

***ISG** Provider Lens™

Mainframe Services & Solutions

U.S. 2021

Quadrant
Report



A research report
comparing provider
strengths, challenges
and competitive
differentiators

Customized report courtesy of:



April 2021

About this Report

Information Services Group Inc. is solely responsible for the content of this report. Unless otherwise cited, all content, including illustrations, research, conclusions, assertions and positions contained in this report were developed by, and are the sole property of Information Services Group Inc.

The research and analysis presented in this report includes research from the ISG Provider Lens™ program, ongoing ISG Research programs, interviews with ISG advisors, briefings with services providers, and analysis of publicly available market information from multiple sources. The data collected for this report represents information that ISG believes to be current as of February 2021, for providers who actively participated as well as for providers who did not. ISG recognizes that many mergers and acquisitions have taken place since that time, but those changes are not reflected in this report.

All revenue references are in U.S. dollars (\$US) unless noted.

The lead author for this report is Pedro L. Bicudo Maschio. The editors Ipshita Sengupta and Grant Gross. The research analyst is Srinivasan PN and the data analyst is Anirban Choudhury. The quality and consistency advisors are John Schick, Tony Mataya, and Shriram Natarajan.



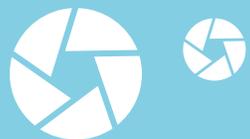
ISG Provider Lens™ delivers leading-edge and actionable research studies, reports and consulting services focused on technology and service providers' strengths and weaknesses and how they are positioned relative to their peers in the market. These reports provide influential insights accessed by our large pool of advisors who are actively advising outsourcing deals as well as large numbers of ISG enterprise clients who are potential outsourcers.

For more information about our studies, please email ISGLens@isg-one.com, call +49 (0) 561-50697537, or visit ISG Provider Lens™ under [ISG Provider Lens™](#).



ISG Research™ provides subscription research, advisory consulting and executive event services focused on market trends and disruptive technologies driving change in business computing. ISG Research™ delivers guidance that helps businesses accelerate growth and create more value.

For more information about ISG Research™ subscriptions, please email contact@isg-one.com, call +49 (0) 561-50697537 or visit research.isg-one.com.



1	Executive Summary
5	Introduction
17	Mainframe Modernization Services
22	Mainframe Transformation Services
29	MFaaS – Mainframe-as-a-Service
34	Mainframe Operations
38	Mainframe Modernization Software
43	Methodology

© 2021 Information Services Group, Inc. All Rights Reserved. Reproduction of this publication in any form without prior permission is strictly prohibited. Information contained in this report is based on the best available and reliable resources. Opinions expressed in this report reflect ISG’s judgment at the time of this report and are subject to change without notice. ISG has no liability for omissions, errors or completeness of information in this report. ISG Research™ and ISG Provider Lens™ are trademarks of Information Services Group, Inc.



EXECUTIVE SUMMARY

This is the first time ISG Provider Lens™ studies have included mainframe modernization. It is a response to buyers' requests for advice on what to do with their mainframes. This research qualified 47 vendors and service providers in five quadrants. According to these companies, the mainframe modernization market has been accelerating in the last two years, driven by the need to increase business agility.

In the preparation phase for this study, we found a lot of articles speculating about what a CIO should do with the mainframes. Common questions include: How should they include the mainframe in their cloud strategies? As COBOL programmers are getting close to retirement, what are the risks of facing a skill shortage?

In this report, clients will find five alternatives represented in each quadrant. Mainframe modernization considers the choice of introducing agility into legacy mainframe applications. Mainframe transformation deals with options to move all applications off the mainframe. Mainframe-as-a-Service (MFaaS) supplements the modernization path, providing a pay-as-you-go (PAYG) business model. Those that do not plan to modernize consider outsourcing mainframe operations. These four quadrants help clients find the right service provider that can deliver to their needs. The fifth quadrant provides clients with modernization tool options for those that prefer to run modernization projects themselves.

A CIO should reflect on the real issue before figuring out if there is a need to modernize or change the mainframe. Setting a short timeframe (12 to 18 months) is imperative to

guide reasoning in this case. More than 24 months would lead to a bias in favor of long application modernizations, which are not recommended. Decision-makers will find more details about the key topics that follow.

Mainframe legacy applications are dead: IBM Z platform has a future running z/OS, Linux, and other operating systems. However, for enterprise clients, the future of the hardware is irrelevant. Business applications are what is important. COBOL, Assembler, PL1, Natural, and other legacy programming languages are procedural and outdated. Modern applications are built on object-oriented programming languages such as Java, .NET, and C#. Investing in modernizing the toolset for agility will bring more significant benefits in the long run.

The top 100 have mainframes: According to IBM, "92 of the world's top 100 banks, 23 of the 25 top U.S. retailers, and nine out of 10 of the world's largest insurance companies run System z mainframe. Nine out of the top 10 global life and health insurance providers use a System z mainframe. And 71 percent of global Fortune 500 companies are System z clients." These facts do not suggest that enterprises should be writing new COBOL applications.

Optimizing the mainframe: Clients have several tools to optimize their mainframes. Providers of MFaaS and mainframe modernization can bring 10 to 25 percent cost savings while transitioning services. They check configurations, software licenses, and dead code that may waste mainframe resources. Also, competitive bidding processes have historically helped reduce cost.

Modernizing the mainframe: The most frequently used method is encapsulating batch and business functions into microservices that can run directly in the cloud. Application programming interfaces (APIs) that expose business function or mainframe data to other applications are always cited as part of the modernization. When the intention is to decommission the mainframe, modernization results in moving all applications to the cloud (or replatforming). Two methods that are prevalent include emulators, which enable COBOL to run in the cloud, and COBOL code compiled to Java or .NET to run in the cloud.

Re-engineering applications off the mainframe: A method that is gaining momentum is automated application re-engineering. Tools are fast, reliable, and produce quality code. Recent advances in methods and technology include artificial intelligence (AI), programming frameworks, code quality inspection, and automated testing. In the past, these tools required expensive on-premises processing power; however, at present, these tools run in the cloud with an increased processing capacity at much lower costs as well as much lower risks. Re-engineering of applications is viable and cost-effective.

Re-engineering: Most case studies cover less than 5 million lines of code converted to Java. Other languages include .NET and C#. Re-engineering is completed in a few months. The largest case study was 20 million lines of code converted in 20 months. Automated re-engineering can convert 2 million lines of code in one hour. Most of the project duration is spent on testing and quality assurance.

Converting COBOL to Java: Direct conversion does not include re-engineering. Data and logic stay the same, and the new code behaves the same as the old code. These conversion tools handle COBOL and many legacy languages and write modern code where Java is the most popular language. Converting code is much faster than re-engineering but also involves many testing cycles. These automation tools can convert 28 million lines of code in one hour.

Emulators: Replatforming and moving applications to x86 servers from mainframes have long been a possibility. The recent development observed is cloud virtual machines have increased the capacity of each x86 server, and the virtual servers can scale horizontally (many server images install within minutes). Cloud capacity and improved emulation technologies enable workloads of more than 100,000 MIPS to run in the cloud.

The database and storage myth: Mainframes hold vast amounts of data, which suggests that mainframe databases cannot go into the cloud. However, none of the participants in this survey mention issues associated with database size or storage complexity. Cloud data lakes are popular alternatives for storage, flat files, and virtual tape backup. Service providers are unanimous in converting legacy databases to any relational database with automated tools. The most popular choice to replace IBM DB2 is the open-source PostgreSQL.

The performance myth: Mainframes scale vertically, by adding more disk, CPU, and memory. The cloud scales horizontally, adding more servers of the same capacity. Any of the methods for replatforming mainframes to the cloud offer the same performance, or better, because of horizontal scaling.

The skill shortage myth: Service providers have demonstrated they can attract and train young talents to work on mainframes. The assessed providers employ more than 170,000 mainframe programming experts, including 60,000 COBOL programmers. In operations, more than 53,000 experts keep mainframes running. They have five years of experience on average. Only 6 percent of the mainframe operators have more than 14 years of experience. However, these numbers need to be put in perspective. COBOL skills are just as rare as SAP. A LinkedIn search returns more than 350,000 people with COBOL skills, 288,000 experts in ABAP (SAP programming language), 3 million C# programmers, and an astonishing 10 million people with Java skills.

Offshoring is a solution for skills shortage: All participating service providers have global operations and COBOL delivery capacity in India. The assumption that a COBOL career is not interesting to youth generations is valid in the U.S.; however, global companies have found ways to attract and retain talents to work on mainframes and COBOL.

Knowledge versus innovation dilemma: Knowledge retention can be a challenge for clients that migrate from COBOL to Java because newly hired programmers do not understand the business and the company may not have a career path to offer to experienced COBOL programmers. A few solutions that compile COBOL to Java enable the co-existence of both programmers for a smooth transition, enabling for knowledge transfer.

Java is by far the preferred destination language when moving off the mainframe. Other languages include .NET, C#, Python, and Powershell (the last two for scripting batch

jobs.). Code re-engineering and code conversion tools provide automation to replace COBOL with Java. It performs well on any cloud and any relational database. Application development tools can handle both languages, providing a smooth transition for application development shops.

Estimating project cost: Vendor and providers usually mention lines of code (LOC) as the base for cost estimation (76 percent of the respondents). However, complexity, tools, and size have an additional impact on pricing. Some statistics include:

- Modernization and code refactoring cost: US\$0.25 to US\$2.30 per LOC; project duration: 2 to 36 months; and project cost: US\$100,000 to US\$25 million.
- Transformation and code conversion cost: US\$0.50 to US\$8.00 per LOC; project duration: 6 to 60 months; and project cost: US\$100,000 to US\$50 million.

Estimating project viability: Mainframe MIPS measures hardware capacity; it is not used for project estimations. However, it provides the first cost estimate for the cloud. A rough estimation is one x86 core in the cloud can replace 50 to 100 MIPS mainframe.

