Modernizing the mainframe

while preserving IT investments and managing risk

Make better happen

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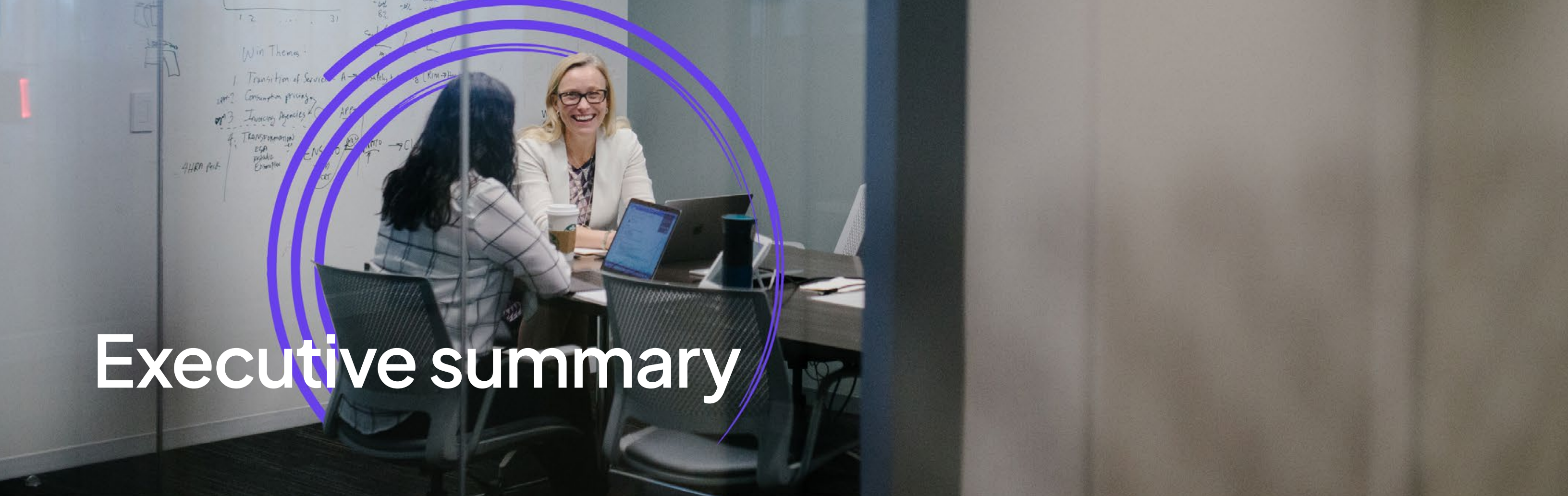


Executive summary

There's a rapidly growing need for the modernization of information technology (IT) systems. Your legacy mainframe is one of your organization's most critical assets, but without upgrading to meet the standards of the modern hybrid ecosystem, you could be putting valuable data at risk. It's no secret that mainframe modernization is a venture that comes with its own share of complications. As such, it's important that the journey start with an informed strategy built by experts with a historical knowledge of data migration. Here we'll explore how a customized migration strategy comes to life and is implemented and executed, as well as best practices for preserving investments and mitigating risks while successfully modernizing your organization's valuable assets.

Why modernize IT systems now?

Specific reasons for modernizing will vary from organization to organization, but the trend towards upgrading for compatibility with a new hybrid ecosystem isn't going anywhere. The forces behind this push for IT modernization aren't new; however, they are becoming more relevant. Here are some factors driving the need to modernize your IT systems:

- Existing staff with legacy skills are steadily retiring, leaving companies at risk
- End-of-life of mainframe platforms introduce a threat to critical applications and databases
- Modern platforms cost significantly less compared to proprietary legacy models that have not been modernized
- Cloud enablement is becoming standard in both corporate and government systems

These IT modernization trends show that not only will risk and costs increase for companies that postpone modernizing, but that upgrading your existing legacy system is cost-effective and sets your organization up for future success.

