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White paper

Choosing the Right Strategy and Approach for Your Mainframe Modernization

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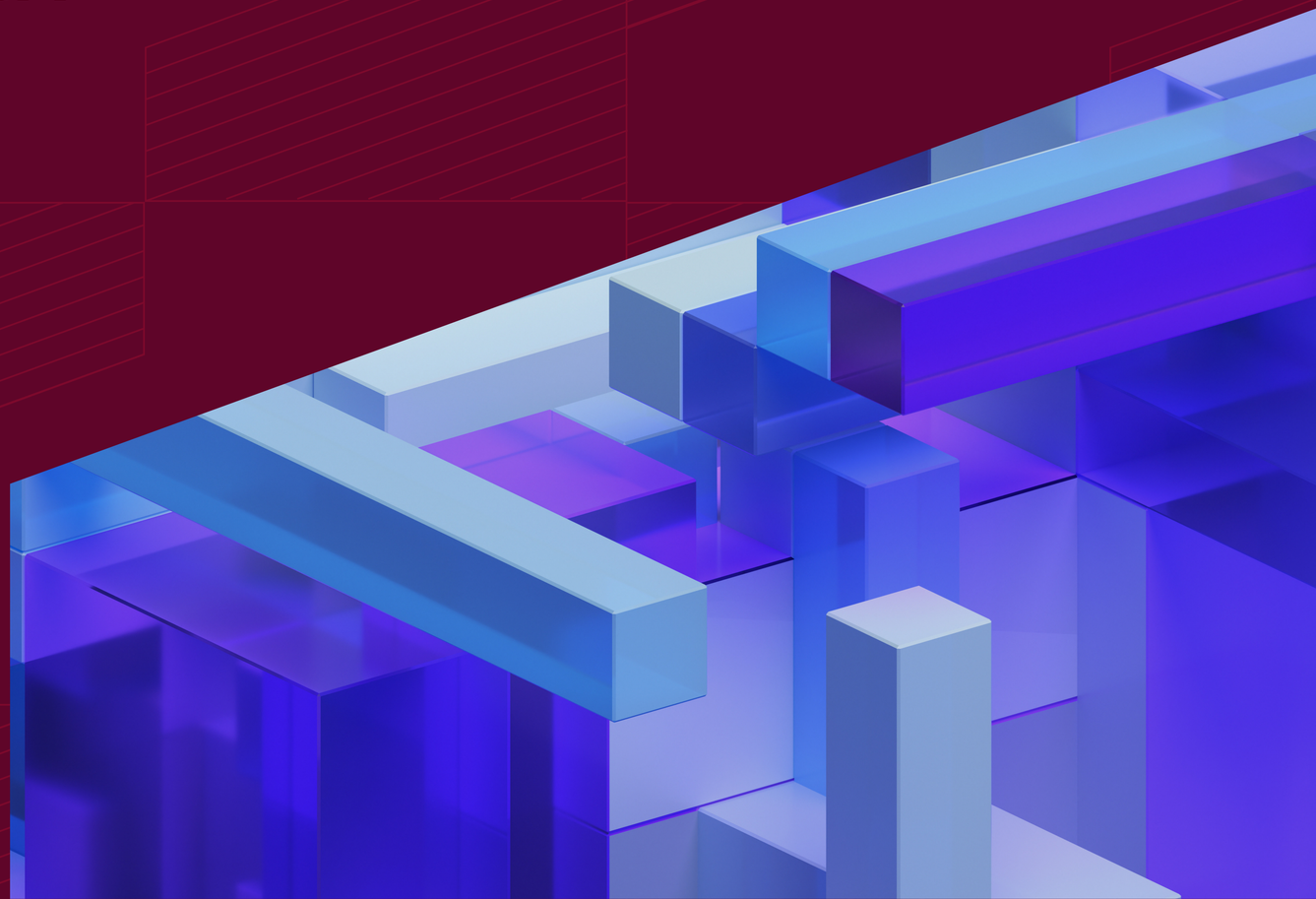

Executive Summary

Modern enterprises today rely heavily on Mainframe systems to run core operations but are increasingly confronted with their legacy architectural limits. In an era defined by rapid advancements in AI and digital services, these environments must evolve, making Modernization a business-critical decision. However, the scale, interdependencies, and diversity of legacy code and data environments inherently make this Modernization complex and layered.