- Top 100 mainframe clients manage more than 50,000 MIPS, with few of them operating more than 200,000 MIPS.
- Very large MIPS client manages 10,000 to 50,000 MIPS.
- Large clients manage 5,000 to 10,000 MIPS.
- Mid-sized clients manage 2,000 to 5,000 MIPS.

- Small clients manage less than 2,000 MIPS.
- Top mainframe outsourcing providers manage more than 300,000 MIPS each, up to millions of MIPS.
- The average outsourced mainframe has 4500 MIPS per client.
- The U.S. concentrates 60 percent of global mainframe MIPS.

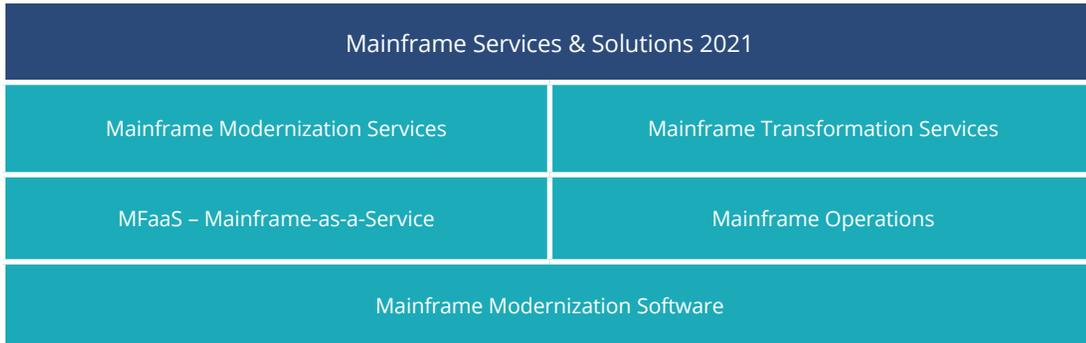
Clients running less than 5,000 MIPS should consider migrating their mainframes to the cloud. Any of the migration options are viable and cost-effective, providing short-term ROI. Clients hosting 10,000 MIPS and more can consider MFaaS as the first move for cost saving while assessing the modernization and transformation options. Top 100 mainframe clients run mainframe farms, not single monoliths. Outsourcing is a good option to reduce cost, while offshoring eliminates the skill shortage risk. Simultaneously, top mainframe clients can consider clustering their mainframe systems around similar business functions to study each cluster separately.

Financing mainframe modernization is a challenge: Many companies consider mainframe modernization a low return investment. A CIO of a large bank with more than 100,000 MIPS responded to our questions saying, “My mainframe is running the bank’s support functions, it is certainly not a problem, and I am not going to invest in it, not even to turn it off.” Vendors of modernization tools responded that, in most cases, the CIO sees the value but considers that the risk is an impediment. Vendors and service providers are working on making the projects faster, secure, and cost-effective to enable mainframe modernizations.

Consider self-financing the modernization: Some providers of application management and support services (AMS) propose deals that include mainframe modernization in the AMS goals. As a result, clients take the maintenance budget they already have and use it to move applications to low-cost platforms and code that is easier to maintain. Their three-year deal becomes a transformation program.

Introduction

Simplified Illustration



Source: ISG 2021

Definition

Mainframes have evolved and scaled to handle high transaction per second (TPS) requirements. These machines consolidate many high-performing CPUs (cores) into a single hardware platform. Their architecture distributes tasks to cores that run in parallel, sharing the internal bus, memory and I/O, thereby providing superior performance. Because of its more than 40 years history, many mainframes today host legacy programming language applications written with COBOL, RPG, Fortran, PL/1, Natural and others.

To comply with digital transformation business requirements, clients can modernize their mainframe applications and introduce agile methods as well as automate continuous integration tools. Two alternatives exist in the market, which include modernization and transformation. Modernization updates legacy code without changing the programming language and introduces automation,

Definition (cont.)

DevOps and modern Agile practices. Mainframe transformation converts legacy code into modern languages to run on modern platforms, including private and public clouds.

To align with PAYG approaches, service providers have been offering MFaaS, which includes all hardware, software licensing and operations under a pay-per-MIPS arrangement. MFaaS is provided in a shared environment. Clients that need PAYG but prefer not to share resources may opt for managed mainframe operations, which enable custom combinations of hardware and licensing ownership.

This study focuses on understanding client objectives and assessing provider capabilities to deliver mainframe services, including modernization, transformation and supporting toolset.

The ISG Provider Lens™ study offers IT decision-makers the following:

- Transparency on providers' relevant strengths and weaknesses
- A differentiated positioning of providers by segments
- A perspective on different markets

This study focuses on the U.S. mainframe market.

ISG studies serve as an important decision-making basis for positioning, key relationships and go-to-market considerations. ISG advisors and enterprise clients use information from these reports to evaluate their current vendor relationships and potential new engagements.

Definition (cont.)

Scope of the Report

This study considers four mainframe markets: modernization, transformation, as-a-service and operations. To enable clients to select the tools available for modernization and transformation, this study includes a mainframe modernization software quadrant. This ISG Provider Lens™ quadrant study introduces five quadrants on mainframe services and solutions.

Mainframe Modernization Services: This quadrant focuses on service providers that offer legacy application modernization, introducing code repositories such as GitHub or similar options, DevOps integration and testing automation over original programming languages, such as COBOL, adding optimization to enable agility. After the modernization is complete, clients can embrace agile methodologies in the development and maintenance of applications running on mainframe systems.

Mainframe Transformation Services: This quadrant assesses application development and maintenance service providers that have evolved their application modernization methodologies to refactor, replatform or rewrite legacy programming language applications written with COBOL, RPG, Fortran, PL/1, Natural and others, enabling the same logic and business rules to run on any platform, including the public cloud.

MFaaS – Mainframe-as-a-Service: This quadrant assesses infrastructure service providers that offer shared IBM Z mainframes under a pay-per-use contract model. Services include facilities, hardware, connectivity, mainframe network management, licensing, operating system and subsystems, tools, and other services.

Mainframe Operations: This quadrant assesses traditional outsourcing providers that have long been offering mainframe services. Typical participants employ experienced practitioners to cover legacy mainframe technologies as well as the most recent mainframe releases. Services can be delivered on any hosting facility (client- or provider-owned).

Provider Classifications

The provider position reflects the suitability of IT providers for a defined market segment (quadrant). Without further additions, the position always applies to all company sizes classes and industries. In case the IT service requirements from enterprise customers differ and the spectrum of IT providers operating in the local market is sufficiently wide, a further differentiation of the IT providers by performance is made according to the target group for products and services. In doing so, ISG either considers the industry requirements or the number of employees, as well as the corporate structures of customers and positions IT providers according to their focus area. As a result, ISG differentiates them, if necessary, into two client target groups that are defined as follows:

- **Mid Market:** Companies with 100 to 4,999 employees or revenues between US\$20 million and US\$999 million with central headquarters in the respective country, usually privately owned.
- **Large Accounts:** Multinational companies with more than 5,000 employees or revenue above US\$1 billion, with activities worldwide and globally distributed decision-making structures.

Provider Classifications

The ISG Provider Lens™ quadrants are created using an evaluation matrix containing four segments (Leader, Product & Market Challenger and Contender), and the providers are positioned accordingly.

Leader

The Leaders among the vendors/providers have a highly attractive product and service offering and a very strong market and competitive position; they fulfill all requirements for successful market cultivation. They can be regarded as opinion leaders, providing strategic impulses to the market. They also ensure innovative strength and stability.

Product Challenger

The Product Challengers offer a product and service portfolio that provides an above-average coverage of corporate requirements, but are not able to provide the same resources and strengths as the Leaders regarding the individual market cultivation categories. Often, this is due to the respective vendor's size or weak footprint within the respective target segment.

Market Challenger

Market Challengers are also very competitive, but there is still significant portfolio potential and they clearly fall behind the Leaders. Often, the Market Challengers are established vendors that are somewhat slow to address new trends due to their size and company structure, and therefore have some potential to optimize their portfolio and increase their attractiveness.

Contender

Contenders still lack mature products and services or sufficient depth and breadth in their offering, but also show some strengths and improvement potential in their market cultivation efforts. These vendors are often generalists or niche players.

Provider Classifications (cont.)

Each ISG Provider Lens™ quadrant may include a service provider(s) which ISG believes has strong potential to move into the Leader quadrant. This type of provider can be classified as a Rising Star. Number of providers in each quadrant: ISG rates and positions the most relevant providers according to the scope of the report for each quadrant and limits the maximum of providers per quadrant to 25 (exceptions are possible).

Rising Star

Companies that receive the Rising Star award have a promising portfolio or the market experience to become a leader, including the required roadmap and adequate focus on key market trends and customer requirements. Rising Stars also have excellent management and understanding of the local market. This award is only given to vendors or service providers that have made significant progress toward their goals in the last 12 months and are expected to reach the Leader quadrant within the next 12 to 24 months due to their above-average impact and strength for innovation.

Not In

The service provider or vendor was not included in this quadrant. There might be one or several reasons why this designation is applied: ISG could not obtain enough information to position the company; the company does not provide the relevant service or solution as defined for each quadrant of a study; or the company did not qualify due to market share, revenue, delivery capacity, number of customers or other metrics of scale to be directly compared with other providers in the quadrant. Omission from the quadrant does not imply that the service provider or vendor does not offer this service or solution, or confer any other meaning.