Contents

Common IT modernization project challenges

Your organization's legacy IT systems hold valuable and sensitive data. Deciding how to modernize and who to entrust such an enormous project to are complex decisions. Some of the problems legacy IT system modernization projects can face include:

Incorporating new application functionality while simultaneously moving to more modern technologies, languages and databases introduces **significant risk to your data**

Modernization projects tend to **exceed their proposed budget and schedule**

Data within the mainframe is **highly dispersed and fragmented**, requiring a kid glove service for preservation

Modernization projects can lag due to **lack of buy-in, coordination and trust** between the business and technical sides of the organization

Robust project governance is needed for this type of project, requiring **excellence in integration, communications and project management**

The expansive scope of modernization is **significantly more complex** than most projects managed by traditional application development teams, and conventional staff skills don't often translate to the challenges of a complex legacy systems modernization project

Large-scale updates and migrations require **unique methodologies, technologies and skillsets,** unlike more traditional waterfall and agile approaches

The solution: A tested, mature methodology

Migrating from a legacy IT system to hybrid and multicloud environments requires a certain knowledge of the technical relationships between data, applications, platforms, networks and endpoints. As part of our team of experts, Ensono has acquired ExperSolve, a modernization and migration company specializing in migrating application code and data from legacy systems to newer technologies. By utilizing our ExperThink™ migration toolset technology, we can work with clients to translate and migrate legacy languages and databases, effectively transforming their modernization projects.

A key driver in a successful modernization project is the use of a mature method that's been designed specifically for conversion and migration. Using ExperThink™ technology, our **Application Migration Methodology™** (AMM™) identifies and solves conversion issues in advance of converting any code. This technology is considered best practice in the modernization project management industry. It has been tested and refined over many years and has been implemented in hundreds of successful modernization projects.

How the Application Migration Methodology™ works

AMM™ is a five-step process that begins with careful analysis and thorough testing, then using a uniquely designed plan, a team of experts oversees implementation of the process, all while using a suite of automated tools to make the experience as secure and painless as possible.

- Source scan
- Complexity analysis
- Solution design
- Data design
- Right Workload/Right Platform analysis
- Migration strategy

1 Assess

The first step is to assess your current systems and define opportunities for improvement. This discovery period provides a clear directive for migration and modernization. In this initial phase, all portfolio and application data is gathered and confirmed using a mix of automated tools, data analysis and collaborative working sessions between your team and our experts. We assess your system's workload to ensure it is paired with the right platform for optimal performance. Through the creation of a knowledge repository, performance can be tracked along the migration process. During this step, we will also assess current workloads in your environment to determine if those workloads are compatible to your platforms' capabilities.

- Proof of concept
- Modernize program sample
- Calibrate toolset

2 Pilot

This phase begins with concepting and testing a plan, which demonstrates the conversion and modernization process and provides samples of the end result. The pilot phase establishes conversion rules, validates and tunes the technical solution specifications and serves to discover unknown conversion complexities. Plus, it aims to uncover potential performance issues and opportunities for increased automation. Elements of your system are modernized to meet current functional and performance requirements, then the program source code is re-engineered to be compatible with cloud-based systems.

Deliverables from this phase include renovated and clean-compiled source code, plus screen and database definitions and any required job control language. Once run in the new IT environment, all baseline input and output test data files are converted into the new format and structures.

- Modernization
- Automated conversion
- Quality review
- Data conversion

3 Convert

Migrating from a legacy system to hybrid and multicloud environments requires a certain knowledge of the technical relationships among data, applications, platforms, networks and endpoints. We work with clients to convert and migrate legacy languages and databases and transform their modernization projects.

Before continuing to the next step, a baseline is created for comparison; this baseline validation ensures renovated programs perform their intended functions. The baseline is the standard against which all future programs and values are measured and is established by executing existing programs in the current IT environment. A baseline shows the intended purpose of those programs by capturing and saving all input or output data the programs produce.

- Execute all new programs
- Compare outputs with baseline
- Intelligent testing

4 Validate

The validate phase of the migration project serves to confirm that a software system meets specifications and fulfills its intended purpose. The baseline output is the acceptance criteria used to validate the modernized code. In other words, when given the same inputs, the modernized code should produce the exact same outputs as the original code. This validation of the renovated programs is achieved by running the compiled programs from the conversion phase in the new IT environment with the converted data from the baseline phase. This project phase is deemed complete when the results from both the baseline input and output match.

