Arcati Mainframe
User Survey

2024
Mainframe User Survey

An analysis of the profile, plans, and priorities of mainframe users.

Many thanks to all those who took part.

This year marks the first for the Arcati Mainframe User Survey on its new home —on the Planet Mainframe site. As usual, the annual mainframe survey provides a snapshot of the IBM Z user community's existing 2023 hardware and software configuration, as well as their plans and concerns for 2024.

This year we have continued to track the growth of mainframe integration with cloud computing, and other areas, as well as gauging the extent to which the IT and business analytics and IT security are really impacting on the mainframe world. As in previous years, we have continued to explore relative costs, asking respondents how they see growth trends relating to their mainframe and cloud infrastructures.

Profile of respondents

The mainframe user survey was completed in Q4 of 2023. Survey respondents journeyed to the survey on different paths. In addition to the Planet Mainframe website and mailing list, invitations to participate were also distributed through iTech-Ed and the Mainframe Virtual User Groups (for CICS, Db2 and IMS). Responses from multiple entries from different people at the same site were excluded from the survey, as were largely incomplete responses.

The distribution of all respondents is shown in Figure 1. For the first time since we started the yearly survey, we had more respondents from Europe than we did from North America —42% to 36%—likely due to our increased reach in the UK, and our presence at four mainframe trade shows in just over a year. Fourteen percent were from the Asia/Pacific region, while South America and Middle East/Africa came in at 5% and 2.5%, both lower than in previous years.
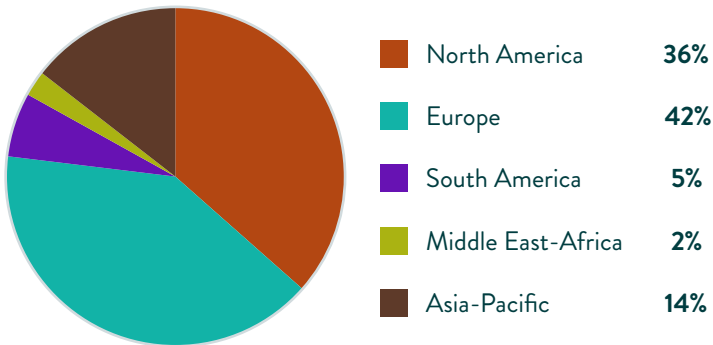
North America		**36%**
Europe		**42%**
South America		**5%**
Middle East-Africa		**2%**
Asia-Pacific		**14%**

Figure 1: Profile of respondents

As usual, a wide range of industry types are represented in our sample (Figure 2), with IT making up over 70 percent of respondents—which can be interpreted in many ways as, in one sense, all mainframe personnel are considered IT, but in another, service provider personnel can be considered part of an "IT company." This may skew the results somewhat. For non-IT sector respondents, Banking made up almost 20 percent, while Insurance came in at almost 15 percent. Government, Retail and Healthcare (a specific type of Insurance), as well as the industries that did not fit any of the categories offered, each made up just over 15 percent of sites responding.

What industry sector are you in?

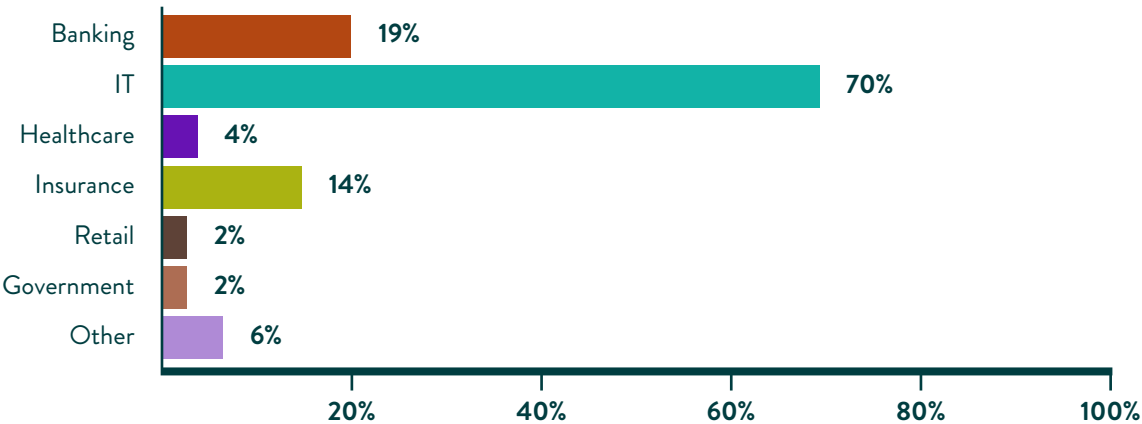| Sector	Percentage
Banking	19%
IT	70%
Healthcare	4%
Insurance	14%
Retail	2%
Government	2%
Other	6%

Figure 2: What industry sector are you in?

For the first time, we asked respondents to tell us about their positions within their organizations. As Figure 3 shows, a third of our respondents were collectively management, while more than 60 percent were Programmers, Engineers, DBAs, and other professionals. Students and interns accounted for just over 5 percent of the respondents.

What is your position in the organization?

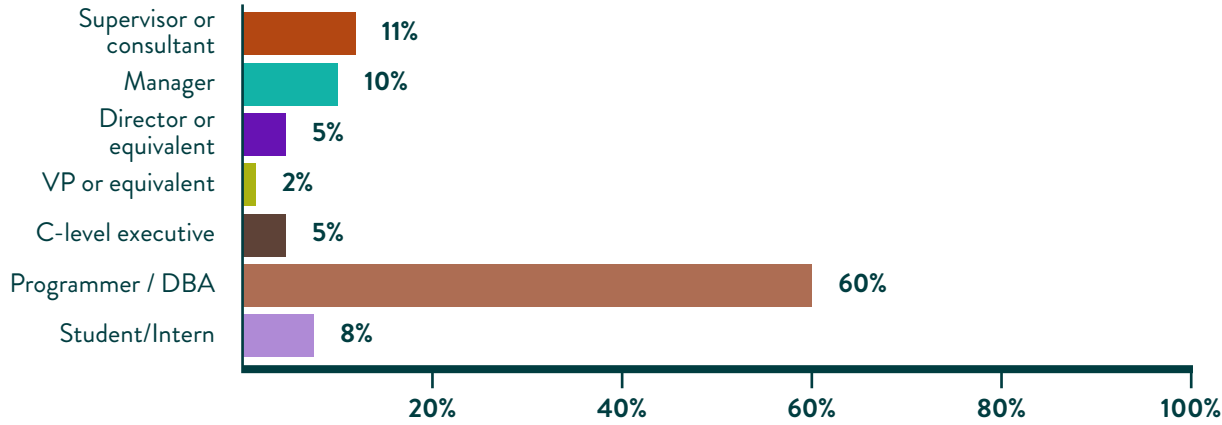| Position	Percent
Supervisor or consultant	11%
Manager	10%
Director or equivalent	5%
VP or equivalent	2%
C-level executive	5%
Programmer / DBA	60%
Student/Intern	8%

Figure 3: What is your position in the organization?

Training and background

Another first for the Mainframe Survey is a look at where our respondents received their education that prepared them for their careers as mainframers. About 40 percent of the respondents seem to have come directly from a college, university, or a technical school. Others came to the mainframe field indirectly, relying on on-the-job training, or were self-taught—these folks undoubtedly had previous education, but relied on other paths for their mainframe qualifications.

Another excellent way to keep pace with new technologies and trends in the mainframe business is to attend trade show events. Our survey respondents have confirmed this, as over 40 percent attend 1-2 events each year (Figure 4). Surprisingly, over 10% state that they attend 3-5 events per year. Of course, in most organizations, you need corporate approval to attend events; a quarter of respondents found it easy to obtain this approval, while nearly 60% found it at least somewhat of a challenge.

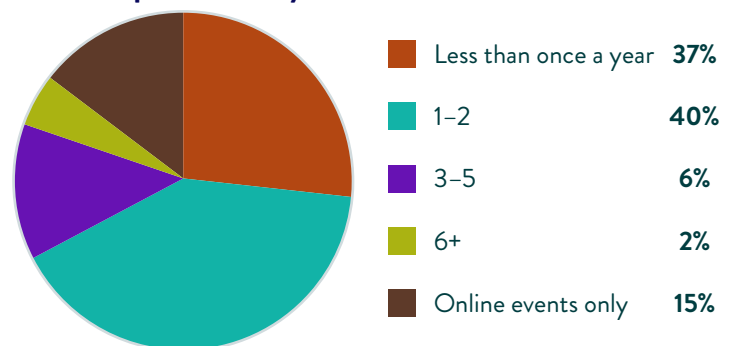**On average, how often do you attend mainframe-related events in person each year?**

Less than once a year	**37%**
1–2	**40%**
3–5	**6%**
6+	**2%**
Online events only	**15%**

Figure 4: Number of events attended each year

Finance and business

This year, we wanted to dig deeper to quantify the importance of the mainframe in our respondents' organizations business operations. About 20 percent of our respondents skipped this question because, not surprisingly, folks outside of management typically do not have access top that type of information. The results were still interesting, however, as more than half of the respondents indicated that over 50% of business revenue is generated by mainframe applications. The number may be higher, as some respondents may not realize that non-mainframe front-end systems often leverage mainframe applications for back-end processing.