Mainframe Services & Solutions - Quadrant Provider Listing 1 of 4

	Mainframe Modernization Services	Mainframe Transformation Services	MFaaS – Mainframe-as-a-Service	Mainframe Operations	Mainframe Modernization Software
Accenture	● Not in	● Leader	● Not in	● Not in	● Not in
Advanced	● Not in	● Product Challenger	● Not in	● Not in	● Leader
Astadia	● Not in	● Product Challenger	● Not in	● Not in	● Not in
Asysco	● Not in	● Product Challenger	● Not in	● Not in	● Product Challenger
Atos	● Leader	● Leader	● Leader	● Leader	● Not in
Blu Age	● Not in	● Product Challenger	● Not in	● Not in	● Leader
BMC	● Contender	● Not in	● Not in	● Not in	● Not in
Capgemini	● Leader	● Leader	● Not in	● Leader	● Not in
Cognizant	● Contender	● Product Challenger	● Leader	● Product Challenger	● Not in
CPT Global	● Contender	● Not in	● Not in	● Not in	● Not in
Deloitte	● Not in	● Product Challenger	● Not in	● Not in	● Not in
DXC	● Leader	● Product Challenger	● Product Challenger	● Product Challenger	● Not in

Mainframe Services & Solutions - Quadrant Provider Listing 2 of 4

	Mainframe Modernization Services	Mainframe Transformation Services	MFaaS – Mainframe-as-a-Service	Mainframe Operations	Mainframe Modernization Software
Ensono	● Leader	● Contender	● Leader	● Leader	● Not in
Fujitsu	● Not in	● Leader	● Not in	● Not in	● Not in
GFT	● Not in	● Product Challenger	● Not in	● Not in	● Not in
GigaSpaces	● Contender	● Not in	● Not in	● Not in	● Not in
Google	● Not in	● Not in	● Not in	● Not in	● Leader
GT Software	● Not in	● Not in	● Not in	● Not in	● Contender
HCL	● Product Challenger	● Leader	● Rising Star	● Leader	● Not in
Heirloom	● Not in	● Not in	● Not in	● Not in	● Rising Star
HostBridge	● Not in	● Not in	● Not in	● Not in	● Contender
IBM	● Leader	● Market Challenger	● Leader	● Leader	● Market Challenger
Infosys	● Leader	● Leader	● Not in	● Leader	● Not in
INNOVA	● Not in	● Contender	● Not in	● Not in	● Not in

Mainframe Services & Solutions - Quadrant Provider Listing 3 of 4

	Mainframe Modernization Services	Mainframe Transformation Services	MFaaS – Mainframe-as-a-Service	Mainframe Operations	Mainframe Modernization Software
Keyhole	● Not in	● Contender	● Not in	● Not in	● Not in
LzLabs	● Not in	● Not in	● Not in	● Not in	● Product Challenger
Maintec	● Not in	● Not in	● Not in	● Contender	● Not in
Micro Focus	● Not in	● Not in	● Not in	● Not in	● Market Challenger
Mindtree	● Product Challenger	● Leader	● Not in	● Product Challenger	● Not in
MOST	● Not in	● Contender	● Not in	● Not in	● Not in
Mphasis	● Product Challenger	● Leader	● Not in	● Contender	● Not in
NTT (UniKix)	● Not in	● Not in	● Not in	● Not in	● Contender
NTT DATA	● Not in	● Contender	● Not in	● Not in	● Not in
PSR	● Not in	● Not in	● Contender	● Contender	● Not in
Raincode	● Not in	● Not in	● Not in	● Not in	● Contender
Software AG	● Contender	● Not in	● Not in	● Not in	● Not in

Mainframe Services & Solutions - Quadrant Provider Listing 4 of 4

	Mainframe Modernization Services	Mainframe Transformation Services	MFaaS – Mainframe-as-a-Service	Mainframe Operations	Mainframe Modernization Software
SysperTec (Virtel)	● Not in	● Not in	● Not in	● Not in	● Market Challenger
TCS	● Not in	● Leader	● Not in	● Leader	● Not in
Tech Mahindra	● Contender	● Leader	● Not in	● Not in	● Not in
TmaxSoft	● Not in	● Not in	● Not in	● Not in	● Leader
TSRI	● Not in	● Not in	● Not in	● Not in	● Leader
T-Systems	● Product Challenger	● Product Challenger	● Contender	● Contender	● Not in
Unisys	● Product Challenger	● Not in	● Not in	● Rising Star	● Not in
UST	● Leader	● Rising Star	● Not in	● Not in	● Not in
Vion	● Not in	● Not in	● Contender	● Not in	● Not in
Wipro	● Not in	● Market Challenger	● Not in	● Contender	● Not in



Mainframe Services & Solutions Quadrants

ENTERPRISE CONTEXT

Mainframe Modernization Services

This report is relevant to U.S.-based enterprises, evaluating providers that offer mainframe modernization services.

In this quadrant report, ISG assesses the current market positioning of providers that offer application modernization efforts such as introducing code repositories such as GitHub or similar options and DevOps integration and testing automation, including security testing.

Enterprises expect and demand solutions (and providers) that reduce millions of instructions per second (MIPS) costs, simplify access to data in mainframe environment, and increase development, deployment, and release timelines.

Who should read this report:

- **Marketing and sales leaders** should read this report to understand the relative positioning and capabilities of service partners that can provide modernization services to enable improved business planning and go-to-market strategy and providers that enable improved business planning and go-to-market strategy.
- **Operational leaders** and finance leaders should read this report to understand ways to differentiate, engage and manage relationships with mainframe modernization service providers that enable optimal return on investment.
- **IT and technology leaders** should read this report to understand the strengths and weaknesses of providers of mainframe modernization services, including their offerings, capabilities, market presence, strengths, relationships with other mainframe service providers and the way they employ the latest technologies and capabilities to deliver reliable offerings, in keeping with changing enterprise needs and practices.

MAINFRAME MODERNIZATION SERVICES

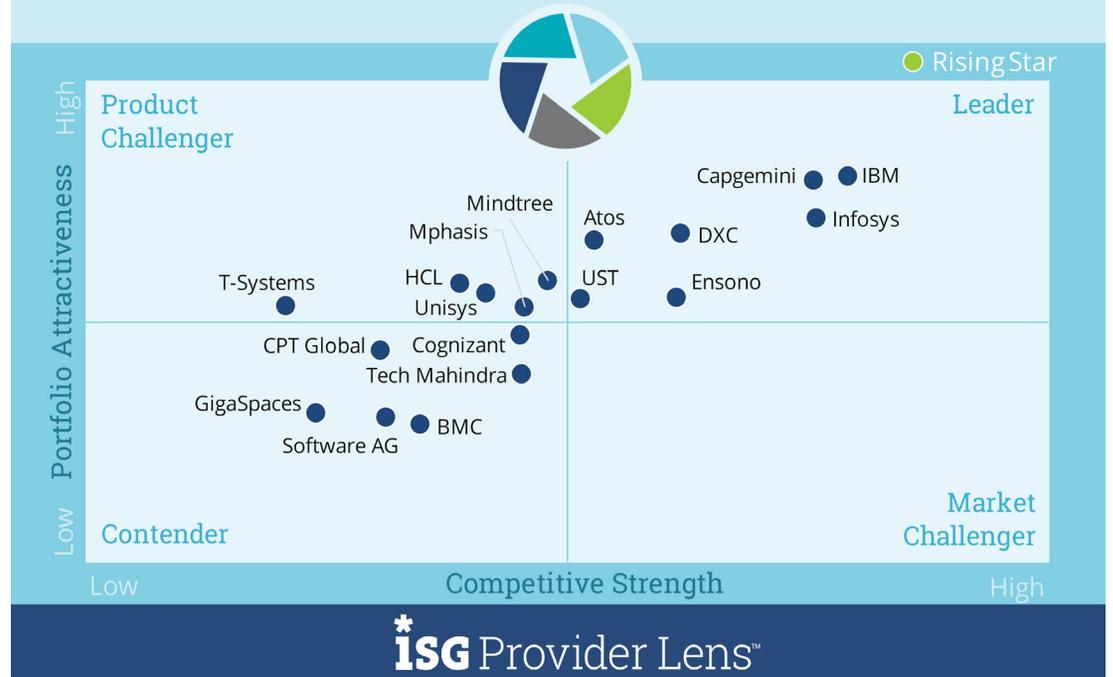
Definition

Service providers assessed in this quadrant offer legacy application modernization, introducing code repositories such as GitHub or similar options, DevOps integration and testing automation, including security testing. Modernization retains the original programming language, such as COBOL, adding architecture optimization and documentation to enable agility. After the modernization is complete, clients can embrace agile methodologies in the development and maintenance of applications running on mainframe systems, including code repositories, quality assurance and DevOps.

The service provider can assess a client's application landscape to propose a modernization roadmap, offering a modernization plan that includes guidance on retaining the relevant applications on the mainframe platform and transforming and migrating the relevant ones to other platforms, enabling cost optimization.

Mainframe Services & Solutions
Mainframe Modernization Services

2021
U.S.



Source: ISG Research 2021

MAINFRAME MODERNIZATION SERVICES

Eligibility Criteria

- The participant should provide case studies around mainframe modernization of either IBM Z, IBM AS/400 or Unisys ClearPath mainframe applications.
- The case studies must include DevOps tools integration.
- The modernization must enable legacy programming languages, such as COBOL, to build and deploy in line with modern continuous integration and deployment best practices (for example, implementation of COBOL CI/CD pipelines).
- Services must include application assessment, phased transformation with robust testing and quality assurance, application decoupling, system architecture, API development, and future state application governance.

Observations

Mainframe modernization is a mature market. Professional service organizations (PSO) and outsourcing service providers have been focusing on improving their modernization skills for a long time. In addition, they participate in the IBM partner ecosystem to constantly update their technology expertise. Most providers focus on optimizing mainframe performance. According to these companies, their clients understand the technology options to include DevOps in COBOL applications, but the market is not gaining traction as expected. The Leader's in this quadrant are those that have enabled and implemented the most advanced modernization technologies to their clients.