- Production data conversion
- Synchronize source
- Bridging
- Systems and UAT testing
- Go live
- Maintain/enhance

5 Implement

Implementation moves the converted code into production and can be executed against the fully renovated portfolio or in logical groupings over time. There are five primary activities in the implementation phase; those activities include synchronization of the code base, testing of systems, integration, UAT, etc., production data conversion, establishing bridging technologies if moving to production in an iterative manner and production cutover itself.

Security and compliance

Any time new technology is brought on there is the potential to bring on new risks. One of the most important facets of AMM™ is security and compliance assurance. We take a holistic look at your security throughout the process to help safeguard your data and applications during migration through secure storage, identity management and encryption. With real-time threat detection and endpoint threat management, you can feel confident about modernizing your system without sacrificing security.

Best practices for IT migration toolsets, features and processes

To complement effective management and methodology, a successful information technology modernization project requires a suite of automated tools, proven processes and a team of dedicated migration specialists. This combination assists in maintaining efficiency and delivers consistent code, all while minimizing costs and risks.

Automated tools

Best-in-class toolsets will provide comprehensive and intelligent solutions, and a fully automated suite of tools such as expert systems and artificial intelligence (AI) technologies throughout the entire project's lifecycle will deliver the best results.

The AI-based code transformation technology ExperThink™ is a data-centric repository that coordinates all aspects of the conversion lifecycle. This proprietary migration tool converts all application elements. So far, 5 billion lines of code have been processed by our industry-leading toolset, code redundancy has been eliminated and 1.5 billion lines have been converted. From assessment to solution development, source renovation, data conversion, validation and implementation, ExperThink™ tracks the movement and disposition of all data elements in applications, databases, and files.

Language, system and database compatibility

The flexibility of ExperThink™ AI technology allows it to support a variety of legacy environments, including:

Languages

- COBOL (Any)
- CICS
- PL/1
- RAMIS
- Telon
- MARK IV
- DYL
- Db2 COBOL Stored Procedures
- Db2 SQL Stored Procedures
- CA-ADS/O
- CA-IDEAL
- Natural
- CA-EASYTRIEVE
- Vision: Reports (QuickJob) Programs
- Vision: RESULTS (DYL280) Programs
- M204 SOUL
- DELPHI/PASCAL
- DATATRIEVE
- AS/400 COBOL/RPG
- CA-GENER-OL
- CA-GEN
- Transact
- NOMAD
- Unify
- Oracle Forms
- Powerbuilder
- Mantis
- REXX
- Unisys COMS
- Unisys TIP
- Assembler
- Smalltalk
- Basic (various)
- C++
- Paradox

Systems

- MVS, VSE, VM
- DEC VMS
- IBM Power Systems
- .NET
- Honeywell GCOS
- Series/1
- UNIX
- Windows/NT
- WebSphere
- HP 3000
- Linux
- AIX
- Solaris
- BEA
- Sun I-Planet
- Delphi
- PIC
- WANG

Databases

- IDMS
- Datacom
- IMS
- IBM Db2
- CA Ramis
- TOTAL/Supra
- VSAM
- Mapper
- IMAGE
- Model 204
- Adabas
- Oracle Database
- SQL Server
- IBM i (AS/400) DDS components
- Unisys DMS
- Informix
- Access

Maintainable code migration

Quality, maintainable code handling is a key feature of a successful migration process. Rather than deliver "compiler-like" code output or proprietary run-time licenses, we believe your code should be understandable and maintainable. The benefit is that the code can be supported by both Java and .NET programmers and legacy programmers can easily learn to maintain code in the new language. Plus, there are no license fees, no proprietary runtimes, and no legacy code or compliers.