This white paper distills a structured approach to choosing the right strategy and execution path for Mainframe Modernization. **It evaluates options such as Retire, Retain, Replace, Rehost, Re-platform, Refactor, and Reimagine, helping enterprises assess trade-offs across cost, risk, complexity, and long-term agility.** By highlighting the role of GenAI in accelerating Modernization, it outlines key considerations for a successful transformation.

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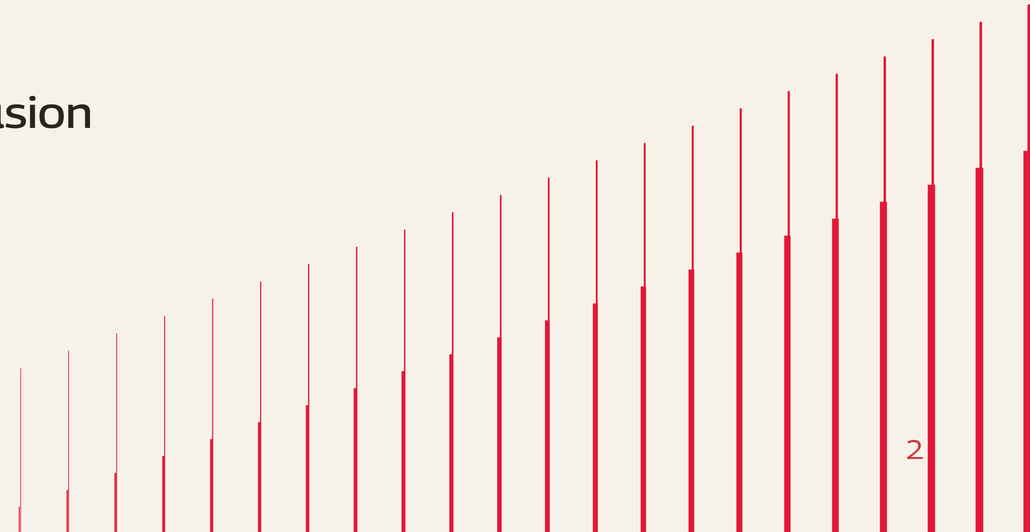
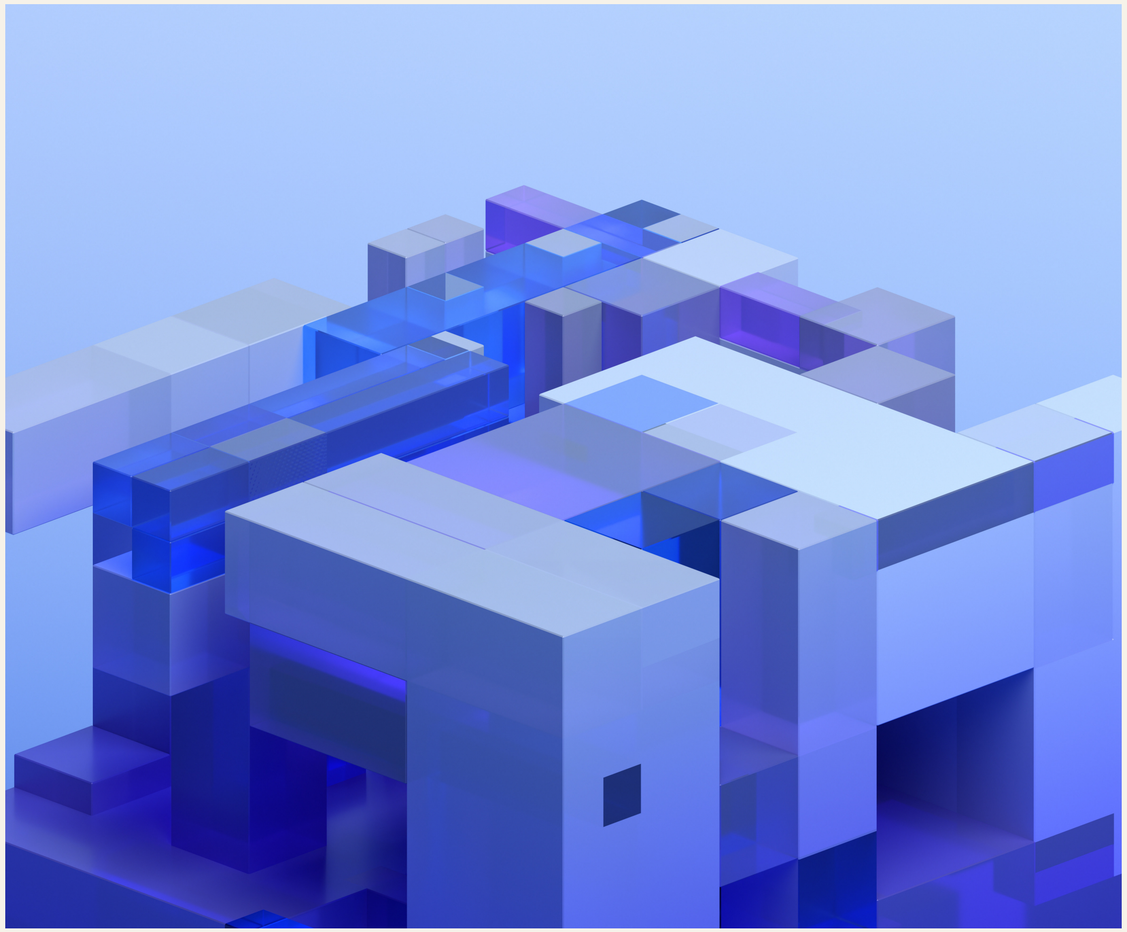