Application portfolio assessment using automated tools is in use by top providers. With automated tools, companies can identify dead code and optimize application logic to reduce errors and improve performance. Most providers focus on developing APIs and microservices to improve mainframe integration with cloud applications. Some replace batch jobs with serverless functions. These inclusions help reduce MIPS capacity, thus reducing costs. APIs expose mainframe data and functions to be consumed by other applications. In an ideal scenario, error-free COBOL code would run on the mainframes and no future changes would be required, because all new functionalities would be developed outside the mainframe, exchanging data through APIs. Some of the case studies indicate that this scenario is a real possibility for many companies.

MAINFRAME MODERNIZATION SERVICES

Observations (cont.)

The following seven Leaders in this quadrant can provide a full scope of modernization services:

- **Atos** is a global service provider with more than 104,000 employees in 71 countries and generates €11 billion in revenue. It offers IBM mainframe services, Atos mainframe servers (BullSequana), MFaaS and mainframe modernization. Atos allows clients to explore many alternatives to optimize their mainframe applications and improve performance in their data center, in colocation sites or Atos' hosting. The company has more than 40 years' experience in mainframe services and help clients optimize and modernize their mainframes.
- **Capgemini** is a global service provider with more than 270,000 employees in 50 countries and generates €15.8 billion in revenue. The company is a long-time IBM partner, making mainframe services one of its core competencies. Capgemini's modernization services concentrate on assessing a client's mainframe environment to identify inefficiencies and optimize cost and performance. It provides optimization on both application code as well as configurations, operations and system architecture choices.
- **DXC Technology** generates US\$19.6 billion in revenue, with more than 138,000 employees in 70 countries. DXC Managed Mainframe Services provide IBM Z operation and support, including hosting, storage and disaster recovery. The company has a large data center footprint in the U.S., providing clients with many location choices and offshoring capacity to mitigate any skill-shortage concerns that clients may have. DXC was one of the pioneering companies in providing mainframe data center outsourcing, accumulating experience to offer leading services in mainframe modernization.
- **Ensono** provides managed infrastructure services, application services, and cloud, mainframe and midrange services. It has 10 data centers in the U.S. and partners with AWS and Microsoft Azure, enabling a comprehensive hybrid cloud platform that integrates mainframes. Ensono modernization services include APIs, microservices and DevOps, which is an advanced approach to enable secure data access over mainframe and cloud infrastructures.
- **IBM** delivers US\$73.6 billion in revenue. IBM Global Business Services (GBS) provides mainframe modernization and transformation services, which include consulting, application management and global process services. The consulting and application management organization generated a revenue of US\$15 billion in 2019. IBM's consultants, COBOL and legacy technology experts leverage leading-edge IBM Z technology to deploy the best in mainframe modernization, including DevOps and automated testing for agile development on the mainframe.

MAINFRAME MODERNIZATION SERVICES

Observations (cont.)

- **Infosys** is a global service provider with more than 249,000 employees in 46 countries and generates US\$13.1 billion in revenue. North America accounts for more than 60 percent of the company's revenue. Infosys Mainframe Services and Solutions include managed services, mainframe modernization and transformation supported by a mainframe talent pool of more than 24,000 experts. The company excels in application development, leveraging its proprietary methodology, supported by a vast partner ecosystem and robust delivery organization. Infosys has earned the AWS Mainframe Migration Competency.
- **UST** is a global service provider headquartered in California with more than 26,000 employees in 25 countries. The company's portfolio includes digital transformation, cloud infrastructure modernization, data analytics, cybersecurity, experience design and system integration. UST has a renewed focus on mainframe services. It offers legacy application modernization, using leading vendor tools to re-engineer applications, expose business functions and redesign the user interface (UI), reducing MIPS requirements and improving the user experience (UX).



ENTERPRISE CONTEXT

Mainframe Transformation Services

The report is for U.S.-based enterprises, evaluating providers of mainframe transformation services for moving and modernizing mainframe to a modern developed environment.

In this quadrant report, ISG assesses the current market positioning of providers of mainframe transformation services. These providers can assess and rewrite legacy programming language applications written with COBOL, RPG, Fortran, and others that typically run-on mainframes.

The accelerating transformation of enterprises, further triggered by the COVID-19 pandemic has compelled enterprises to focus on transformation from legacy languages and technologies to the more advanced options as many systems could not withstand the load faced by during the pandemic. Given the widescale shortage of skilled professionals, enterprises are increasingly turning to service providers that can assess and rewrite legacy programming language applications based on different business needs.

Who should read the report:

- **Marketing and sales leaders** should read this report to understand how providers can help them develop and leverage a broad range of applications from multiple environments to enable improved business planning and go-to-market strategy.
- **Operational leaders and finance leaders** should read this report to understand ways to differentiate, engage with and manage relationships with mainframe service providers to achieve optimal return on investment, including business performance improvements.
- **IT and technology leaders** should read this report to understand the strengths and weaknesses of providers, offering mainframe transformation services, including their offerings, capabilities, market presence and strengths, relationships with other mainframe service providers, and the way they employ the latest technologies and capabilities to deliver reliable offerings, in keeping with enterprise business and market change.

MAINFRAME TRANSFORMATION SERVICES

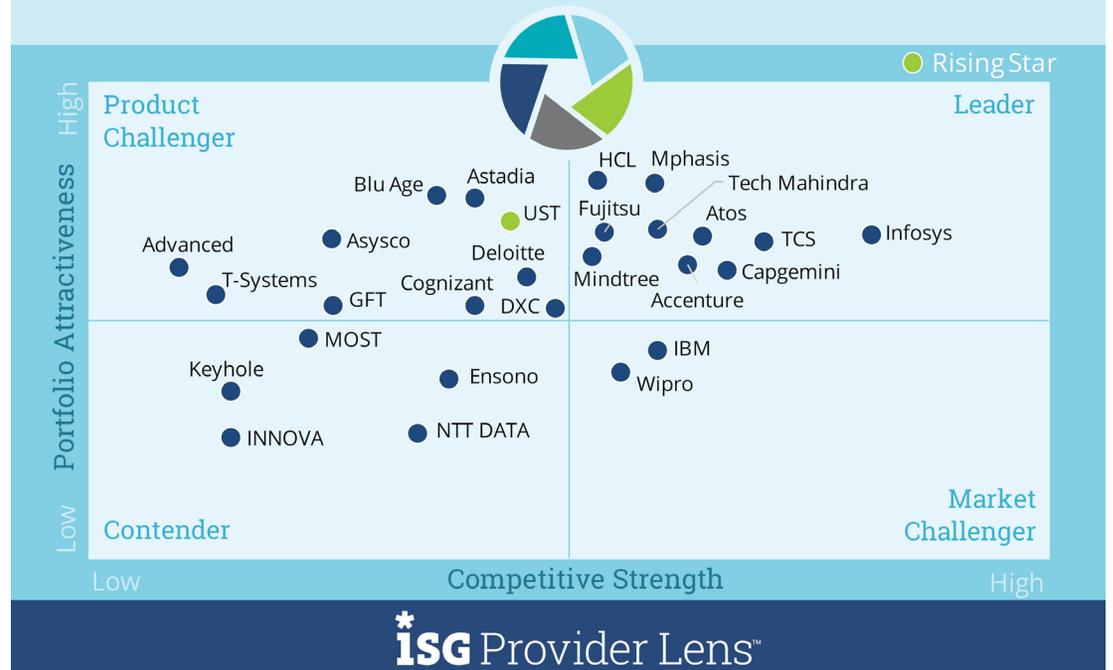
Definition

This quadrant assesses application development and maintenance service providers that have evolved their application modernization methodologies to assess and re-platform, refactor, or rewrite legacy programming language applications written with COBOL, RPG, Fortran, PL/1, Natural and others, which typically run on mainframes. The main target programming languages may include Java, .NET, C# and others, enabling the same logic and business rules to run on any platform, including the public cloud.

Clients that want to move their applications off the mainframe into other infrastructure technologies can choose a service provider to convert legacy code to programming languages suited to run on open platforms. Destination servers can include HPC clusters or cloud Infrastructure-as-a-Service (IaaS). Data stored in mainframe-type databases such as DB2 are converted to other SQL databases (many options). A complete transformation should include UI translation services, eliminating green screens while introducing modern graphic UI for better UX.

Mainframe Services & Solutions Mainframe Transformation Services

2021
U.S.



Source: ISG Research 2021

MAINFRAME TRANSFORMATION SERVICES

Eligibility Criteria

- The service provider must be able to reverse engineer legacy applications to provide application logic documentation.
- The service provider must be able to automate code conversion tools to reduce the time required to transform the applications.
- Optionally, the service provider can offer emulation systems to run legacy applications on other platforms without rewriting code. However, the provider should offer convincing case studies that demonstrate the viability of the emulation to be considered.
- The participant should have data center infrastructure (mainframes, servers, middleware, storage, databases and tools) to support the transformation program. Optionally, the provider can show it has partner resources that enable the hosting of the transformation program.
- Services must include application assessment, phased transformation with robust testing and quality assurance, application decoupling, system architecture, API development and future state application governance.
- The transformation should enable the client organization to operate Agile development and maintenance with CI/CD automation.

MAINFRAME TRANSFORMATION SERVICES

Observations

With automation and cloud computing capacity, mainframe transformation has become a secure path for any client. It is a growing market, with increasing interest. Many factors drive this trend, which are as follows:

- Business units pushing IT for more agility;
- The need to unify applications in the cloud and close the data center;
- The marketing push from AWS, Microsoft and Google, as all three have launched mainframe migration programs, with incentives in certain cases;
- The newer technologies that lower project cost and duration with increased reliability;
- IBM pushing z15 upgrades triggers clients to seek help;
- End of support for legacy mainframes such as AS/400 and Unisys Dorado OS.