Figure 6 shows that almost 20 percent of respondents indicate that most their organizations' applications run on the mainframe. This is actually a shockingly large number, considering the strengths of mainframe applications (throughput, capacity, etc.) vs the strengths of non-mainframe applications (low cost, platform independence, less importance, etc.). It speaks to an exceptionally large number of mainframe applications, considering the lower computing requirements of general business applications (office applications, etc.). Even the lower end (0-25%) likely hints at a significant number of mainframe applications.

Overall IT budget

The mainframe's weight in terms of organizations' overall IT budget is heavy, as shown on Figure 7. These days most organizations have moved workloads that do not need to be on the mainframe to other platforms. What is left are business-critical workloads that must stay on the mainframe. Future surveys will probably not differ much from these results. (We shall see...)

What percentage of your company's business revenue is handled by mainframe applications?
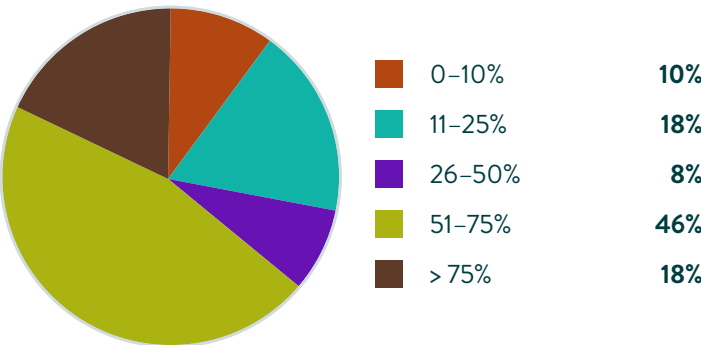

0–10%	**10%**
11–25%	**18%**
26–50%	**8%**
51–75%	**46%**
> 75%	**18%**

Figure 5: What percentage of your company's business revenue is handled by mainframe applications?

What percentage of your company's applications are running on the mainframe?

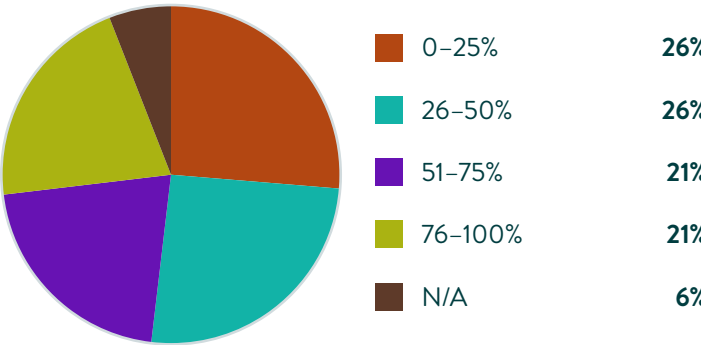|	
0–25%	**26%**
26–50%	**26%**
51–75%	**21%**
76–100%	**21%**
N/A	**6%**

Figure 6: Percent of applications running on mainframe

What proportion of your Total IT Budget is spent on mainframe-related items vs. other platforms?
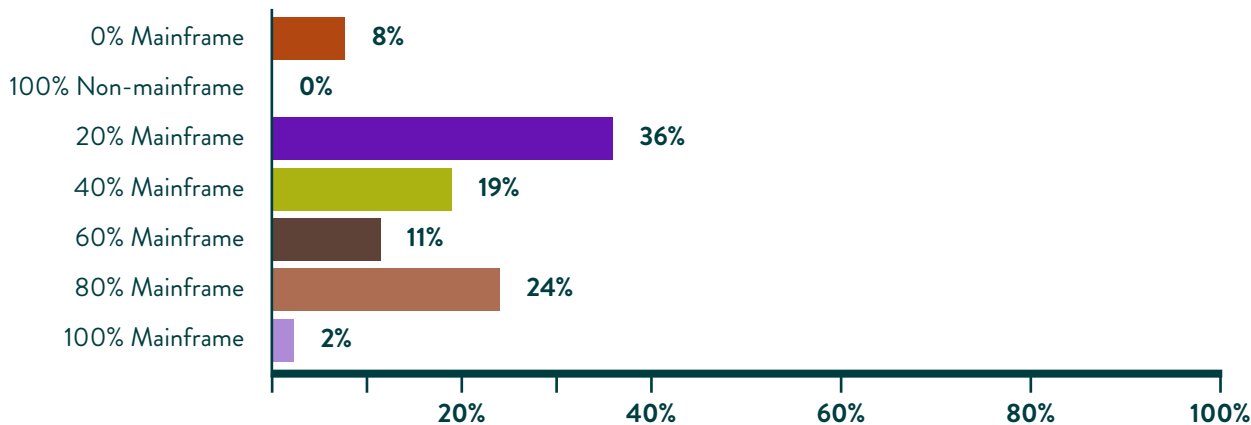

Figure 7: What proportion of your TOTAL IT BUDGET is spent on mainframe-related items vs. other platforms?

Mainframe-specific personnel costs are rising moderately over time (Figure 8), indicating a relatively stable workforce after inflation is taken into account.

My company's mainframe related personnel costs are:

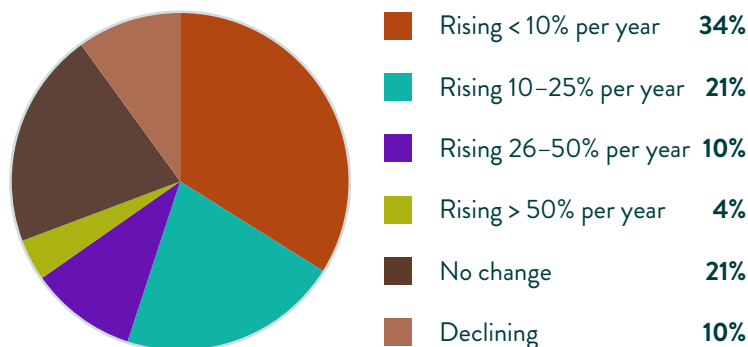|	
Rising < 10% per year	**34%**
Rising 10–25% per year	**21%**
Rising 26–50% per year	**10%**
Rising > 50% per year	**4%**
No change	**21%**
Declining	**10%**

Figure 8: The company's mainframe related personnel costs

Mainframe upgrade approvals

We decided this year to investigate mainframe spending and personnel involved in mainframe upgrades. Half of the respondents "in the know" feel that getting required mainframe upgrades approved is a challenge. This should be no surprise, since, as we have seen, the costs can be significant to the company. As for the people involved in the approval process, the results were all over the map (see Figure 9). Senior executives held much sway —totalling more than 25% —but IT personnel were heavily involved as well, with consultants, architects and System Administrators combining for about 30%.

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Who typically plans mainframe processor/system/database upgrades?

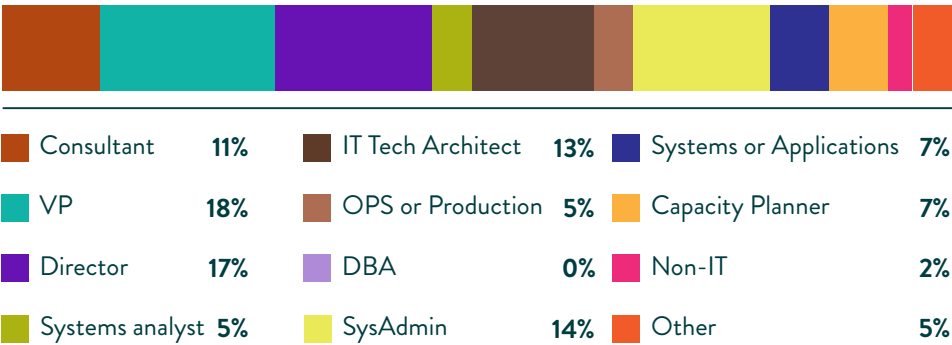|								
■ Consultant	11%	■ IT Tech Architect	13%	■ Systems or Applications	7%
■ VP	18%	■ OPS or Production	5%	■ Capacity Planner	7%
■ Director	17%	■ DBA	0%	■ Non-IT	2%
■ Systems analyst	5%	■ SysAdmin	14%	■ Other	5%

Figure 9: Who typically plans mainframe processor/system/database upgrades?

When we asked about the people involved in approvals specifically for mainframe processor, system, and database upgrades (Figure 10), senior executives were again at the forefront (according to respondents) at about 25%, but the Finance executives also held sway at over 20%. We were somewhat surprised at how little Capacity Planners were involved is these approval processes.

Who typically approves mainframe processor/system/database upgrades?

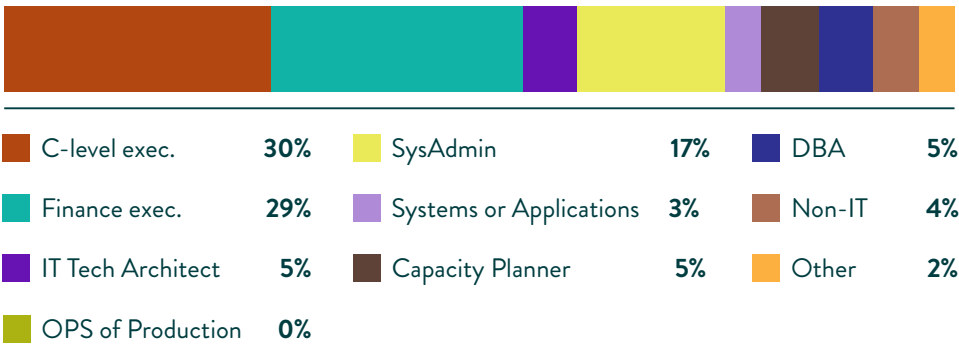|								
■ C-level exec.	30%	■ SysAdmin	17%	■ DBA	5%
■ Finance exec.	29%	■ Systems or Applications	3%	■ Non-IT	4%
■ IT Tech Architect	5%	■ Capacity Planner	5%	■ Other	2%
■ OPS of Production	0%				

Figure 10: Who typically approves mainframe processor/system/database upgrades?