Mainframe Modernization: Why Now?

For more than 60 years, Mainframe applications have been the backbone of key industries. Even in an era defined by AI-driven innovation and real-time digital services, **Mainframes power 71% of Fortune 500 companies and handle 68% of global production IT workloads.**

Yet maintaining them is becoming increasingly complex and expensive. Operating costs are rising, legacy skill pools are shrinking, and existing architectures limit seamless integration with modern digital platforms. At the same time, enterprises are under dire pressure to accelerate product delivery, enable real-time data access, and operate across hybrid environments, making Modernization a strategic imperative.



Key Drivers for Modernization

Across large enterprises, legacy Mainframes remain deeply embedded, underscoring the need for Modernization. The following factors explain why this shift has become critical.

Area	Driver
Business Agility and Growth	Legacy Mainframes limit adaptation to market shifts. Modernization enables cloud-native architecture, faster deployment, and a competitive edge.
Data-Driven Decisions	Modernized platforms integrate AI/ML for real-time, trusted insights while preserving enterprise-grade security.
Talent and Skill Risk	Declining Mainframe expertise increases operational risk, making Modernization a need for long-term sustainability.
Cost Optimization	Streamlined operations, automation, and hybrid cloud adoption reduce costs and improve FinOps and governance.

Mainframe Modernization Paths

Organizations seeking greater agility, lower costs, and long-term sustainability must modernize their Mainframes. The choice depends on understanding available approaches, the technology stack, and the specific challenges of legacy environments. Here's a rundown.

1 Hybrid Strategy for Modernization

- Hybrid strategies combine optimal workload balancing across in-place, Hyperscaler, and private cloud options to meet business mandates for security, reliability, and compliance.
- Organizations can leverage the advantages of multiple environments while maintaining flexibility and control.

2 In-place Modernization

- In-place keeps the core workloads on Mainframes while leveraging modern tools and technologies.
- IBM WatsonX provides COBOL-to-Java transformation services that allow old applications to run on Mainframes with greater flexibility.
- Data Modernization tools such as DVM, Data Gate, and Databricks enhance data access and security while maintaining the Mainframe infrastructure.

3 Exit Mainframe and Migrate to a Hyperscaler

- This process migrates workloads onto public cloud platforms (AWS, Azure, GCP) to integrate with cloud-native services.
- Hyperscalers also provide transformation accelerators, middleware, and scheduling services to deal with all facets of application functions.
- In complex environments, third-party tools are often used to handle code conversion and data migration, particularly where legacy technologies introduce additional complexity.
- In addition, these platforms provide advanced services for scheduling, routing, and middleware that may be used during transformation.

4 Migrate to a Private Cloud

- This model moves the workload to a private cloud or on-premises infrastructure for greater control over the resources and data.
- Platforms such as Red Hat OpenShift provide flexibility, containerization, and support for microservices architectures.
- It is suitable when data sensitivity is a concern or resource management is a key issue.
- Third-party tools can be embedded to support future code conversion and data migration.

Technology Stack Considerations

Factors such as platform diversity, conversion complexity, and skill availability directly affect Modernization outcomes. The common characteristics and challenges found in Mainframe environments are as follows:

Technology Diversity

- Systems: IBM zSeries, Unisys, Fujitsu, etc.
- Languages: COBOL, Assembler, PL/1, Natural, Ezytrieve, CLIST, REXX, etc.
- Databases: DB2, IMS, IDMS, Adabas, VSAM, etc.
- Custom environments: Scheduling, integration points, middleware, data management, backup, and archival processes.