The service providers in this quadrant use several tools from different vendors, and they select the best tool for each client needs. The Leaders have developed proprietary tools to integrate and orchestrate the partner tools they use. For each client, the transformation project may deal with different languages, particular programming styles and standards that the automation tools cannot understand, requiring expert intervention. Projects can mix replatform and re-engineer, which adds complexity.

Transformation projects range from 12 to 60 months, requiring robust project management skills. Planning and testing cycles consume most of the project time. Code conversion or compiling, emulator installations, and database conversion use automation and run relatively fast.

We qualified 10 Leaders and one Rising Star in this quadrant. They are as follows:

- **Accenture** is a global professional services company with capabilities in digital, cloud and security. The company has partnered with AWS, Microsoft and Google to develop special programs that focus on migrating mainframes to the cloud. It can deliver cloud lift-and-shift and application re-engineering to convert legacy code to new application architectures. Accenture uses leading tools to provide mainframe emulation and code rewriting. In 2019, it acquired Caltec Scube, a niche provider of mainframe migration and application code conversion tools to scale its technology to large enterprises. Accenture cloud mainframe migration partnerships include Microsoft Azure and Google.

MAINFRAME TRANSFORMATION SERVICES

Observations (cont.)

- **Atos** is a global service provider with more than 104,000 employees in 71 countries and generates €11 billion in revenue. Its portfolio includes cybersecurity, cloud and HPC. It offers transformation services that leverage a large application development organization and its Mill framework. Atos offers a self-funded transformation approach to enable enterprises to move out of their mainframes at a low-risk pace. Robust technology enables rehosting of mainframes for immediate savings, while automation tools power smart application transformation. Its self-funded program promises complete transformations to the cloud in three years.
- **Capgemini** is a global service provider with more than 270,000 employees in 50 countries and generates €15.8 billion in revenue. It has large operations in the U.S., supporting clients from 44 offices. The company offers many mainframe services and developed Code Analysis Platform (CAP360) to accelerate application assessments and application code transformation. Capgemini has a strong

focus on migrating mainframes to the cloud in partnership with Amazon, Google and Microsoft. The company offers a robust solution, comprising its intellectual property, partner tools and experienced practitioners. Capgemini is a Microsoft Azure partner for mainframe migrations.

- **Infosys** is a global service provider with more than 249,000 employees in 46 countries and generates US\$13.1 billion in revenue. Infosys A.R.T. Modernization is a framework that guides mainframe transformation. It uses automated tools to assess a client's portfolio, identifying the applications to keep on the mainframe, replatform to cloud, or re-engineer to modern application architectures. Infosys provides a comprehensive transformation program. Its cloud mainframe migration partnerships include AWS, Microsoft Azure and Google.
- **Fujitsu** is a global company with more than 130,000 employees and generates US\$35.4 billion in revenue. It has a long history in mainframe technology and services. Mainframe migration to the cloud is enabled by Fujitsu's PROGRESSION™, an automated suite for application modernization. Clients can escape from long assessments and architecture decisions to adopt a proven framework to rapidly migrate out of the mainframe into Microsoft Azure with a cloud-native application written according to Microsoft's recommended code standards. Clients experience the benefits of object-oriented applications. Fujitsu is a Microsoft partner for mainframe migrations.

MAINFRAME TRANSFORMATION SERVICES

Observations (cont.)

- **HCL Technologies** is a global service provider with more than 153,000 employees (called “ideapreneurs”) working in 50 countries. It generates US\$10 billion in revenue. It is listed by Google as a mainframe modernization partner. HCL has developed a comprehensive toolset to cover all aspects of legacy applications transformation. Its toolset orchestrates several vendor tools, making it one of the most complete offerings of the assessed companies, which explains its high position in portfolio attractiveness.
- **Mindtree** is a global technology consulting and service company with more than 21,000 employees in 15 countries and generates US\$1 billion in revenue. The company offers a full stack of mainframe services, from infrastructure operations to application development. Mindtree’s Mainframe and Midrange Center of Excellence (MMS CoE) provides modernization principles and proprietary frameworks that merge with partner tools, using leading-edge technologies for rapid mainframe transformations and migration to the cloud.
- **Mphasis** is a global service provider with more than 22,000 employees in 16 countries and generates US\$1 billion in revenue. The company offers an extensive service portfolio and has long experience in mainframe technologies. Mphasis has a compelling zero-cost transformation program. It proposes an application maintenance services (AMS) deal, with the promise of modernizing all systems in three years. Ideally, clients would pay for Mphasis AMS the same amount they would pay for any provider, with the advantage of converting legacy applications to modern technologies.
- **Tata Consultancy Services (TCS)** generates US\$22 billion in revenue and has more than 469,000 consultants in 46 countries. Its transformation services are based on TCS’ MasterCraft™, a tool that analyzes applications’ code and automates code generation. TCS is a strategic partner for hyperscalers, and it has collaborated to develop mainframe migration programs with AWS, Microsoft and Google. TCS can handle ambitious transformation programs.
- **Tech Mahindra (Tech M)** is a global service company with more than 121,000 employees in 90 countries and generates US\$5.2 billion in revenue. The company has a global legacy modernization center of excellence to support the modernization of mainframe assets, application interfaces and business processes. Tech M employs sophisticated tools to address clients’ business needs, including SaaS options to replace applications. It designs modern architectures that exploit cloud services and hybrid cloud integration.

MAINFRAME TRANSFORMATION SERVICES

Observations (cont.)

- **UST** (Rising Star) is a global service provider headquartered in California, U.S., with more than 26,000 employees in 25 countries. UST has a renewed focus on mainframe migration to the cloud. The company leverages a robust partner ecosystem and its experience in customer experience design to deliver renewed functionality and elevated UX. UST employs the best tools in the market to deliver smart transformations. It is growing in the U.S. market at an accelerated pace, positioning the company to enter the Leader's quadrant.



ENTERPRISE CONTEXT

MFaaS – Mainframe-as-a-Service

This report is relevant to enterprises in the U.S., evaluating providers offering Mainframe-as-a-Service (MFaaS) within mainframe environments.

In this quadrant report, ISG assesses the current marketing positioning of providers of Mainframe-as-a-Service in the U.S., based on the depth of service offering and market presence.

Our research indicates that the U.S. leads in the adoption of MFaaS when compared with other regions. The migration to the as-a-service model will enable an organization to transform its mainframe cost, from capital expenditures to operational expenses. It will also reduce the stress related to mainframe infrastructure upgrades, hardware maintenance costs and support-related expenditure. Therefore, larger enterprise customers tend to seek out service providers with a large and highly skilled workforce, advanced capabilities and a global presence.

Enterprises' top priorities in using these offerings are to reduce operational costs, achieve quick turn around and improve customer satisfaction.

The common hurdles to migrate enterprise mainframe to the as-a-service model, especially during the current COVID-19 scenario, include high CAPEX and shortage of necessary talent among enterprises.

Who should read this report:

- **Marketing and sales leaders** should read this report to understand the relative positioning and capabilities of service partners that can help them build and manage complex business management software integrations and data flows for improved business data analysis and decision-making.
- **Operational leaders and finance leaders** should read this report to understand the relative positioning of providers that offer MFaaS that enable high return on investment (ROI), including business performance improvements.
- **IT and technology leaders** should read this report to understand the strengths and weaknesses of providers of MFaaS, including their offerings, capabilities, market presence, strengths, relationships with other mainframe service providers, and the way they employ the latest technologies and capabilities to deliver reliable offerings in keeping with changing enterprise needs and practices.

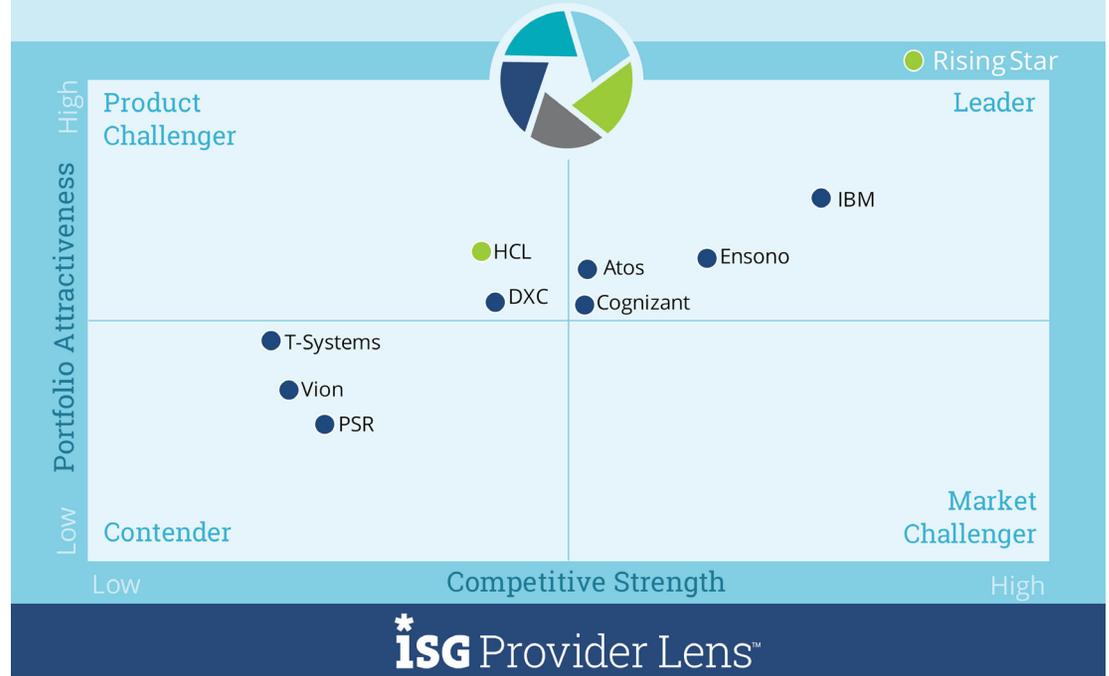
MFAAS – MAINFRAME-AS-A-SERVICE

Definition

This quadrant assesses infrastructure service providers that offer shared IBM Z mainframes under a pay-per-use contract model. Services include facilities, hardware, connectivity, mainframe network management, licensing, operating system and subsystems, tools, and all maintenance services required to keep mainframe workloads running according to the expected performance established upfront. MFaaS is hosted on a provider's data center or in the cloud.