Mainframe workforce

We asked our participants about the hiring practices at their corresponding organizations—see the results in Figure 11. We can see that while companies are hiring mainframe personnel, they are hiring more Cloud personnel, and at a higher rate. Unfortunately, in terms of workforce reductions, the mainframe teams seem to be impacted more than any other personnel groups in the survey. The interpretation could lead us to believe that companies doing well financially are going to hire mainframers at a decent rate, but companies under financial pressure are going to discard mainframers before anyone else.

What are the hiring tendencies in your company for these talents/levels?

Distributed Cloud Mainframe Non-Tech

Entry Level Experienced Senior Level
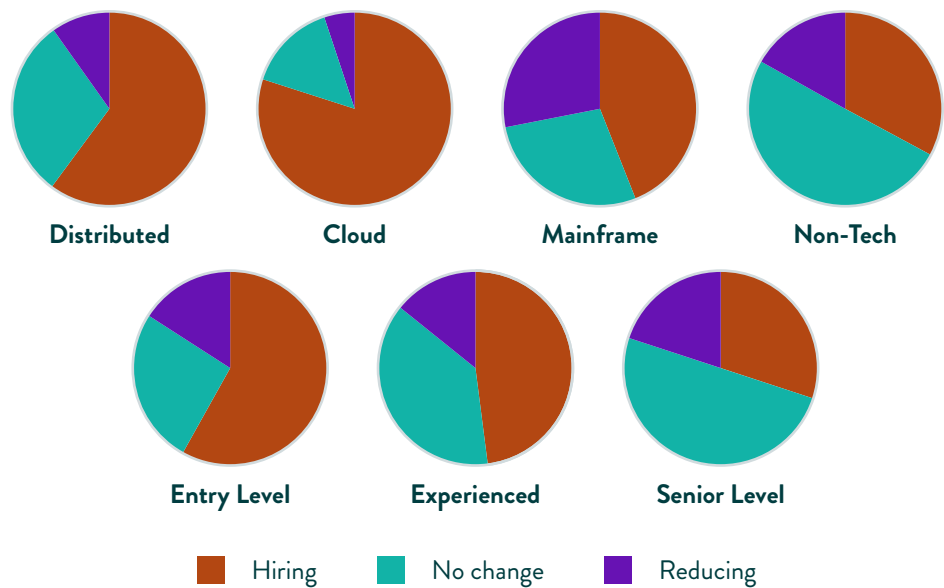
■ Hiring ■ No change ■ Reducing

Figure 11: What are the hiring tendencies in your company for these talents/levels?

When looking at the number of application programmers working in today's mainframe shops —see Figure 12 —we can see that the majority of respondents report teams in excess of 50 individuals. It would seem that large organizations employ large teams of programmers —this would include not just large financial services and insurance organizations, but likely includes programming consulting firms like IBM, and perhaps a number of smaller consulting firms specializing in mainframe programming outsourcing.

But respondents also indicated that companies with smaller teams represent a sizable portion of the total number of companies employing mainframe programmers. Presumably, this would include smaller financial services and insurance organizations that rely on mainframe processing, smaller outsourcing firms, as well as a number of smaller mainframe software product supplier firms.

How many mainframe application programmers work at your company?

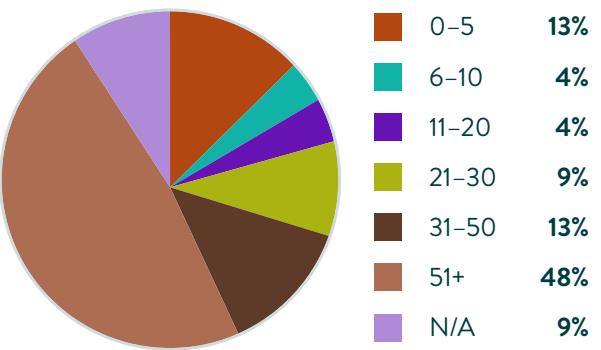|	
■ 0–5	**13%**
■ 6–10	**4%**
■ 11–20	**4%**
■ 21–30	**9%**
■ 31–50	**13%**
■ 51+	**48%**
■ N/A	**9%**

Figure 12: How many mainframe application programmers work at your company?

When comparing the number of mainframe programmers to cloud programmers —Figure 13 —we find that most companies employ many more cloud personnel than they do mainframers. This should not be a shock to anyone since many organizations leverage cloud resources for many purposes beyond transaction processing. Further to that, most folks understand that many mainframe applications are front-ended by cloud applications. It was interesting that almost 10% of respondents bucked that trend, reporting that the ratio of mainframe to cloud programmers within their organizations was 1:1. This group may represent mainframe outsourcing shops or mainframe-specific ISVs.

When asked about the stability of the mainframe teams within their organizations, respondents indicated that generally, an equal number of teams are growing versus shrinking, while the majority are unchanged over time.

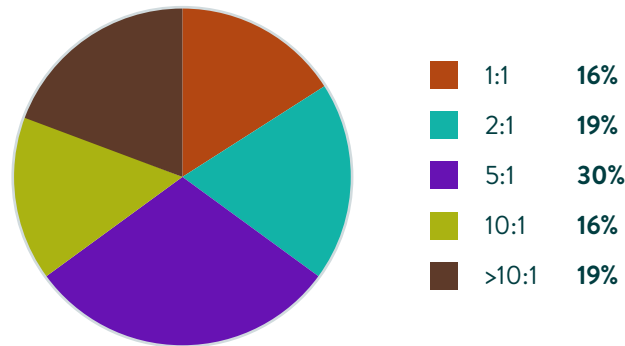**What is the ratio of distrubuted/cloud programmers to mainframe programmers?**

■	1:1	**16%**
■	2:1	**19%**
■	5:1	**30%**
■	10:1	**16%**
■	>10:1	**19%**

Figure 13: What is the ratio of distributed/cloud programmers to mainframe programmers?

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The mainframe environment

MIPS usage

As in previous surveys, we continue to use MIPS as the principal measure of size. We asked respondents (Figure 14) to indicate the total mainframe MIPS installed on their systems. Twenty percent of respondents had 501 to 1000 MIPS (down from last year's figure of 36 percent). Forty percent had over 25,000 MIPS (significantly more than last year's figure of 29 percent). It seems that most shops are ramping up on mainframe capacity; but the data could also indicate that some of the smaller shops are shutting down their mainframe operations. However, that could also mean that these smaller shops are growing, and no longer fit into the lower categories in terms of total MIPS usage.
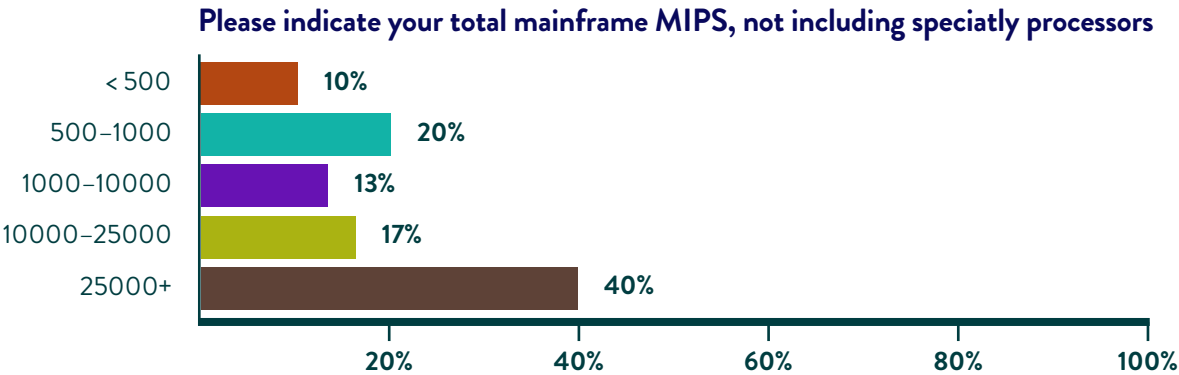
Please indicate your total mainframe MIPS, not including specialty processors

Figure 14: Total mainframe MIPS, not including specialty processors

Figure 15 shows that more than 80% of respondents' organizations MIPS/MSU usage is growing in some way. Almost 10% have reported declining usage, while about 6% report no change. These numbers do not compare well to last year's results, but (in hindsight) the spike in increased usage last year may have been a sharp recovery phase, as organizations corrected for Covid-related business slow-downs.

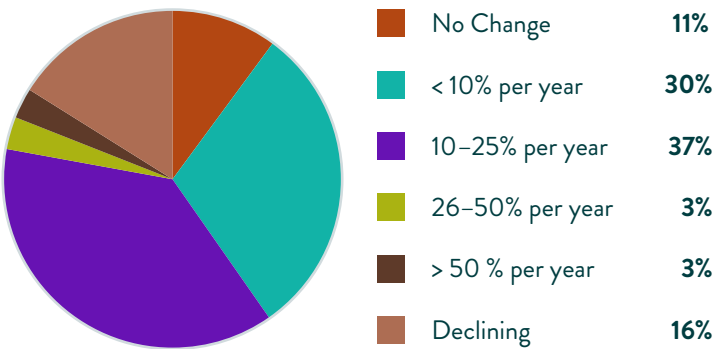**How fast is your mainframe MIPS capacity or MSU usage growing?**

No Change		11%
< 10% per year		30%
10–25% per year		37%
26–50% per year		3%
> 50 % per year		3%
Declining		16%

Figure 15: How fast is your mainframe MIPS capacity / MSU usage growing?