Conversion Challenges

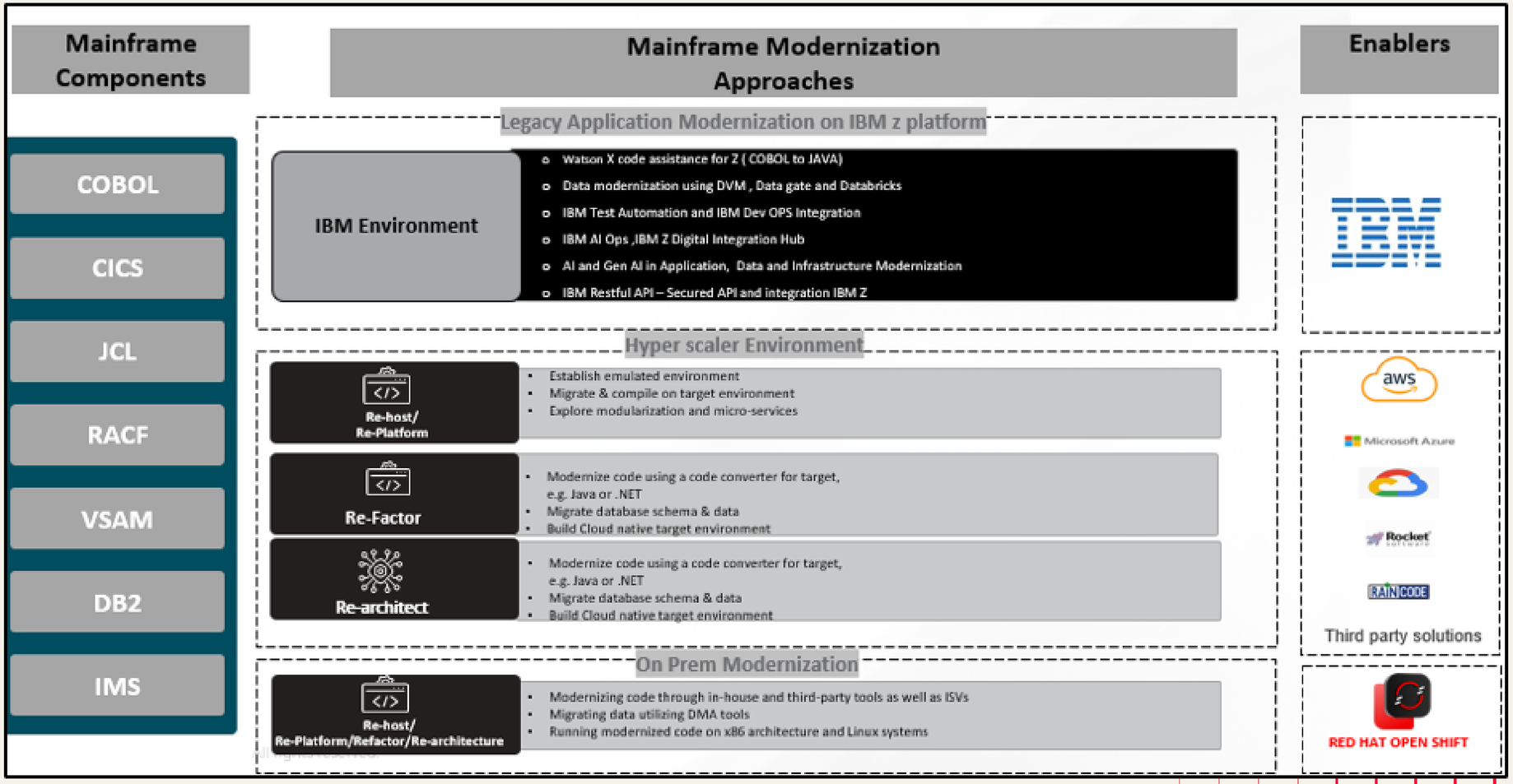
- Legacy languages usually have a modular structure that differs significantly from that of object-oriented programming languages.
- Database schemas can vary from one data model to another, including relational, hierarchical, and network data models.
- Customized processes and integrations must also be thoroughly documented and understood to prevent surprises during Modernization.

Skill Availability

- Evaluate the internal and external expertise for source and target technology knowledge.
- Fill the gaps by training, collaboration, or hiring external consultants.
- Include third-party involvement in the Modernization process.