Mainframe Services & Solutions
MFaaS – Mainframe-as-a-Service

2021
U.S.



Source: ISG Research 2021

MFAAS – MAINFRAME-AS-A-SERVICE

Eligibility Criteria

- The provider must use robust and secure data centers, compatible with high performance and the availability expected from mainframes.
- The provider must offer services such as job scheduling, performance optimization, CICS®, batch, backup, restore, system upgrades, security patches and other typical mainframe operations.
- The provider must be able to demonstrate the disaster recovery effectiveness of its MFaaS infrastructure.
- Hosting facilities should offer low-latency connections to clients' locations and the public cloud such as AWS direct connect, Azure route and GCP direct connect. Carrier-neutral data centers are preferred.
- The provider must demonstrate the financial capacity to invest in and grow its mainframe operations.
- The company must have a hiring and training program to ensure skill availability in the future.
- The provider must offer high performance and security, which are included in service-level agreements (SLAs) and corresponding contractual penalties.

MFAAS – MAINFRAME-AS-A-SERVICE

Observations

Service providers of MFaaS own the data center and the mainframe hardware. Mainframe capacity is offered over shared environments and standard software and management tools. Variations to the model exist. Some providers offer dedicated mainframes to certain clients, maintaining the same business model — pay per use and MIPS- and storage-based pricing.

The mainframe operations market has more players than MFaaS because of the investment required to add mainframe capacity ahead of demand. However, the installed MIPS market has been growing at around 10 percent per year.

We observed that pricing strategy and contractual terms vary by provider. They use MFaaS as a generic term, with minor differences from mainframe operations services. MFaaS approximate to the cloud IaaS model in terms of pricing but differs in elasticity because mainframe workloads have always grown. Service providers do not expect clients to have variable consumption monthly.

Innovations in mainframe management and operations are compared to in-house mainframe shops, with the heavy use of automation in both monitoring as well as operations. Some providers go one step ahead to install logs and agents to enable rich dashboards where clients can monitor performance and trigger service requests.

MFaaS is an extraordinary option for short-term deals (less than three years) to cover the period when the client is transforming their applications. MFaaS eliminates the need for new investments and offers security and scale.

ISG identified four Leaders in this quadrant and one Rising Star, which are as follows:

- **Atos** is a global service provider with more than 104,000 employees in 71 countries, generating €11 billion in revenue. Its portfolio includes cybersecurity, cloud and HPC. The company's MFaaS offering is based on more than 130,000 MIPS in data centers across the globe. Atos accumulates more than 40 years of mainframe experience with over 2,000 mainframe experts worldwide. Automation levels as high as 70 percent and valuable R&D investments in HPC technologies, including quantum computing, ensure that the company will continue to develop and improve its MFaaS portfolio.
- **Cognizant** is a global service provider headquartered in New Jersey with more than 289,000 employees in 37 countries, generating US\$16.6 billion in revenue. The company offers a full-stack IT services for

MFAAS – MAINFRAME-AS-A-SERVICE

Observations (cont.)

large accounts. Cognizant is an IBM Platinum Business Partner and collaborates to integrate IBM mainframes, IBM Power Systems and IBM storage solutions. Its MFaaS offers scalability and advanced monitoring with real-time analytics to improve clients' visibility to utilization/consumption, performance and alerts for proactive management. Its professional services can optimize workloads for MIPS reduction and install CI/CD pipelines with automation to enable agile development on the mainframe.

- **Ensono** has 10 data centers in the U.S. and partners with AWS and Microsoft Azure. The company acquired Wipro's U.S. data centers in 2018, transforming itself to a leading MFaaS provider. With a large MIPS capacity, the company can offer clients many choices to host their mainframe applications. Ensono onboarding includes resource optimization, client hardware acquisition and staff hiring. Clients benefit from stable and secure MFaaS that Ensono can integrate with cloud infrastructures.
- **IBM** reported US\$73.6 billion in revenue last year. In 2020, it announced the spin-off of its GTS organization. The new company generated approximately US\$19 billion in revenue. Presently, GTS organization provides mainframe operations and MFaaS. IBM offers the largest number of MIPS and data center location choices, which may benefit low latency connectivity to clients' branches. With robust infrastructure, seasoned consultants and leading-edge mainframe technologies, IBM is positioned to stay in the Leader's quadrant for a long time.
- **HCL Technologies** (Rising Star) is a global service provider with more than 153,000 employees (called "ideapreneurs") working in 50 countries, generating US\$10 billion in revenue. The company owns six data centers in the U.S., including a Tier III in New Jersey. It hosts a mainframe lab in Sweden, a mainframe center of excellence in the U.S., and another center in India. Robust automation and offshore capacity make HCL an attractive provider for long-lasting engagements.

ENTERPRISE CONTEXT

Mainframe Operations

This report is for U.S.-based enterprises, evaluating providers of mainframe operations related to mainframe applications.

In this quadrant report, ISG assess the current market positioning of providers offering mainframe operations. Our assessment is based on the depth and breadth of providers' service offerings and market presence.

The mainframe operations segment is mature and includes a full range of services related to mainframes, infrastructure and the cloud. Enterprises expect service providers to offer services, including consulting, managing, and monitoring mainframes; disaster recovery; database management; security and operating Linux. Enterprises look for services that address areas such as client and market challenges, cost savings, staffing risks, operation excellence and optimization.

Who should read the report:

- **Marketing and sales leaders** should read this report to understand how providers can help them develop and leverage a broad range of applications from multiple environments to achieve improved business planning and go-to-market strategy.
- **Operational leaders and finance leaders** should read this report to understand ways to differentiate, engage with and manage relationships with mainframe service providers that ensure optimal return on investment, including business performance improvements.
- **IT and technology leaders** should read this report to understand the strengths and weaknesses of providers offering mainframe operations, including their offerings, capabilities, market presence, strengths, relationships with other mainframe service providers, and the way they employ the latest technologies and capabilities to deliver reliable offerings, in keeping with enterprise business and market change.

MAINFRAME OPERATIONS

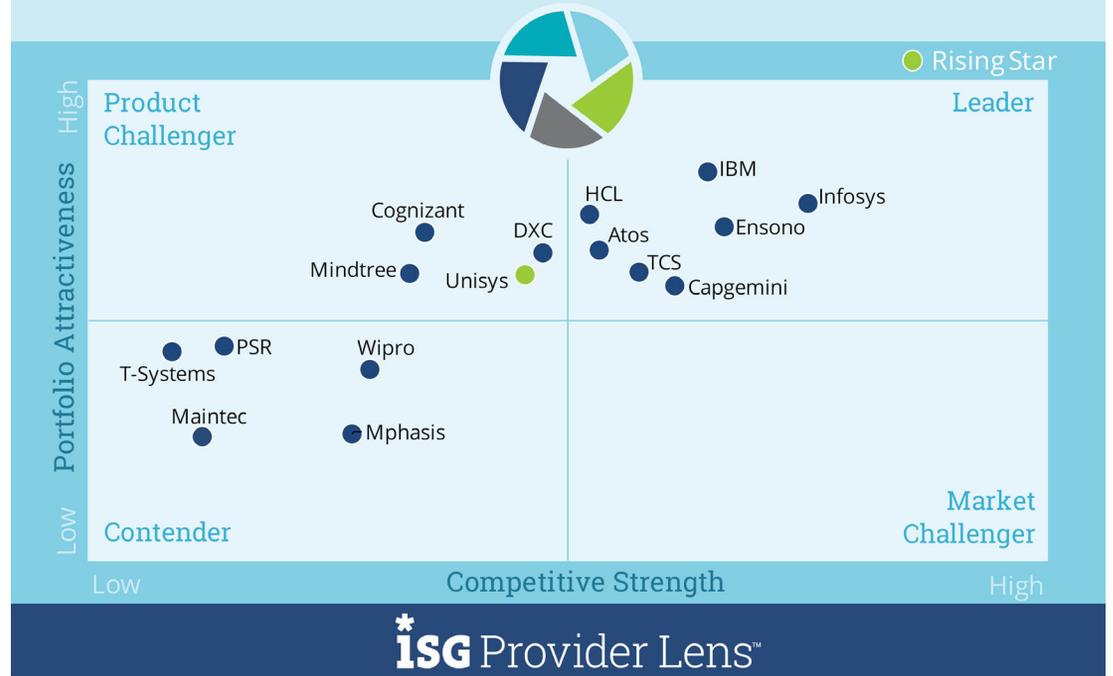
Definition

This quadrant assesses traditional outsourcing providers that have long been offering mainframe services. Typical participants employ experienced practitioners to cover legacy mainframe technologies as well as the most recent mainframe releases.

Mainframe operation service providers offer skilled teams to keep clients' mainframes running. Services can be delivered on any hosting facility (client- or provider-owned). Mainframe operation services exist for a long time and include job scheduling, performance optimization, CICS, batch, backup, restore, system upgrades, security patches and other typical mainframe operations. Multiple options exist for hardware and software ownership, upgrades and modernization responsibilities.