Db2 usage

According to our respondents, it looks like the majority of Db2 shops are running either Db2v12 or Dbsv13 (the latest version) in their organizations' mainframe systems. In fact, Figure 16 shows that less than 5% of respondents indicated usage of a version older than Db2v12. This tells us that most mainframe shops (or at least those of our respondents) are serious about keeping up to date with their most important business-critical database. For those shops running Db2v12 or older, Figure 17 indicates that most are in the planning stages for an upgrade.

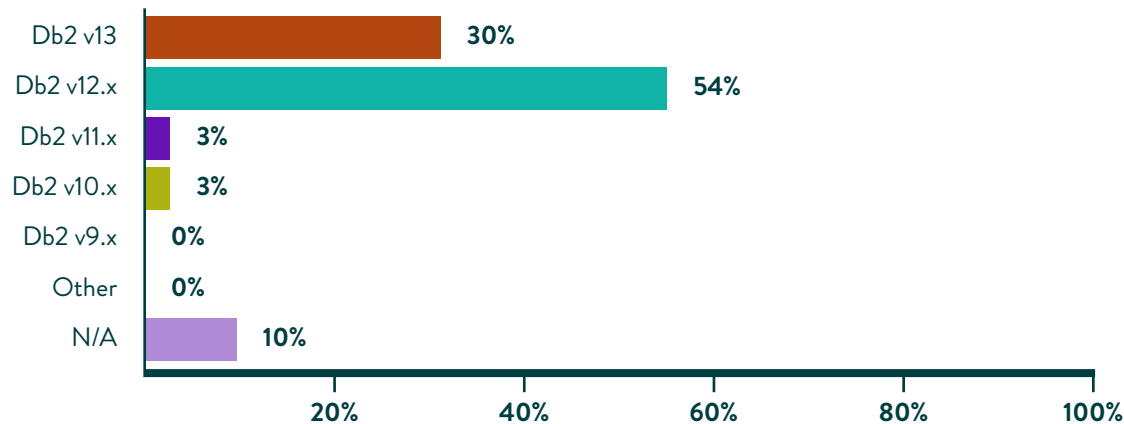### What version of Db2 is currently running on the mainframe system?

Version	Percentage
Db2 v13	30%
Db2 v12.x	54%
Db2 v11.x	3%
Db2 v10.x	3%
Db2 v9.x	0%
Other	0%
N/A	10%

Figure 16: What version of Db2 is currently running on the mainframe systems?

Is your organization planning a Db2 upgreade?

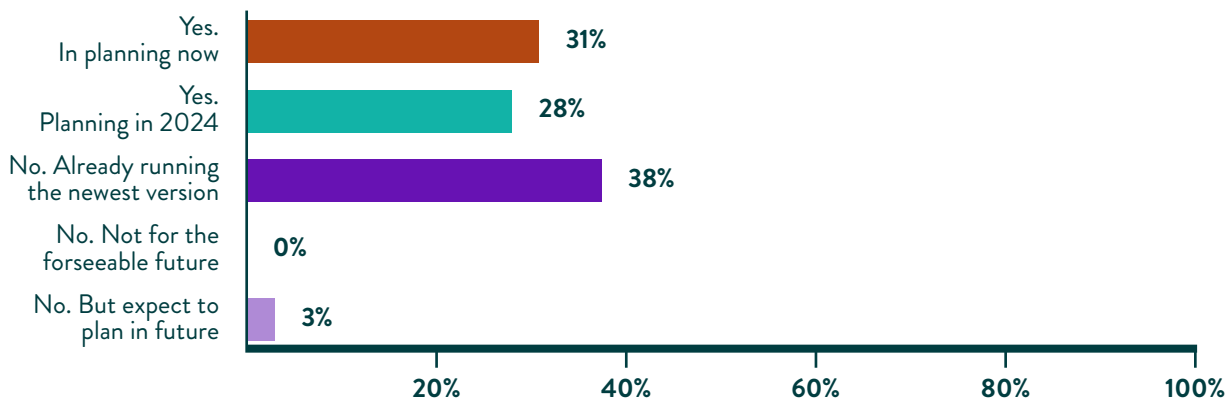| Response	Percentage
Yes. In planning now	31%
Yes. Planning in 2024	28%
No. Already running the newest version	38%
No. Not for the forseeable future	0%
No. But expect to plan in future	3%

Figure 17: Is your organization planning a Db2 upgrade?

Outsourcing

Another first for this year's survey —we were interested to know to what degree mainframe organizations are leveraging outsourcing in their mainframe operations. Our respondents indicated in Figure 18 that in about 60% of the cases, their organizations are managed entirely in-house. About 20% indicated that they invest at least partially in outsourcing, while less than 5% reported that their organizations were, in fact, outsourcing firms. This actually surprises no one considering that mainframe outsourcing agencies are sprouting up everywhere, especially offshore. We will investigate this trend in more detail in a future survey.

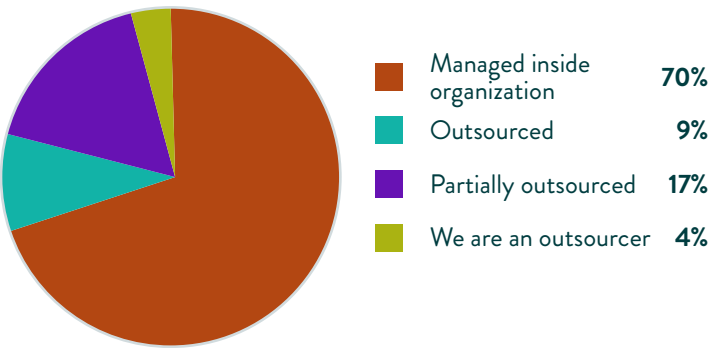**Are your company's mainframe systems managed in-house or outsourced?**

■ Managed inside organization	**70%**
■ Outsourced	**9%**
■ Partially outsourced	**17%**
■ We are an outsourcer	**4%**

Figure 18: Are your company's mainframe systems managed in-house or outsourced?

New and emerging technologies in the mainframe shop

According to our respondents, most of their employers are hip deep in the latest technologies within their IT organizations. More than 90% report that their companies are either using APIs today to speed up application development or are planning to do so. More specifically, 71% are already doing it. Linux adoption and Java-based applications are also immensely popular, both running at 88% either currently using or planning to do so (up significantly from last year, when Java adoption was reported at 61% adopted or planning). Splunk is now being used, or soon will be, in 69% of respondents' organizations for IT analytics. DevOps (and/or DevSecOps) is working now in about two thirds of respondents' organizations, with another 20%+ planning to do so. Containers and Dockers are making their mark in IT shops as well, with respondents indicating 83% and 79% current or planned penetration, respectively. These technologies have been around for about ten years, and their value is reflected in their wide-spread adoption - confirming that we are well past the early-adopters phase. RedHat OpenShift and IBM Cloud Paks are present in many shops as well, coming in at 78% and 65% current or planned penetration respectively (a quite significant increase over last year's 12%). Even less-than-mainstream technologies are making their presence felt —RPA (Robotic Process Automation) is present in those companies whose respondents knew what it was —according to 45% of our respondents. A further 23% indicated their companies are planning to implement RPA (last year this was 14%). This is an impressive list of tech activity taking place in our respondents' companies —but these products and toolsets are available for all platforms, not just z/OS platforms. For z/OS-specific items, respondents indicated that Zowe was either running now, or soon will be in 85% of their mainframe shops. Finally, IBM's Tailor Fit Pricing is now running, or soon will be, in 68% of respondents' mainframe shops.

Workload migration

We have known for years (decades, really) that workloads have been shifting from the mainframe platform to other platforms —distributed systems, and more recently, the Cloud. The truth is that many of these migrated workloads over the years were better served on non-platform systems. Workloads that don't require five-nines of reliability or transaction processing and throughput muscle —things like word processing, email handing, etc. —are obvious examples. However, by now most of these workloads have been migrated, so we were curious about today's workload migrations. Figure 19 gave us a couple of surprises. Our respondents indicated that their employers were still moving workloads off the mainframe —almost 60% indicated that this was the case. Why would this still be happening? A couple of reasons come to mind. There could be smaller, less visible, applications running on mainframe systems that are only discovered by deep analytic dives into mainframe resource usage. As candidates for migration are discovered, they are moved asap, to reduce unnecessary MIPS/MSU usage, with the hope of saving some monthly mainframe spend. This effort may or may not truly yield meaningful results, as in most cases, high-profile resource-intensive applications that don't need mainframe-type reliability, throughput, security and scalability have been migrated years ago. Today's efforts may be like preventing tears dripping into the ocean. At any rate, that is the hope. If there are IT executives our there on cost-savings missions with limited understanding of the strengths and weaknesses of platform suitability, there could be some unnecessary pain on the way. There have been hard lessons learned in the past (see https://planetmainframe.com/2016/03/reboot-hill-revisited/). It is out hope that decision makers are aware of appropriate platform usage (see https://planetmainframe.com/2021/09/the-ibm-mainframe-the-most-powerful-and-cost-effective-computing-platform-for-business/).
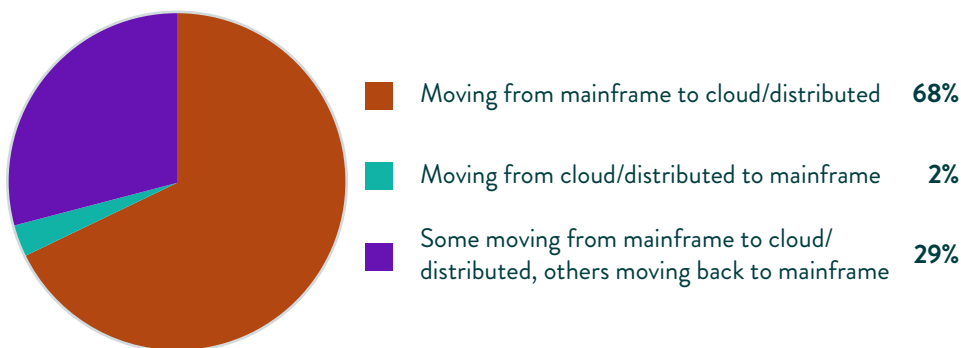
In my company, workloads are...