Technology Stack Considerations

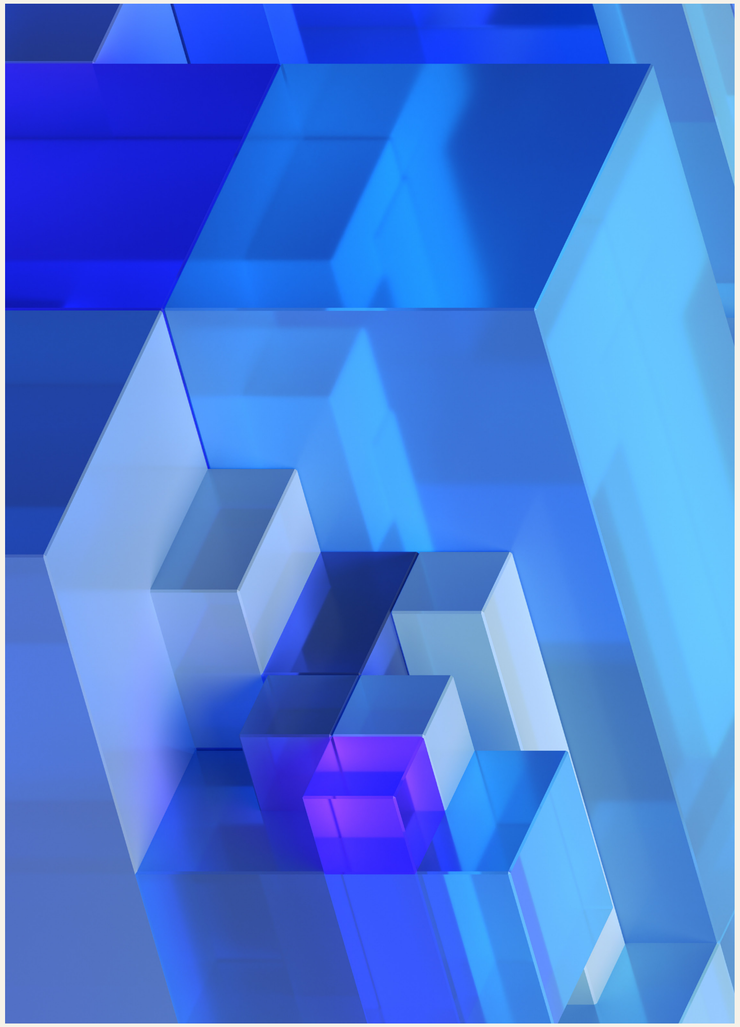
Figure 1: Mainframe Modernization Framework



Accelerating Mainframe Modernization: The Impact of GenAI and Advanced Tooling

With GenAI models and specialized acceleration tools, similar-scale Modernization can now be completed in less than 16 months, and further innovation is expected to reduce timelines to under 12 months.
For example, a McKinsey study2 describes a banking organization that used orchestrated GenAI agents on selected Mainframe components during a migration. In this scenario, modernizing approximately 20,000 lines of Mainframe code was initially estimated to require 700–800 hours. The use of GenAI agents reduced overall effort by nearly 40%, with specific Mainframe activities such as relationship mapping reduced from several weeks to a matter of hours. While outcomes vary by environment, the example illustrates how GenAI can accelerate effort-intensive Mainframe Modernization tasks.

Recent initiatives also highlight a clear difference between full migration strategies and in-place Modernization. Compared with full migrations to new environments, in-place Modernization, which upgrades legacy applications on their existing platforms, delivers faster results with less operational disruption.
Despite these developments, testing remains a significant part of Modernization initiatives, often accounting for 40–50% of the project's total time. Automated test case creation, execution, and validation are now enabled by accelerators powered by GenAI and Agentic AI, which shorten testing cycles, enhance quality, and accelerate end-to-end Modernization outcomes.
The table below contrasts earlier Modernization challenges with current capabilities to highlight how tooling and approaches have evolved.