Mainframe Services & Solutions
Mainframe Operations

2021
U.S.



Source: ISG Research 2021

MAINFRAME OPERATIONS

Eligibility Criteria

- Robust mainframe operation capacity must be demonstrated through case studies.
- The company must conduct hiring and training programs to ensure skills availability in the future.
- The company must offer professional services for the management and monitoring of CPU, memory, databases, operating systems and tools.
- Professional services must include patching services for operating systems, middleware and applications; system upgrades; data center security; network configuration; and system integration.
- The company must provide management dashboards, including utilization reports, performance indicators, chargeback and other reporting functionalities.
- Services must comply with ITSM best practices and include incident management, problem management and release management.
- Ideally, the service provider should have sufficient mainframe capacity to supplement its client capacity during peak times.

Observations

Mainframe operations is a mature market with constant consolidation. It comprises traditional data center outsourcing providers that specialize in mainframes. The market is growing at around 5 percent each year in terms of MIPS capacity, but not in terms of the number of competitors.

Some service providers reported client churn, because of clients migrating small mainframes to the cloud. New clients come from in-house data centers. Clients choose mainframe operation services because of the availability of custom configurations and access to mainframe skills.

We qualified 16 service providers. These service providers manage more than 9 million MIPS globally and over 4.6 million MIPS in the U.S.

- **Atos** is a global service provider with more than 104,000 employees in 71 countries, generating €11 billion in revenue. Its portfolio includes cybersecurity, cloud and HPC. Atos has been providing mainframe operation services for more than 40 years and offers high-value mainframe services, including Linux on IBM Z, big data analytics, blockchain and ML. With more than 2,000 mainframe experts and large global mainframe operations, Atos can provide the U.S. clients with world-class managed mainframe operation services.
- **Capgemini** is a global service provider with more than 270,000 employees in 50 countries, generating €15.8 billion in revenue. It operates in 44 locations in the U.S. The company is a long-time IBM partner,

MAINFRAME OPERATIONS

Observations (cont.)

making mainframe services one of its core competencies. A seasoned operations team with large offshoring capacity and robust management tools position Capgemini in the Leader quadrant.

- **Ensono** offers a broad portfolio to more than 200 enterprise clients that are served by over 2,400 employees. It has 10 data centers in the U.S. and partners with AWS and Microsoft Azure. These high-scale data centers hold massive MIPS capacity. Ensono offers hybrid cloud managed services that integrate client's mainframe. Experienced staff and strict focus on expanding mainframe services are the base for Ensono's Leader position.
- **IBM** announced the spin-off of its GTS organization, creating a new company with approximated revenue of US\$19 billion, serving 4,600 clients, which makes it one of the top 10 global service providers in the IT service market. Mainframe operations has been part of GTS' portfolio for more than 40 years. IBM can support many outsourcing models, from staff augmentation to full outsourcing, and contractual terms that range from granular prices to monthly payments over consumption baselines.
- **Infosys** is a global service provider with more than 249,000 employees in 46 countries, generating US\$13.1 billion in revenue. North America accounts for more than 60 percent of the company's revenue. The company has an ambitious plan to be the most preferred mainframe services partner for enterprises within the next three years. Its mainframe operations rely on a robust service platform, leveraging AI automation. Infosys maintains a center of excellence to share the best practices globally, ensuring seamless services in all regions. It hosts a talent development program to attract and retain mainframe experts.
- **HCL Technologies** is a global service provider with more than 153,000 employees (called "ideapreneurs") working in 50 countries, generating US\$10 billion in revenue. It acquired Volvo Group IT services in 2018, providing it with additional expertise and a large mainframe footprint. The company owns six data centers in the U.S., including a Tier III data center in New Jersey. It hosts a mainframe lab in Sweden, a mainframe center of excellence in the U.S., and another one in India. HCL relies on automation to differentiate operation services, with a focus on MIPS reduction and efficiency gains.
- **Unisys** (Rising Star) is a global service provider headquartered in Pennsylvania with more than 17,000 employees, generating US\$2 billion in revenue. The company has been in the mainframe business since 1961. Unisys' MCP for Azure enables legacy ClearPath Forward mainframe applications to run in the cloud. The company offers mainframe operation services for systems running on-premises, in colocation or in the cloud. There are many legacy Unisys systems in the U.S. that need to be modernized and migrated to the cloud, providing Unisys with the opportunity to grow its footprint in this market.

ENTERPRISE CONTEXT

Mainframe Modernization Software

This report is relevant to enterprises in the U.S., evaluating vendors of modernization software within the mainframe ecosystem.

In this quadrant report, ISG assesses the current market positioning of vendors offering mainframe modernization software to enterprises in the U.S., based on the depth of service offerings and market presence.

Even during the current times of business and economic uncertainties, ISG sees a growing need for modernization software that enable code assessments and code conversion of legacy applications. Typically, it encompasses reverse engineering, business logic mapping, business rules extraction, code review and inspection, documentation, emulators, frameworks and application development tools that can accelerate code and application modernization. The range of competencies among vendors makes it more challenging to identify and engage with the most suitable partners.

Who should read the report:

- **Marketing and sales leaders** should read this report to understand how mainframe modernization vendors can help them develop and improve business planning, go-to-market strategy and related activities.
- **IT and technology leaders** should read this report to understand the strengths and weakness of vendors offering modernization solutions, including their offerings, capabilities, architecture, and the way they employ latest technologies to deliver reliable offerings that suit enterprise needs and expectations.

MAINFRAME MODERNIZATION SOFTWARE

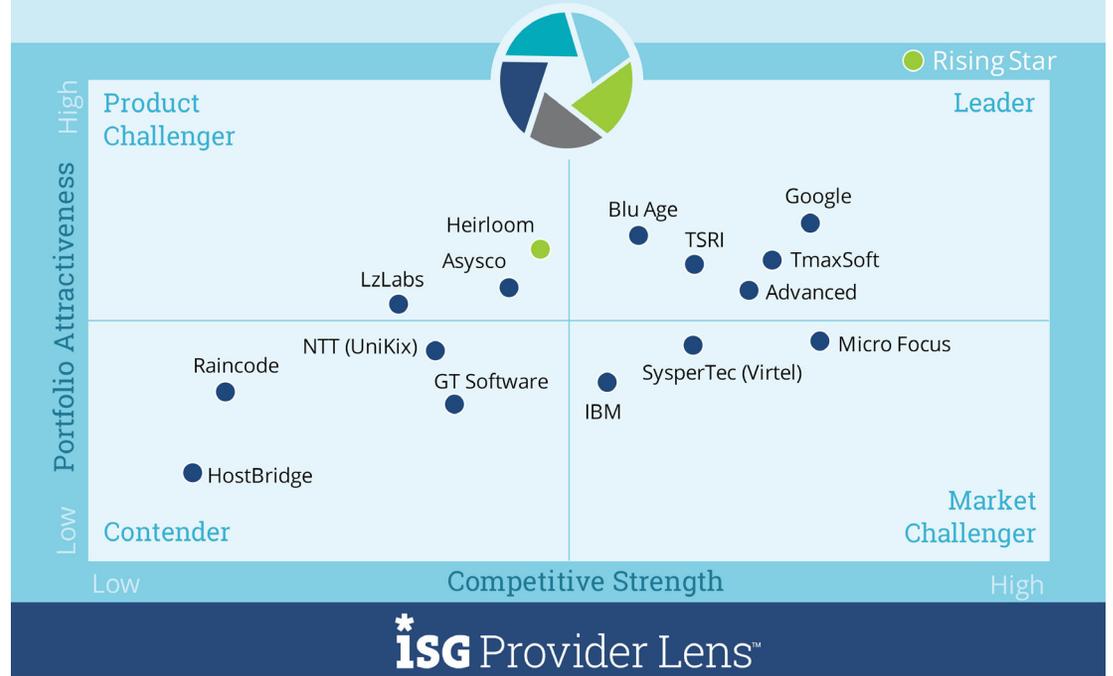
Definition

This quadrant ranks the software and toolsets that enable legacy application code assessments and code conversion. Mainframe modernization software includes reverse engineering, business logic mapping, business rules extraction, code review and inspection, documentation, emulators, frameworks, and application development tools that can accelerate code modernization and application modernization.

Enterprises and service providers require tools to perform their mainframe modernization and transformation. This quadrant includes vendors that supply the modernization toolset and eventually partner with global system integrators (GSI) that deliver modernization services. Mainframe modernization software outcomes can include logic flows, data architectures, automated code conversion, serverless functions, APIs and microservices that accelerate the mainframe modernization program.

Mainframe Services & Solutions
Mainframe Modernization Software

2021
U.S.



Source: ISG Research 2021

MAINFRAME MODERNIZATION SOFTWARE

Eligibility Criteria

- Vendor should provide case studies that illustrate its software capabilities.
- The software should be licensed or delivered as a service, enabling client autonomy.
- The vendor must have mainframe specialization and offer mainframe-specific tools.
- Generic code conversion tools or wide-scope server/cloud optimization tools are not included.
- The product must be available and in use by clients for more than one year.
- The solution must have a robust service support organization or service partner ecosystem in the U.S. to ensure enterprise support.

Observations

The mainframe modernization software market is expanding, with some vendors reporting more than 20 percent growth. The increased interest in modernizing mainframes is driven by the desire to migrate applications to the cloud and shut down data centers. The COVID-19 pandemic accelerated cloud adoption in 2020 because many enterprises discovered they should have better business continuity solutions, and the cloud showed reliability, availability and scale during such difficult times.

Modernization software in this report includes application re-engineering tools, code compilers, emulators, database conversion tools and many other tools used for assessing, replatforming, refactoring and rewriting mainframe applications. Only four of the 16 companies evaluated are very large vendors (IBM, Google, Micro Focus and NTT DATA). Of those four, two acquired niche vendors to leverage their tools (Google and NTT DATA). The market is dominated by mid-sized companies, which have deep technology expertise, and a small number of practitioners.

Most efficient tools enable clients to continue changing their legacy code until transformation occurs. Some tools are differentiated by their capacity to synchronize legacy code and new code. Despite the method, it is important to reduce the need for code change freeze windows. Some tools persist in the client environment after the modernization project. It is often the case for emulators, application development tools, operation tools, monitoring platforms and code compilers. Clients need to understand the solution beforehand.