■ Moving from mainframe to cloud/distributed	**68%**
■ Moving from cloud/distributed to mainframe	**2%**
■ Some moving from mainframe to cloud/distributed, others moving back to mainframe	**29%**

Figure 19: Workload movement

These concerns aside, 40% of our respondents also indicated that there was workload migration in BOTH directions —from mainframe to other, AND from other back to the mainframe. For the most part, these non-mainframe-to-mainframe migrations could well be corrections for earlier unsuccessful migrations off the mainframe. Are lessons still being learned?

Rules processing

One of the most important parts of a transaction processing system is rules processing — which applies to almost all transaction processing systems. The big mainframe users —banks, credit card processors, insurers, and retailers all run rules processing continuously. We were looking for details on where and how this is done. According to our respondents, 60% of their organizations run rules processing on the mainframe, while 28% offload this activity to one or more other platforms. Fishing for more detail, our respondents tell us that 17% either run rules processing from Db2 tables or embedded in their code. The first is easy to update but runs slower; the second runs extremely fast but can be time-consuming and risky to update. Twenty-one percent indicated a dedicated rules processing application —there are a variety of ways to do this including Db2 (or other database) applications, and high-performance in-memory APIs. The latter combines speed (almost as fast as embedded code) and ease of updates. Only about 8% offload this part of their mainframe processing to other platforms. This solution is the best for rules management (updates, new rules, etc.), but the delay encountered going off platform makes it impractical for real-time rules processing. See Figure 20. We will be looking more closely at this in a future survey.

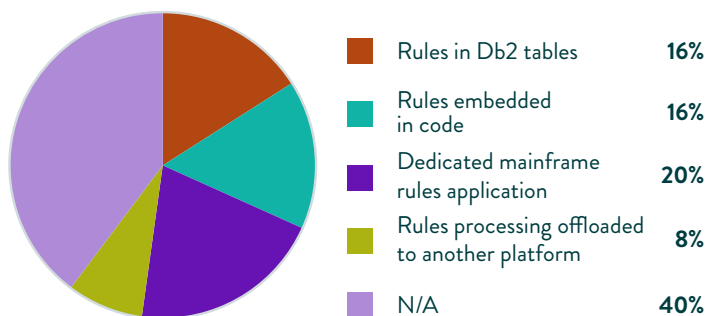**Are your company's mainframe systems managed in-house or outsourced?**

Rules in Db2 tables	**16%**
Rules embedded in code	**16%**
Dedicated mainframe rules application	**20%**
Rules processing offloaded to another platform	**8%**
N/A	**40%**

Figure 20: What techniques do you use for mainframe rules processing

Mainframe strategy

Priorities in 2024

This year, we thought it would be interesting to ask about the top priorities for 2024 from the perspective of our respondents. Figure 21 shows that systems or application modernization was first collectively, placing in the top three priorities for the organization for about 60% of respondents. Modernization can mean different things to different folks —the term has been virtually hijacked by vendors specializing in solutions for migrating applications off the mainframe and landing them (often recreating them) on other "modern" platforms. This type of rhetoric has worked in the past, but is less effective today, as most IT professionals know which platforms are appropriate for specific types of workloads. Fortunately, the term "modernization" today has a more grounded and less marketing-ish meaning —techniques to modernize existing mainframe applications, like attaching APIs for sharing data with other platforms, etc.

What are your organizations top THREE IT priorities for next year?

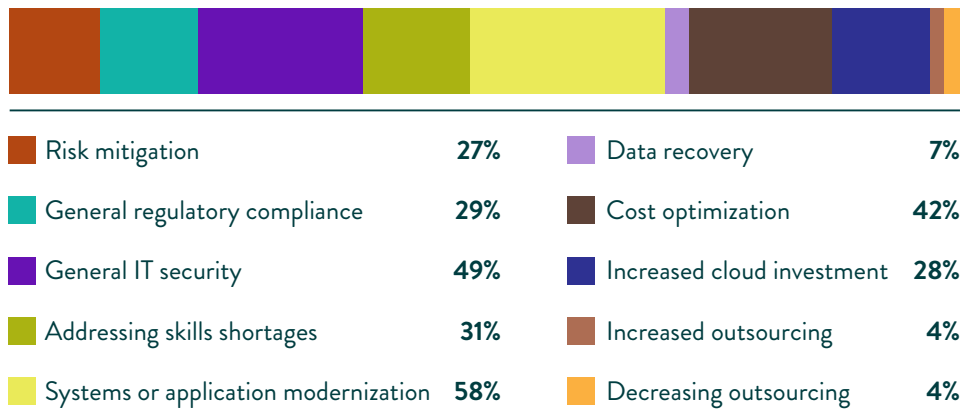|				
Risk mitigation	**27%**	Data recovery	**7%**
General regulatory compliance	**29%**	Cost optimization	**42%**
General IT security	**49%**	Increased cloud investment	**28%**
Addressing skills shortages	**31%**	Increased outsourcing	**4%**
Systems or application modernization	**58%**	Decreasing outsourcing	**4%**

Figure 21: What are your organization's top THREE IT priorities for next year?

The second most popular priority was General IT security, coming in at almost 50% on respondents' top three for this year; this should surprise no one. Coming in third at just over 40% was cost optimization of the mainframe. This will not surprise many either as most mainframe shops employ capacity planners and other skilled personnel whose jobs are at least, in part, to look at this attribute. Our only hope is that there are also folks looking at cost optimization for all platforms, and for all aspects of IT. Of course, many are doing this, and we will look at this more closely in 2024.

Coming in at number four, over 30% of respondents told us that another top employer priority for this year was addressing skills shortages. For IT organizations, outside of business concerns, this can be the most crucial priority, as difficulty in replacing departing expertise can grind an important project to a halt. With baby-boomers currently retiring in droves, organizations need to change and develop new ways to accommodate an aging workforce, all while enticing younger employees and graduates. Doing both simultaneously can be a significant challenge.

Almost 30% of respondents indicated that increased Cloud investment was a top-three priority for this calendar year. This would be true for most organizations, as they strive to control general IT costs. This covers all aspects of IT —not just offloading mainframe workloads to the Cloud —but everything from offloading email servers from local datacenters to Cloud servers, to migrating local corporate HR and finance databases from on-site servers to Cloud servers.

Also in at about 30% was general regulatory compliance —this should be as important as security to all organizations, as a company can be made to suffer equally by being negligent on either matter. A notable example is Google's 2.6 billion dollar fine assessed by Europe's top court this past year.

Risk mitigation came in at over 25% of respondents indicating it is a top-three priority for this year. This can be a pretty wide-ranging topic, which could include both IT security as well as regulatory compliance, but also includes financial department concerns —e.g., looking at things like financial costs associated with not upgrading older software, opening the company up to copyright violation exposure, and assessing risks associated with engaging with offshore development consulting firms.

These were the top seven priorities, as indicated by our survey respondents. The last three on our included data recovery, increasing outsourcing, and decreasing outsourcing resulted in being a top-three priority for only about 7%, 4.44%, 4.44% respectively. The last two are of particular interest, as the temptation of lower IT personnel costs seems at odds with the actual experience of going down this road.

Mainframe use

Again this year, we asked in the survey what people thought were the main arguments against continued use of the mainframe within the enterprise. The good news was that more than a third of our respondents indicated that there were no arguments against mainframe use —this was up from only 10% last year. There were reasons why people think otherwise, however. The biggest obstacle was that mainframe operations were too expensive —over 40% of respondents cited cost as the single biggest obstacle against continued mainframe usage, which was down considerably from the 70% figure from last year, and the 55% from the year before. This type of trend is difficult to gauge but can be explained by the Covid and post-Covid financial perspectives prevalent in those years, and the more normalized perspectives as we distance ourselves from that time.

About 40% of our respondents indicated that supporting mainframe applications was a negative concern about mainframe usage; the same percentage felt that the difficulty in retaining the necessary skills was a big negative —slightly down from the 45% last year. For the last two years, 50 percent of respondents thought the cultural barrier between mainframe and other IT professionals was an obstacle; this year that dropped to less than 25% perhaps indicating that the modernization projects we talked about earlier are leading to greater cross-departmental collaboration (and understanding).

Mainframe application disposition

This year our survey also asked what people expected to happen to their legacy applications on IBM Z over the next three years and most respondents —about 60% —indicated that their apps would be maintained and actively integrated with new apps (see Figure 22). Almost 30% expected legacy apps to be enhanced with new apps, and just under 15% thought that they would be maintained but not integrated with new apps. Meanwhile, a full 20% expected that legacy apps would be ported to Unix/Linux. We were a bit surprised about that last one however it is consistent with responses to some of the other questions. That being said, the good news is that this feeling is in the distinct minority.