We achieve maintainable code migration through technologies such as:

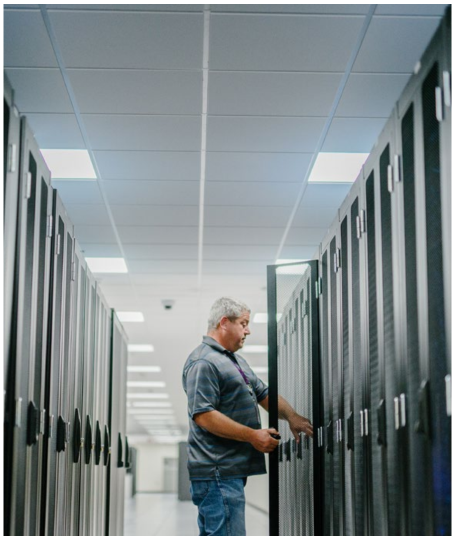
AI rules that focus on maintainability

More than 50% of all AI rule base

Manual polishing in factory for enhancement

Features that realize maintainable code migration include:

- Use of object abstraction for all databases, files, screens, files and data structures
- Customizable naming standards
- Structured coding
- Replacement of date logic with standard classes
- Native Java or .NET code only



Migration to relational technology

The key to "unlocking" legacy data is by migrating to a true relational model. Many legacy systems are tied to non-relational data, such as VSAM, IMS, IDMS, Adabas or Datacom, which is not compatible with modern digital languages. Current migration technology can modernize these databases into a truly normalized relational design on today's popular databases.

Factory approach

The factory approach is a best practice recommended to complement an automated suite of tools. Once the original design is tested and tuned, a factory of modernization experts can rapidly incorporate the required changes with consistent, quality results. The complexity and risk of hiring a new, unproven team for modernization work can be mitigated by working with a dedicated modernization team with a history of delivering projects on time at a competitive cost.

Intelligent testing

Intelligent testing is another best practice methodology providing an efficient approach to the testing acceptance and approval process. With intelligent testing, we work with you to create a baseline test case on the source environment and execute it, saving the source code, the inputs and the outputs in a migration "package."

The source code, input and output data are converted, and the converted input data is processed by the converted programs producing new output data—which is compared with the original output data from the baseline.

Data conversion

Most modernization projects require data conversion. This may be as simple as EBCDIC to ASCII conversion, but often involves complex data structures and relational databases. A best practice to follow is to use a dedicated data migration tool, such as our **Universal Data Converter** (UDC™) to convert all data. The UDC™, an integrated part of the end-to-end toolset, directly accesses the data repository so that little or no programming is needed.

UDC™ automatically handles virtually every aspect of data validation and conversion, including:

- Data quality analysis
- Data cleansing
- Non-relational to relational
- EBCDIC to ASCII

SERVICE PROVIDER

Global data and risk analytics provider modernizes and migrates mainframe applications to public cloud

3,000+

COBOL Programs with Db2 and MQ converted

700

Model 204 artifacts converted

Migrated to Java, Spring, Angular, C# and PostgreSQL on AWS

Client

A global data analytics provider to the insurance, energy, specialized markets and financial services industries

Obstacle

This client had been using the mainframe platform to manage its critical, revenue-generating and back-office applications. The company wanted to migrate these workloads off the mainframe to address the business risk of reduced skills to support legacy technologies including COBOL and Model 204. The client also wanted to reduce the costs of the platform and convert code to modern languages that could be maintained and evolved into the future.

Journey

We created a rapid proof of concept to migrate the client's legacy applications off the mainframe. The concept delivered high quality code to its Java and C# developers and enabled application maintainability on AWS. The process leveraged ExperThink™* toolchain to produce a quality, maintainable solution for COBOL, Db2 and Model 204 migration to Java, C# and PostgreSQL. Working closely with the client, we moved business-critical applications to the public cloud (AWS), including the client's largest CPU consumer.

Outcome

- 66% of workload MIPS successfully migrated off the mainframe, with remaining mainframe now being managed by Ensono
- ExperSolve's automation toolset and methodology accelerated the client project start-up and execution
- This migration put the client in the best position to maintain applications into the future

*ExperThink™ is a proprietary migration tool developed by ExperSolve, an Ensono company.

Ready to get started?

Ensono is an expert technology adviser that is your ally in making better happen faster. We specialize in helping enterprise clients transform their organization, innovate new and disruptive technologies and optimize their IT operations to achieve better business outcomes. Our dedicated team works across hybrid environments with services that span consulting, mainframe and application modernization, public cloud migration and cloud-native development. Let’s make better happen together - visit www.ensono.com to get started.

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Make better happen