Accelerating Mainframe Modernization: The Impact of GenAI and Advanced Tooling

Challenge	Earlier Experience	Current Experience
Language transformation challenges (PL/I, Assembler, Natural)	Limited proven solutions for language transformation (<50%)	Leverage solutions with a transformation rate > 65%
Database Transformation Challenge (IMS, IDMS, etc.)	The rate of successful schema and ETL script generation is low.	Current transformation tools/accelerators can transform > 75% and are maturing
Reverse Engineering Tools	Internal tools and market tools have limited features	Enhanced features enabling accelerated Modernization
Testing Challenges	Dependency on the available regression test suite	Leverage reverse engineering, BRE + Co-pilot and additional market tools
Overall Migration Timeline	3 Mn LOC took > 36 months of transformation	3 Mn LOC takes < 18 months for vanilla stack

Holistic View of Mainframe Modernization: Enhanced Guidance

Mainframe Modernization is frequently misunderstood as “Mainframe disposition” or a technical activity. But it is a comprehensive business strategy that examines the entire Mainframe environment, aligns with business goals, and incorporates new technology as needed.
Key steps required for effective Modernization:

1 Application Landscape Assessment and Classification

Group Mainframe categories, such as core, critical, non-core, reporting, and non-critical. Enable organizations to prioritize efforts based on business value. Key steps are:
Inventory and Assessment: All applications, dependencies, and business needs need to be mapped.
Business Value Analysis: Relevance, cost, and risk associated with each application must be assessed.
Compliance Analysis: Data retention, security, and compliance constraints need to be accounted for.

Holistic View of Mainframe Modernization: Enhanced Guidance

2 Modernization Patterns:The “7 Rs” Framework

Modernization approaches differ based on the application context. The industry-recognized ‘7 Rs’ model outlines a set of commonly used Modernization patterns.

Strategy	Primary Objective	Typical Use Case	Time/Risk
Retire	Eliminate cost	No business value remains	Low
Retain	Preserve stability	Compliant, stable workloads	Low
Retain	Standardization	COTS/SaaS available	Medium
Rehost	Exit legacy infrastructure	Quick lift-and-shift	Low–Medium
Re-platform	Improve efficiency	Minor optimization needed	Medium
Refactor	Increase agility	Strategic systems	Medium-High
Reimagine	Drive differentiation	Digital, customer-facing apps	High

Holistic View of Mainframe Modernization: Enhanced Guidance

3 Strategic Considerations for Pattern Selection

To choose the appropriate method of Modernization, it is necessary to weigh and measure the feasibility of technology, business value, risk, and cost considerations:

- **Business Drivers:** Cost savings, flexibility, and support for innovation must be balanced with regulatory requirements and skill availability.
- **Technical Complexity:** Legacy system dependencies, code quality, integration requirements, data migration, and validation must be assessed.
- **Risk Management:** Phased transitions, testing, and contingency plans should be considered to avoid business disruptions.
- **Change Management:** Building skills, communicating with stakeholders, and knowledge transfer should be prioritized.

4 Incremental and Iterative Modernization

Organizations should take an incremental approach: begin with pilot workloads, apply automation, and iteratively refine the strategy as tools and platforms mature.

- **Quick Wins:** Identify workloads that can be modernized with low risk to capture early value.
- **Continuous Improvement:** Apply learnings from pilots to improve transformation execution.
- **Tooling and Accelerators:** Apply industry and partner tools for code analysis, automated refactoring, migration, and testing..

5 Enterprise Insights and Best Practices

Experience from Modernization initiatives highlights a small set of practices that influence outcomes.

- **Hybrid Strategies:** Enterprises are increasingly adopting hybrid strategies that leverage the best of both worlds—the Mainframe and the cloud.
- **GenAI and Automation:** Use GenAI-enabled tools for code conversion, testing, and operations optimization.
- **Regulatory Alignment:** Comply with industry regulations and data governance standards.

Example of Hybrid Modernization Approach

Below is an illustration of the hybrid Modernization strategy in action. (The data presented does not refer to any specific customer.)

The given circumstance includes a Mainframe environment operating at an average capacity of 6500 MIPS on two LPARs, one for production and one for testing. The production LPAR supports 12 applications with a combined MIPS consumption of 5,120.

This Modernization strategy is defined after a detailed analysis of the application landscape and the tools and platforms used across the Mainframe environment.

Application Indicator	Category of Application	Application Languages	Application Database	Future Roadmap	MIPS consumption
APPL 1	Business Critical	Cobol	DB2	Businesses are not interested in modifying the application	800
APPL 2	Business Critical	Cobol	DB2	Explore the possibility of modernization	600
APPL 3	Mission Critical	Assembler, PL/1	DB2, IMS	No change entertained	1200
APPL 4	Mission Critical	Cobol, PL/1	DB2, IMS	No change entertained	1000
APPL 5	Non-critical	Cobol	DB2	Product functionality retiring	300
APPL 6	Non-critical	Cobol	DB2	Business rules need to be revisited	250
APPL 7	Reporting	Cobol, Ezytrieve	DB2	Enhance existing reports	80
APPL 8	Reporting	Cobol	DB2	Reports to be accessed on different platforms/formats	100
APPL 9	Integration	Cobol	DB2	A few integration points are not required	120
APPL 10	Integration	Cobol	DB2	Enhance existing integrations	180
APPL 11	Custom (COTS)	Cobol	DB2	Better features/functions required	400
APPL 12	Custom (COTS)	Cobol	DB2	Missing code elements	90