What do you expect to happen to your legacy applications on IBM Z over the next three years?
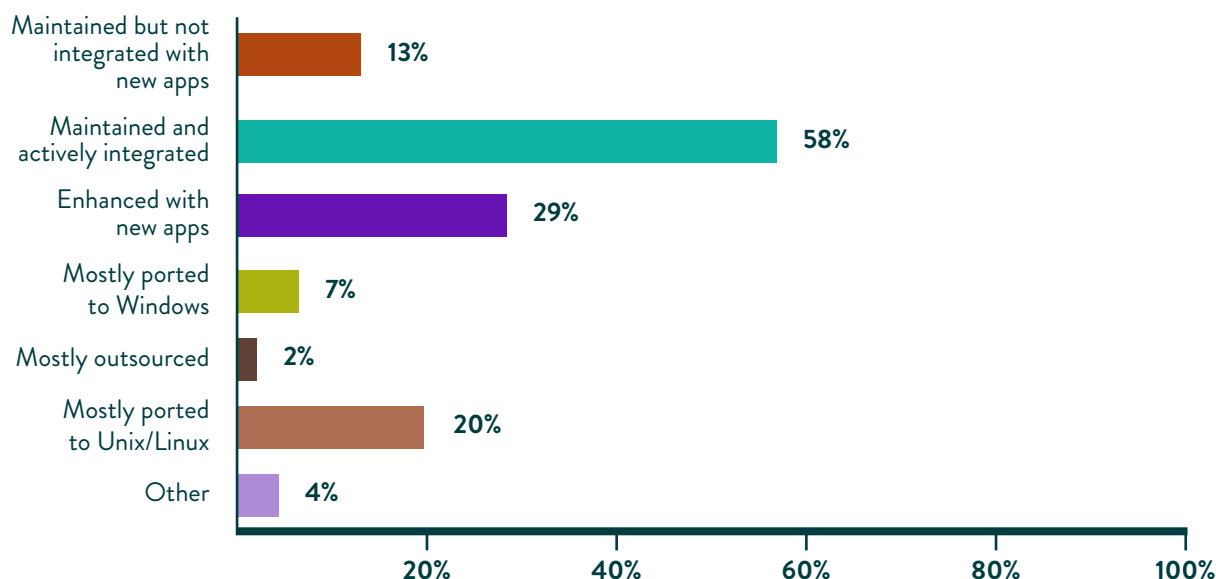

*Figure 22: What do you expect to happen to your legacy applications
on IBM Z over the next three years?*

Modernization

We have asked about modernization is past editions of the survey, but considering the real meaning of the word, as per our Priorities discussion above, we decided to introduce some clarity in the answers this year. When asked if mainframe application modernization a priority for respondents' organizations, 18% indicated that it was not a priority. About 55% indicated that it was a priority (as in modernizing existing applications) while just over 25% indicated that it was a priority (as in replacing or off-loading applications to other platforms). While revealing a good-news-bad-news result, the reality is that of those 25% intending a migration, a good number of them will learn that just migrating the applications will be more costly that they ever imagined (in some cases necessitating a complete recoding of many thousands of lines of code), will take many years of development to replace something that already works well, and/or will never perform as well. That is the reality of large-scale migration projects.

Data archiving strategy

Most mainframers are aware of the many and varied national, state, provincial and even regional regulations dictating the length of time that ElectronicallyStored Information (ESI) needs to be retained. With this in mind, we followed up with the same question we've asked previously to determine whether respondents had a data archiving strategy in place that was compliant with the latest regulations. This year, 67% of respondents indicated that their data archiving strategy is fully compliant, up from last year's figure of 44% and the previous year's 33% (see Figure 23). Another 23% indicated that they were almost fully compliant, which is down slightly from previous years, while 10% indicated that they were not compliant, but are implementing a compliance strategy, down considerably from previous years. Clearly, compliance remains a prominent issue, and organizations are continuing to take the matter seriously.
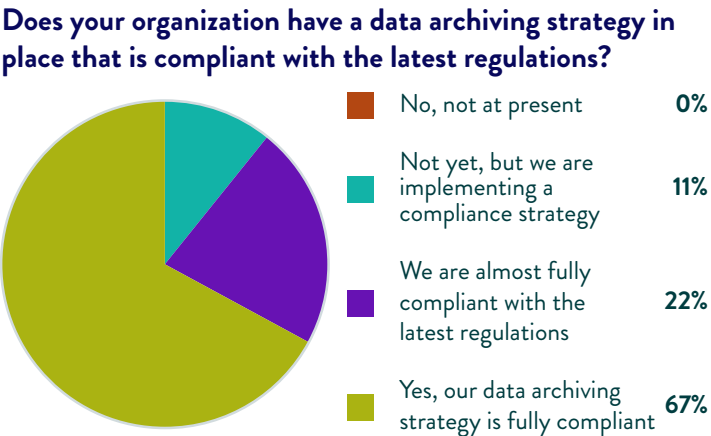
Does your organization have a data archiving strategy in place that is compliant with the latest regulations?

No, not at present	**0%**
Not yet, but we are implementing a compliance strategy	**11%**
We are almost fully compliant with the latest regulations	**22%**
Yes, our data archiving strategy is fully compliant	**67%**

Figure 23: Does your organization have a data archiving strategy in place that is compliant with the latest regulations?

Web services/SOA

Again this year, we asked respondents whether their z/OS systems participate in Web services and SOA environments, and the results are shown in Figure 24. Fifty-six percent of respondents indicated that their mainframe systems participate partly in Web services, well up from the 33% last year. Only 24% indicated that their mainframe participates fully in Web services, which is down from last year, while last year 34% indicated their systems did not participate at all, that number was down to only 8% this year.
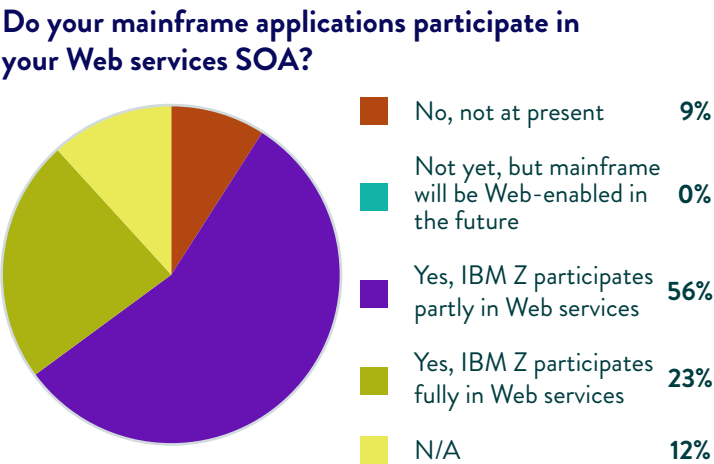
Do your mainframe applications participate in your Web services SOA?

No, not at present	**9%**
Not yet, but mainframe will be Web-enabled in the future	**0%**
Yes, IBM Z participates partly in Web services	**56%**
Yes, IBM Z participates fully in Web services	**23%**
N/A	**12%**

Figure 24: Do your mainframe applications participate in your Web services SOA?

Eighty-one percent of organizations said that they are web-enabling CICS (Figure 25), up from last year's value of 80% and 75% the previous year. Seventy-three percent of sites are web-enabling Db2, which is an increase on last year's 65% and the previous year's 50%. Fifty-four percent of sites are web-enabling IMS, which is up from the previous years' levels of 45%. Fifty-eight percent indicate that their shops are web-enabling WebSphere Application Server, up from 50% last year and 30% the previous year. Sixteen percent of respondents are web-enabling SAP (up from 10% last year), and 27% are web-enabling Siebel and other software, way up from last year's 5%. No surprise in these numbers for the most part; continued increases in web-enablement, as expected.

Which IBM Z middleware has your organization enabled, or plan to enable, with Web services?
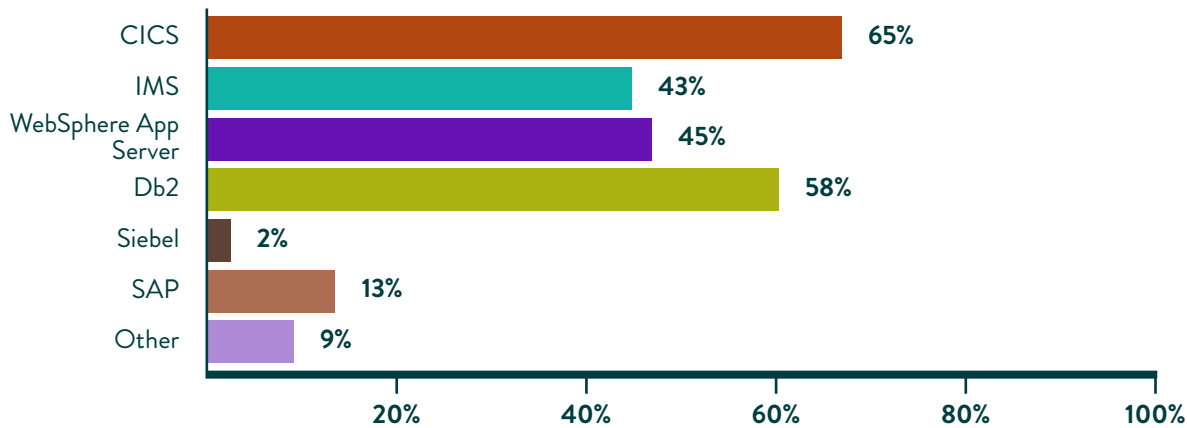

Figure 25: Which IBM Z middleware has your organization enabled, or plan to enable, with Web services?

