizations to seek more agile, cost-effective alternatives.

Modernization efforts focus on:

- Unlocking Data Value: Mainframes often house vast amounts of critical data, but accessing and leveraging this data efficiently can be challenging. Modernization projects aim to unlock value by integrating mainframe data with modern analytics platforms, cloud services, and artificial intelligence solutions. By improving data accessibility, organizations can gain deeper insights, create differentiated customer value, and drive more informed decision-making.
- **Reducing Development Costs:** Mainframe application development is often costly and slow due to the complexity of legacy code and tools. Modernization initiatives target reducing these costs by implementing more flexible development methodologies, such as DevOps, and utilizing tools that allow for faster development cycles and continuous integration.
- **Increasing Application Velocity:** Businesses today require greater agility to respond to market changes and customer demands. Modernizing mainframe applications by adopting modern architectures (e.g., microservices, APIs) or re-platforming certain workloads to hybrid environments helps organizations enhance the speed at which they can deliver new features and services.

Examples of Mainframe Modernization in Action

Several industries and government entities are actively engaged in mainframe modernization efforts, which seek to enhance their systems' capabilities while reducing operational costs. Some examples include:

- **Financial Institutions:** Many banks have initiated efforts to modernize their core banking systems by integrating APIs that connect mainframe data to modern digital platforms. These initiatives allow for real-time data processing and improved customer experiences, such as faster mobile banking services and more personalized financial products.
- **Government Agencies:** Numerous government organizations are adopting hybrid cloud strategies to modernize legacy systems. For instance, some tax agencies have integrated cloud services with their mainframes to streamline tax filing processes, improve data security, and reduce infrastructure costs. This hybrid approach helps keep sensitive data secure while leveraging the scalability of the cloud.
- **Retail and E-commerce:** Retailers are modernizing their supply chain management systems, which often rely on mainframes, to enable real-time tracking, optimize inventory management, and improve customer satisfaction. By integrating cloud-based analytics with mainframe data, companies can better anticipate demand and automate logistics

decisions.

- **Healthcare Providers:** Healthcare institutions are working to modernize electronic health record (EHR) systems by incorporating machine learning algorithms and cloud-based analytics platforms. These modernization efforts help providers improve patient care through data-driven insights, while ensuring the security and reliability of sensitive medical information.

Strategies for Successful Modernization

Successful mainframe modernization efforts require a strategic, phased approach to minimize risk and disruption. Key strategies include:

- **Hybrid Architectures:** Many organizations adopt hybrid architectures that allow for a gradual migration of certain applications or workloads off the mainframe while retaining critical processes on the platform. This approach provides flexibility, allowing organizations to modernize at their own pace while minimizing operational risk.
- **Application Refactoring:** Refactoring involves modifying existing code to make it more efficient, scalable, and compatible with modern technologies. Enterprises can modernize their legacy applications incrementally, without the need for a full rebuild.
- **Reimagining Applications**: In some cases, modernization goes beyond incremental fixes. Enterprises may choose to re-engineer or re-architect applications to add new capabilities or even rewrite them entirely on a modern stack. The right approach depends on cost, complexity, and the degree of transformation needed.
- **API Integration**: Modernizing through APIs allows organizations to integrate mainframe data with newer systems and platforms. This provides flexibility by enabling businesses to access mainframe-stored data through web services, mobile apps, and cloud platforms without major re-platforming.
- **Cloud Integration:** Cloud platforms provide opportunities for scaling and cost reduction by allowing enterprises to shift non-critical workloads off the mainframe. Cloud integration can support data analytics, AI, and IoT applications that require more elasticity than mainframes can offer natively.
- **Converting Code Languages:** Tools are available to convert legacy code to more modern programming languages (e.g., COBOL to Java) reducing the cost and risk of maintaining the code and enabling integration with modern systems.
- **Data Conversion:** Flat file structures can be converted to relational data base tables to take advantage of the reduced cost of specialty engines.

Modernization of Mainframe Applications

As organizations evolve, they rarely follow a singular approach of either staying fully on the mainframe or moving off it entirely. Instead, the trend has shifted toward enterprises adopting a hybrid model. This approach strategically places workloads and applications on the most suitable platform, whether it be the mainframe, cloud services, or a combination of both.

The key question for IT leaders is to determine which workloads should remain on the mainframe, which should be integrated with hyperscalers or private clouds, and which would benefit from public cloud environments. Each decision must take into account performance, reliability, security, resiliency, cost efficiency, regulatory and other requirements, and the ability to drive innovation.

Optimization opportunities include:

- **Mainframe Engines:** By optimizing the code base to utilize various Mainframe Engines (GP, zIIP, and IFLs), companies can reduce GP-MIPS consumption, particularly during peak periods.
- **Containerization on the Mainframe**: Leverage advanced features to containerize mainframe workloads and replicate them across platforms as needed, providing greater flexibility and portability without sacrificing performance.
- **Encryption and Compression:** Next-generation mainframe features offer security and efficiency improvements at virtually zero cost. For example, encryption is now handled on-chip, offering "zero-cost" secure transmissions like SSH.

Similarly, compression on-chip reduces bandwidth and storage requirements without adding overhead.

- **AI Integration:** AI-driven models can now operate with latencies of less than 1 millisecond, making real-time applications such as fraud detection in banking or underwriting in insurance industries more viable than ever.
- **Advanced Compilers:** Compiling COBOL code to take advantage of newer mainframe instructions can result in lower CPU consumption. In fact, COBOL V6 compiled code often runs faster than older assembler code, thanks to these new optimizations.

Hybrid Enterprise Model

A hybrid enterprise model is emerging as the optimal strategy, leveraging the unique advantages of mainframes, such as security and high processing power, alongside the agility and scalability of cloud environments. This approach helps organizations innovate faster, increase operational flexibility, and unlock valuable data stored in mainframe systems.

For companies with aging or legacy mainframe systems, modernization efforts such as upgrading, optimizing, or integrating these systems can result in significant benefits. Companies who have employed these efforts have reported cost savings of 9-12%, alongside improvements in performance and reliability.

As organizations move towards this hybrid approach, the modernization of mainframe applications allows them to capitalize on both the enduring strengths of the mainframe and the limitless possibilities presented by modern cloud solutions.

Conclusion

Mainframes continue to play an essential role in powering the global economy, but the challenges of managing aging talent and rising software costs are intensifying. MSPs offer valuable solutions by bridging the talent gap, offering flexible roles to late-career professionals and retirees, and providing expertise in managing mainframe software expenses. Simultaneously, enterprises are unlocking new value through mainframe modernization initiatives, such as leveraging hybrid architectures, API integrations, and cloud services to enhance application agility and reduce costs. As the world becomes increasingly digital, the mainframe's role will evolve, but its importance to global industries will remain steadfast. Given the critical role mainframes play, organizations need to act now to ensure they have the workforce and software strategies in place to adequately support and maintain their mainframes for the foreseeable future.

Ready to secure your mainframe's future while unlocking new value? To learn more, contact a member of our team:

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Pillsbury works closely with leading technology suppliers to revitalize, optimize and modernize the mainframes that underpin global business. For additional information about the suppliers we partner with, visit the links below.

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