Example of Hybrid Modernization Approach

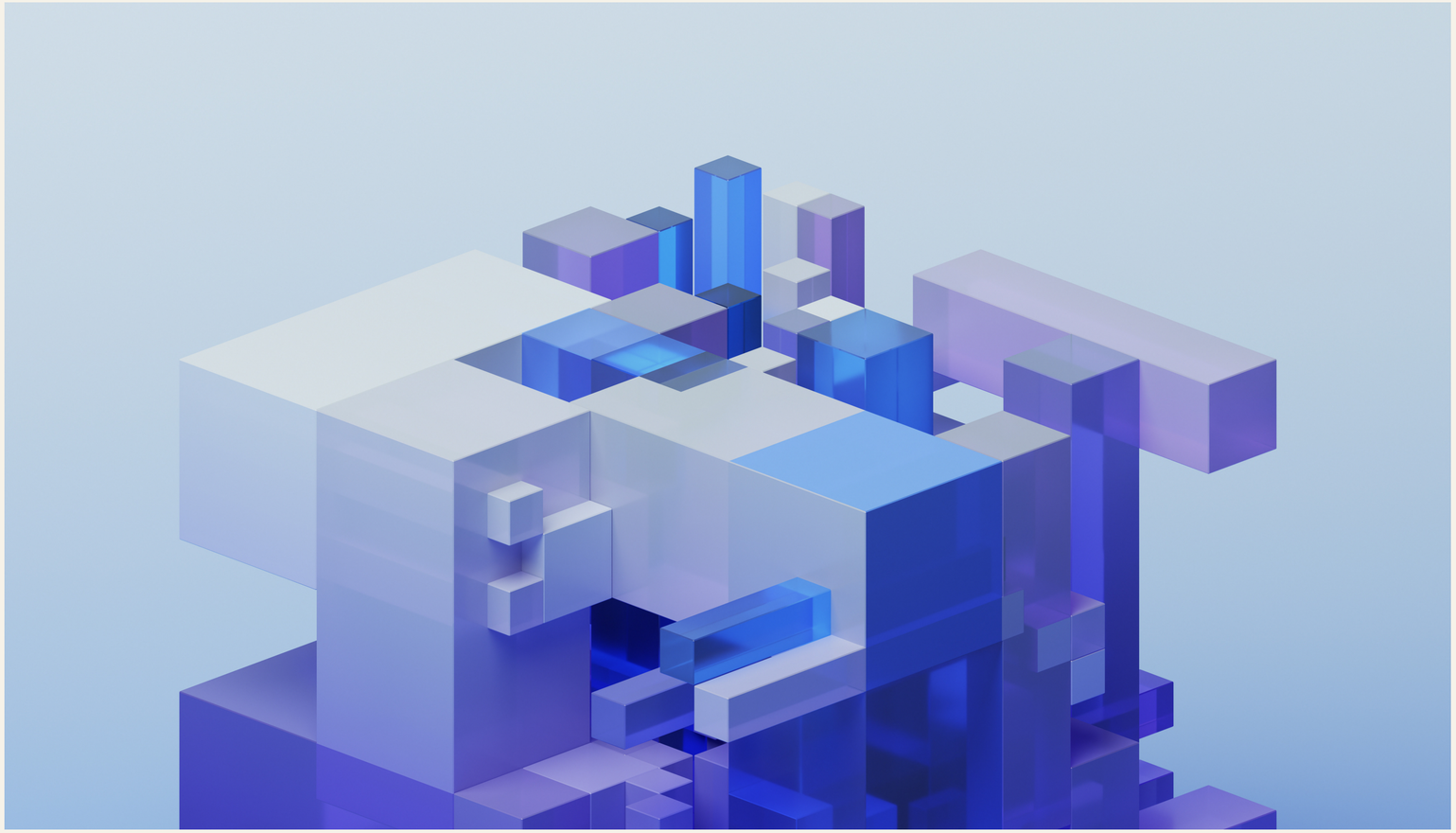
Based on this analysis, Modernization patterns can be mapped to the future roadmaps. GenAI and agentic AI tools can then be applied to accelerate timelines.