AI/Machine learning

This year we decided to ask if anyone is implementing AI/machine learning models on their mainframe systems to integrate with current mainframe applications —the responses were surprising —see Figure 26. Nine percent of respondents indicated that they were already implementing AI/machine learning models, while another 21% indicated that they were in progress. Another 50% indicated that they were in the planning stages.

Is your organization implementing AI/machine learning models on your mainframe to integrate with your current mainframe applications?
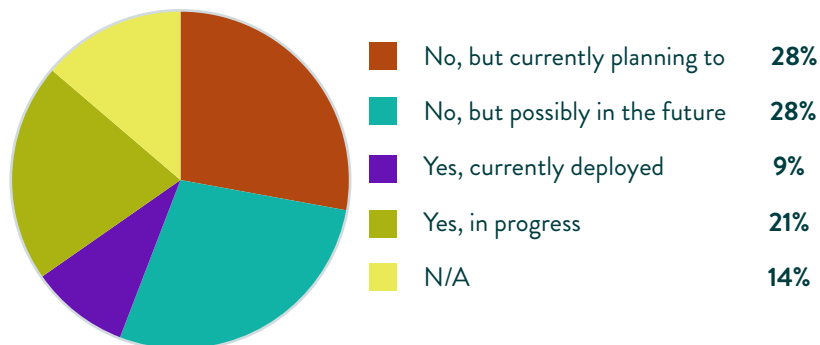

No, but currently planning to	28%
No, but possibly in the future	28%
Yes, currently deployed	9%
Yes, in progress	21%
N/A	14%

Figure 26: Is your organization implementing AI/machine learning models on your mainframe to integrate with your current mainframe applications?

COBOL to JAVA

Previous questions in our survey have established the popularity of Java apps in our respondents' organizations, but we wanted to know if anyone out there was looking at moving their existing applications from COBOL to JAVA. Respondents came back with a resounding 60% having no interest in doing that. There was some interest however as 35% indicated that they were deploying, or planning/considering moving existing COBOL applications to Java. When asked what was motivating this potential move, many did not have an opinion, but of those who did, almost 30% indicated projected cost savings, another 30% indicated that they wanted to facilitate the skillsets of new programmers. Almost 40% indicated that they saw it as a way to get off the mainframe, while another 5% indicated that it was just a new business strategy.

Mainframe in-memory techniques

We asked survey participants about their use of third-party mainframe in-memory technology, and what, if any they have deployed. Twenty-five percent of respondents indicated that their organizations were running 3rd-party in-memory solutions, while 40% indicated that they were not, relying solely on Db2 and other buffering techniques. Another 35% indicated that they were using no third-party in-memory technology. It would seem that up to 75% of mainframe shops may not be getting the performance they could be getting out of their mainframe systems. IBM and a small number of ISVs provide enhanced in-memory technology (Is this the best kept secret in the mainframe world?)

Mainframe ISVs

We all know that most mainframe shops have invested a fair amount in non-IBM software for their z/OS mainframe systems, but we wanted to quantify it, so we included a couple of ISV-related queries in the survey. When we asked about budget balance between IBM software vs ISV software, we got some interesting results. Not surprisingly, about 75% of respondents indicated a heavy preference for IBM software (about the same as last year). However, of these, a full 50% indicated that the ratio was 60% IBM vs 40% ISV! Even more interesting, about 25% indicated a majority of ISV products —more than IBM products. Ten percent indicated a heavy reliance on ISV software! See Figure 27.

How much of your organization's mainframe software budget is spent on IBM software vs. independent softwave vendors?

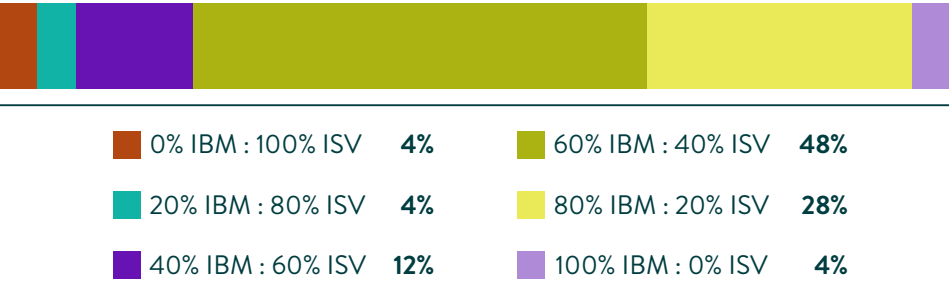| Legend	%		Legend	%
0% IBM : 100% ISV	**4%**		60% IBM : 40% ISV	**48%**
20% IBM : 80% ISV	**4%**		80% IBM : 20% ISV	**28%**
40% IBM : 60% ISV	**12%**		100% IBM : 0% ISV	**4%**

Figure 27: How much of your organization's mainframe software budget is spent on IBM software vs. independent software vendors (ISVs)?

When asked about the reasons for software product replacement, more than 50% of respondents indicated cost reduction was the biggest reason (typically moving from IBM or larger ISV products to products from smaller ISVs. Only slightly more than 10% indicated that increased product functionality was the reason —it would seem that price matters is the take-away from these two data points. About 15% indicated that improved vendor service was the mitigating factor —a lesson to be learned there. Finally, more than 15% indicated that software replacement comes down simply as an effort to reduce the total number of vendors involved in their mainframe environments —that would seem to be good news for IBM, and bad news for smaller ISVs.

Cloud integration in mainframe shops

With flexibility, responsiveness, and cost, fuelling the journey to the Cloud, we asked several questions about Cloud adoption within organizations that run mainframe systems. Regarding whether or not companies operate hybrid cloud environments, 67% of the respondents indicated that their organizations did (up from 42% last year and 21% the previous year). About 15% reported that they did not (down sharply from last year's 40%), while another 15% indicated that they were in the planning stages to set up hybrid cloud environments (about the same as last year). It should be noted that hybrid environments are specific Cloud implementations —while almost all companies leverage the Cloud in some way, a hybrid environment is a very specific Cloud implementation in mainframe shops.

Cloud data capacity in mainframe shops

When asked about the growth of Cloud data capacity within their IT environments, just under 50% of survey respondents reported a growth of 10-25% per year. About 20% reported less growth, while another 25% reported more growth. No respondents reported declining Cloud data capacity. Expectations last year were a little lower —30% expected no growth, and 40% expected growth between 11 and 25%.

When asked about the proportion of enterprise data residing on the mainframe vs the Cloud, survey respondents were all over the map (see Figure 28), but the largest group (30% of respondents) reported that their organizations' ratios were 80% on the mainframe and 20% in the Cloud. In general, mainframe shops seem to remain somewhat risk-averse when it comes to their valuable data.

What proportion of enterprise data resides on the mainframe vs the cloud?

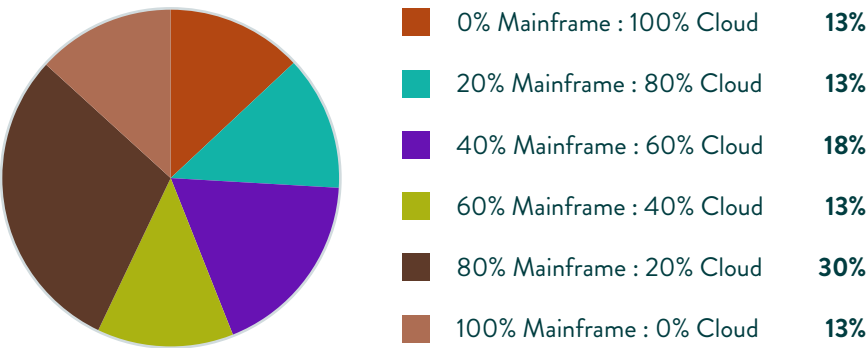|		
🟧	0% Mainframe : 100% Cloud	**13%**
🟩	20% Mainframe : 80% Cloud	**13%**
🟪	40% Mainframe : 60% Cloud	**18%**
🟨	60% Mainframe : 40% Cloud	**13%**
🟫	80% Mainframe : 20% Cloud	**30%**
🟧	100% Mainframe : 0% Cloud	**13%**

Figure 28: What proportion of enterprise data resides on the mainframe vs the cloud?

When it comes to which Cloud providers, respondents' organizations leveraged, they indicated AWS at about 70% - up from 35% last year, followed by Azure at 60% - up from 25% last year —see Figure 29. Google came it at about 30% - up from less than 15% last year. Last year 30% of respondents indicated that their organizations were not using the Cloud at all —that number was only about 10% this year. Clearly, many shops are using multiple Cloud vendors, which should not be a surprise considering the likelihood that organizations may tend to leverage one vendor for Cloud data storage and another vendor for DevOps, etc.