MAINFRAME MODERNIZATION SOFTWARE

Observations (cont.)

There are no best or worst methods, each has its pros and cons. Clients need to understand the modernization method and the implications of their choice. From a high-level perspective, emulators enable faster migrations to the cloud, but they impose residual costs. Code compilers eliminate emulators but introduce other residual costs. Re-engineering eliminates residual costs, but the project is more expensive. There is always a trade-off; this report highlights the most evident points, but clients need to study the consequences further.

No tool has all features to cater to the needs of the clients. In many cases, clients need to combine two or more tools from different vendors to cover all programming languages and methods required in their particular environment. In most cases, if not all, clients do not have the skills or training required to use the modernization tools themselves. It is recommended to hire professional services from the vendor organization or their certified partners.

For this report, ISG has considered the seven most common legacy languages for comparison purposes (COBOL, Natural, PL/1, Assembler,

JCL, REXX and Easytrieve). Some vendors support more languages that were not been considered for their portfolio attractiveness.

We have qualified 16 vendors in this quadrant and identified five Leaders and one Rising Star. They are as follows:

- **Advanced** is a software vendor and IT service provider headquartered in the U.K. with more than 2,500 employees, generating US\$330 million in revenue. The company focuses on application modernization and cloud migration services. In 2019, it acquired Modern Systems and later created its Modernization Platform-as-a-Service (ModPaaS) available on AWS, Microsoft Azure, Google Cloud Platform and Oracle Cloud, which gives it excellent visibility in the market. The company's differential is the automatic generation of object-oriented applications in Java or C#.
- **Blu Age** is a software vendor and service provider headquartered in France. It is a privately held organization with 130 legacy modernization experts. The company has been providing code transformations for 15 years. Its patented technology is available on AWS, Microsoft Azure and Oracle Cloud. The toolset generates cloud-native Java Spring with a modern Angular/HTML/Bootstrap UI. The toolset re-engineers applications, considering business rules, application behavior and dependencies to automatically design object-oriented programs.

MAINFRAME MODERNIZATION SOFTWARE

Observations (cont.)

- **Google** is part of a US\$161 billion revenue company, headquartered in California. In 2020, Google Cloud acquired Cornerstone Technology and its product G4. Google has been investing to power G4 technology with AI. Clients can access G4 through some certified partners or Google's professional service organization. Once set, the automated platform extracts business rules and converts both programs and databases to run on Google Cloud Platform. Final applications can run in any cloud. Typical projects take a few months to complete and deliver consistent results with nearly 100 percent automation.
- **TmaxSoft** is a software vendor headquartered in Illinois with more than 1,700 employees in 20 countries. TmaxSoft OpenFrame is a platform on Linux, Unix or in the cloud, to run legacy applications without code changes. It provides batch and other tools, code compilers and database conversion tools. It offers a scalable replatforming solution to rapidly reduce costs, while providing modernization and improved integration. TmaxSoft partner program enables several system integrators in the U.S. to provide support to mainframe modernization.
- **The Software Revolution, Inc., (TSRI)** is a software vendor headquartered in Washington. It offers JANUS Studio®, a framework for automated software assessment and documentation, transformation, and refactoring. The company has completed more than 130 mainframe modernization projects. The company's size and geographic presence limit its portfolio attractiveness. The tool offers the most comprehensive functionality for application re-engineering, and the company's professional organization has seasoned professionals and good case studies.
- **Heirloom Computing** (Rising Star) is a software vendor headquartered in California, founded in 2010. Heirloom refactors mainframe applications to cloud-native Java programs that can scale horizontally on AWS and other clouds. The company offers a modern refactoring toolset that attracts system integrators and cloud providers' attention because of its code refactoring speed and scalability.

GOOGLE (G4)

Overview

Google is part of Alphabet Inc., a US\$161 billion company headquartered in California. In 2020, Google Cloud acquired Cornerstone Technology and its product G4. Google has been investing to power G4 technology with AI. G4 platform is available as a service on Google Cloud Platform (GCP). Legacy languages supported are COBOL, PL/1, Assembler, JCL, Easytrieve and more than 100 others, covering CICS, IMS and most mainframe technologies. Its modernization methods include refactoring, code conversion to Java and .NET/C#.

Strengths

Execution capacity: One year after the acquisition, Google has improved G4 functionality and performance with its robust R&D organization. Google's professional services organization helps clients understand and execute their mainframe migration to cloud. The company has established a mainframe center of excellence with a global capacity, extending the knowledge it acquired with Cornerstone.

Comprehensive offer: G4 platform inspects the mainframe to extract business rules to create a hyper model of databases and applications. Its dashboards provide dependency maps, program flows, data access and documentation, providing clarity for code conversion prioritization. Microservices and APIs can be easily identified. Code conversion targets 100 percent automation. GCP massive computing power ensures rapid transformations.

No lock-in: The G4 Platform and the converted code run on GCP. Clients benefit from bundling services in one platform, leveraging Kubernetes, Apigee, analytic tools and ML. Clients own the generated code and can move to any cloud. Google provides assessments and proof of concept before clients commit to large transformations. Platform pricing is based on the number of lines of code to convert.

Extended support: Google has a strict partner qualification program to assure the quality of services.

Caution

The G4 Platform is not directly available to clients. It is only available for trained clients or certified partners.

Google supports selected corporate clients. Most enterprises need to go through Google's certified partners to use G4.

Like other re-engineering tools, the generated code does not sync back to COBOL code. Therefore, clients need to consider how to reskill or replace their application development and maintenance team.



2021 ISG Provider Lens™ Leader

G4 is a powerful code conversion platform to migrate mainframes to the cloud. It delivers predictable results and cost savings on a secure platform.



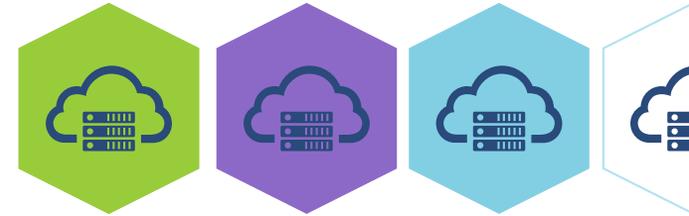
Methodology

METHODOLOGY

The research study “ISG Provider Lens™ 2021 – Mainframe Services & Solutions” analyzes the relevant software vendors/service providers in the U.S. market, based on a multi-phased research and analysis process. It positions these providers based on the ISG Research methodology.

The study was divided into the following steps:

1. Definition of Mainframe Services & Solutions market
2. Use of questionnaire-based surveys of service providers/vendor across all trend topics
3. Interactive discussions with service providers/vendors on capabilities & use cases
4. Leverage ISG's internal databases & advisor knowledge & experience (wherever applicable)
5. Detailed analysis & evaluation of services & service documentation based on the facts & figures received from providers & other sources.
6. Use of the following key evaluation criteria;
 - Strategy & vision;
 - Innovation;
 - Brand awareness and presence in the market;
 - Sales and partner landscape;
 - Breadth and depth of portfolio of services offered;
 - Technology advancements.



Authors and Editors



Pedro Luís Bicudo Maschio, Author

Partner Author

Distinguished analyst and author, Pedro brings extensive experience in research of the Americas and SEMEA (Southern Europe Middle East and Africa) markets. With more than 30 years of experience in sourcing, he has developed vendor assessments plus contract restructuring, services scope and IT benchmarking programs for diverse vertical markets in the Americas and Asia Pacific. Before joining ISG, Pedro was a partner of TGT Consult and managing vice president at Gartner Inc., responsible for the consulting business in APAC and Latin America.



Srinivasan PN, Enterprise Context and Global Summary Analyst

Research Analyst

Srinivasan is a senior analyst at ISG and is responsible for supporting and co-authoring Provider Lens™ studies on AWS Ecosystem and Insurance BPO Industry. His area of expertise lies in the space of engineering services and digital transformation. Srinivasan has over 6 years of experience in the technology research industry and in his prior role, he carried out research delivery for both primary and secondary research capabilities. Srinivasan is responsible for developing content from an enterprise perspective and author the global summary report. Along with this, he supports the lead analysts in the research process and writes articles about recent market trends in the industry.

Authors and Editors



Jan Erik Aase, Editor

Partner, Principal Analyst and Global Head – ISG Provider Lens/ISG Research

Mr. Aase brings extensive experience in the implementation and research of service integration and management of both IT and business processes. With over 35 years of experience, he is highly skilled at analyzing vendor governance trends and methodologies, identifying inefficiencies in current processes, and advising the industry. Jan Erik has experience on all four sides of the sourcing and vendor governance lifecycle: as a client, an industry analyst, a service provider and an advisor. Now as a research director, principal analyst and global head of ISG Provider Lens™, he is very well positioned to assess and report on the state of the industry and make recommendations for both enterprises and service provider clients.

ISG Provider Lens™ | Report: Mainframe Services & Solutions

April 2021

© 2021 Information Services Group, Inc. All Rights Reserved



ISG (Information Services Group) (Nasdaq: III) is a leading global technology research and advisory firm. A trusted business partner to more than 700 clients, including more than 75 of world's top 100 enterprises, ISG is committed to helping corporations, public sector organizations, and service and technology providers achieve operational excellence and faster growth. The firm specializes in digital transformation services, including automation, cloud and data analytics; sourcing advisory; managed governance and risk services; network carrier services; strategy and operations design; change management; market intelligence and technology research and analysis. Founded in 2006, and based in Stamford, Conn., ISG employs more than 1,300 digital-ready professionals operating in more than 20 countries—a global team known for its innovative thinking, market influence, deep industry and technology expertise, and world-class research and analytical capabilities based on the industry's most comprehensive marketplace data. For more information, visit www.isg-one.com.