Application Indicator	Category of Application	Application Languages	Application Database	Future Roadmap	MIPS consumption	Modernization Pattern mapping with client consent
APPL 1	Business Critical	Cobol	DB2	Businesses are not interested in modifying the application	800	Retain on Mainframe, modernize with IBM modernization tools (WCAZ)
APPL 2	Business Critical	Cobol	DB2	Explore the possibility of modernization	600	Refactor/Re-imagine to Hyperscaler
APPL 3	Mission Critical	Assembler, PL/1	DB2, IMS	No change entertained	1200	Retain on Mainframe
APPL 4	Mission Critical	Cobol, PL/1	DB2, IMS	No change entertained	1000	Retain on Mainframe
APPL 5	Non-critical	Cobol	DB2	Product functionality retiring	300	Retire the application on the Mainframe. Archive Data
APPL 6	Non-critical	Cobol	DB2	Business rules need to be revisited	250	Rewrite/Re-imagine
APPL 7	Reporting	Cobol, Ezytrieve	DB2	Enhance existing reports	80	Rewrite
APPL 8	Reporting	Cobol	DB2	Reports to be accessed on different platforms/formats	100	Replace with a similar feature-reporting product available
APPL 9	Integration	Cobol	DB2	A few integration points are not required	120	Refactor/Re-Imagine
APPL 10	Integration	Cobol	DB2	Enhance existing integrations	180	Refactor/Re-Imagine
APPL 11	Custom (COTS)	Cobol	DB2	Better features/functions required	400	Replace it with a similar feature/function/product.
APPL 12	Custom (COTS)	Cobol	DB2	Missing code elements	90	Re-Host if Rewrite is not possible

Example of Hybrid Modernization Approach

Business cases can be developed for each of these patterns in correspondence with the migration plan. By calculating the current-year TCO, the migration cost for Modernization, and the projected TCO over a three-year horizon, we can evaluate the value and benefits.

Below example represents a strategy based on application categorization, pattern selection, and alignment with business requirements and the future roadmap. Early adoption of GenAI and Agentic AI solutions will further improve the Modernization experience with assured outcomes.



Example of Hybrid Modernization Approach

Application Indicator	Modernization Pattern	Target Roadmap	Y1 Q1	Y1 Q2	Y1 Q3	Y1 Q4	Y2 Q1	Y2 Q2	Y2 Q3	Y2 Q4	Y3 Q1	Y3 Q2	Y3 Q3	Y3 Q4
APPL 1	Retain on Mainframe, modernize with WatsonX code assistant for Z	Mainframe Modernization through WCAZ.	■	■	■	■								
APPL 2	Refactor/Re-imagine to Hyperscaler	Target platform			■	■	■	■	■	■	■			
APPL 3	Retain on Mainframe	Mainframe operations continue as is.												
APPL 4	Retain on Mainframe	Mainframe operations continue as is.												
APPL 5	Retire the application on the mainframe. Archive Data	The application and data will not be carried forward.												
APPL 6	Rewrite/Re-imagine	Re-imagine the application using existing business rules in a microservices architecture on the target platform.						■	■	■	■	■	■	
APPL 7	Rewrite	Rewrite of the application into a native modern language.			■	■	■	■	■	■				
APPL 8	Replace with a similar feature-reporting product available	Market products with similar features, and transform data to a relational database in the target platform.	■	■										
APPL 9	Refactor/Re-Imagine	Transform language and DBMS to the target platform.			■	■	■							
APPL 10	Refactor/Re-Imagine	Transform language and DBMS to the target platform.			■	■	■							
APPL 11	Replace it with a similar feature/function/product.	Market-available COTS product, data transformation to the target platform.	■	■	■									
APPL 12	Re-Host if Rewrite is not possible	As a temporary measure, you can rehost and then rewrite as needed.						■	■					

Conclusion: Strategic Navigation of Mainframe Modernization

Successful Mainframe Modernization extends beyond platform migration. It requires a business-centric approach that considers the full Mainframe environment, aligns with organizational priorities, and applies technology where it delivers clear value. By combining deep Mainframe expertise, hybrid Modernization patterns, and GenAI-based accelerators, organizations can approach Modernization with greater clarity and control. As a seasoned leader in digital transformation, Tech Mahindra's comprehensive Modernization strategy helps organizations to unlock value from existing investments and build a future-ready digital foundation.v

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