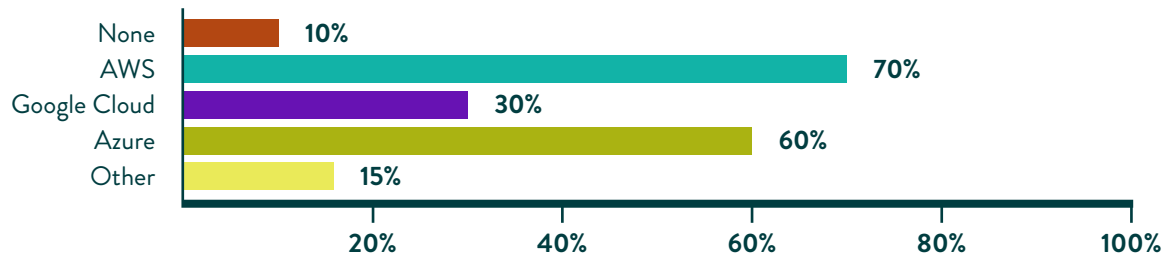**Which of the following cloud providers does your organization use?**

Figure 29: Which of the following cloud providers does your organization use?

When asked if respondents thought that their company's mainframe systems may one day be replaced entirely with the Cloud, only about 10% thought that would happen (see Figure 30). Most respondents said no, but just under 30% thought that mainframe usage would decrease over time, 25% indicated that mainframe computing would be maintained, while over 30% said that mainframe capacity would likely grow over time.

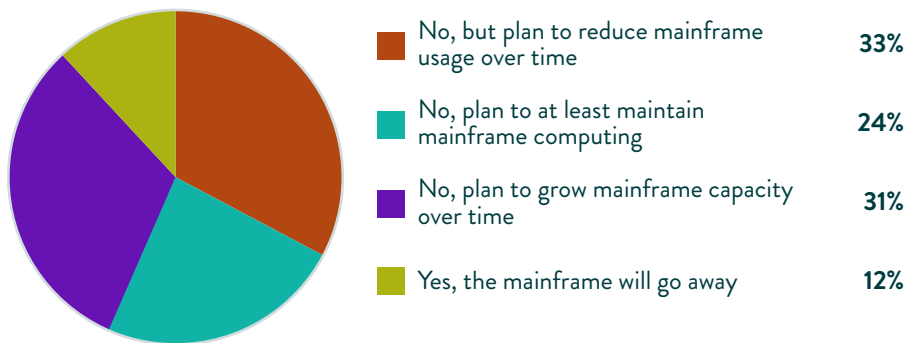**Do you see the mainframe eventually being replaced entirely by the cloud?**

Figure 30: Do you see the mainframe eventually being replaced entirely by the cloud?

Analytics in mainframe shops

If you have spent any time on the IBM website over the last two years or more, you will be aware that analytics is a major focus for them both in general, and within the context of the mainframe. This year we decided to try to get a clearer picture of analytics penetration into our survey participants mainframe shops. When asked about which products applicable organizations are using, two-thirds indicated IBM analytics products, while 23% indicated third-party analytics tools, while another 10% indicated both IBM and third-party tools.

Query types

When asked if respondents' organizations are running both long queries (analytics) and short queries (transaction processing) on their Db2 databases, 65% indicated yes, and 12% indicated no. The takeaway is that most mainframe shops are running analytics on their mainframe systems.

Query optimization

When asked if their Db2 queries were being optimized, 22% of respondents indicated that they were optimizing their long queries, while less than 5% were optimizing short queries. Interestingly 60% said that they were optimizing both. The take-away from this could be that many shops are "optimizing" long and short queries using the same toolsets. The problem is that any tool intended for optimizing long (analytics) queries will do little or nothing to do any real optimization of short queries. (The reverse is also true.) On the plus side, most companies may be doing a good job at optimizing their analytics queries —and it is almost always needed. The bad news is that it is entirely possible that most mainframe shops are not optimizing their short (transaction processing) queries properly, or at all. And what do most companies use their mainframe systems for, primarily? You guessed it —transaction processing.

Analytics usage

We asked our survey participants about whether their organizations are using mainframe analytics for chargeback or cost allocation. Over 40% of respondents indicated that they did not; about 30% said that they did. The truth is that not all companies leverage chargeback techniques between corporate departmental borders. The unfortunate thing about this is that if companies are using analytics on both sides of their IT organizations —the distributed & Cloud side AND within the mainframe silo —companies would have real financial data about the cost-effectiveness of their various platforms. Once that becomes apparent, the real value of mainframe computing comes to light. This should eventually be in favor of the mainframe, as once the bean-counters dig into dollar-focused analytics, nothing will stop them. Good news ahead for the mainframe?

Finally, when asked how their organizations use analytics, more than 40% of respondents indicated that the purpose is to identify application resource consumption (Figure 31). About 40% also indicated their goals included combining capacity and performance data with business volume data. Another 40% of respondents were using analytics to broaden visibility of mainframe and server data outside the IT operational department. This is a good start, but until similar data points can be compared between platforms —necessitating tools that can be applied to multiple platforms, some important comparisons will be difficult/impossible. The good news is that there are some third-party tools out there right now that do decent job of it.

How does your organization use IT analytics?

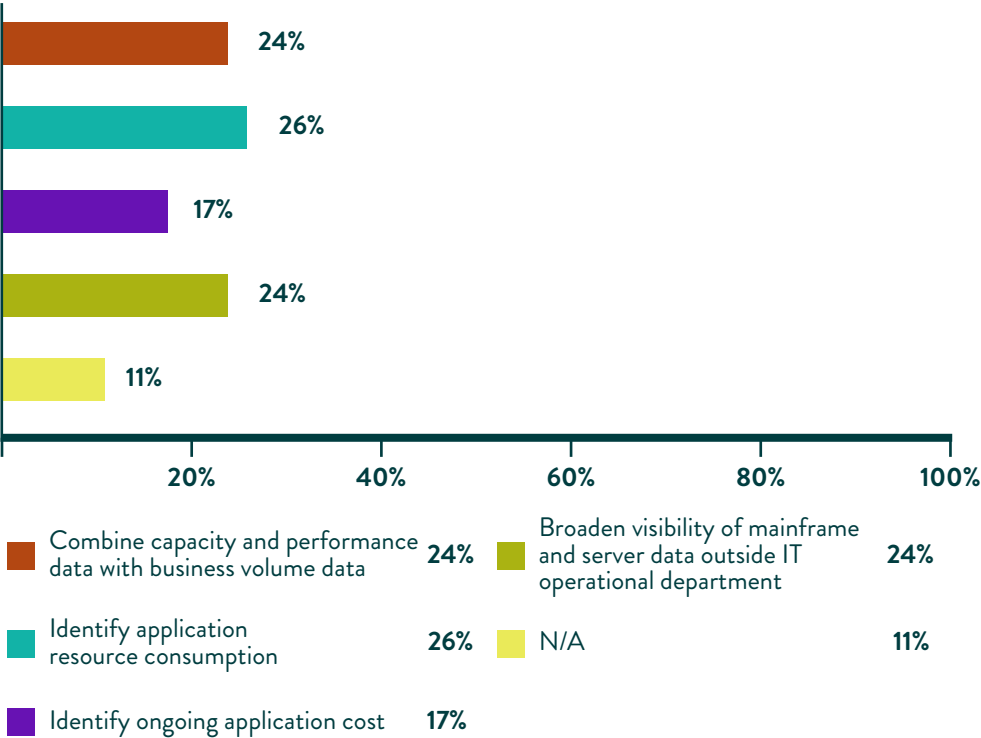|	
■ Combine capacity and performance data with business volume data	**24%**
■ Identify application resource consumption	**26%**
■ Identify ongoing application cost	**17%**
■ Broaden visibility of mainframe and server data outside IT operational department	**24%**
■ N/A	**11%**

Figure 31: How does your organization use IT analytics?

Security in mainframe shops

We've made enquiries about security in mainframe shops in past years —this year we decided to dig a little deeper. We think that shops are realizing is that security by obscurity is no longer valid, and mainframe shops are much more cognisant of threats, and much more active in preventative measures.

Pervasive encryption

The IBM mainframe now boasts a pervasive encryption feature (starting with the z14 version), and we wondered how many shops out there are using it. Our survey respondents indicated that about 50% of their organizations were currently implementing pervasive encryption on their mainframe systems (see Figure 32). Another 15% indicated that they were actively deploying it, and another 25% indicated that they were planning to deploy it in the future. Slightly more than 10% indicated that they had no plans for pervasive encryption deployment.

Does your mainframe shop use pervasive encryption?

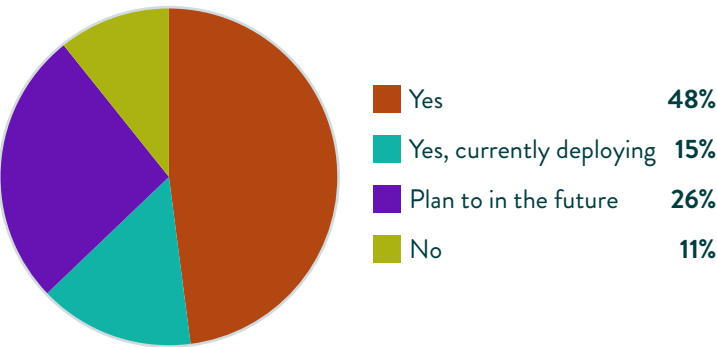|	
■ Yes	**48%**
■ Yes, currently deploying	**15%**
■ Plan to in the future	**26%**
■ No	**11%**

Figure 32: Does your mainframe shop use pervasive encryption?

When asked if the offering of pervasive encryption was an influence on an upgrade decision by their organization, half of the respondents indicated that it was, and half indicated that it was not. Perhaps some are worried that using the feature might slow systems down.

Security audits

One can measure how serious an organization is about security by looking at how much security testing they perform —both internal and external testing. When we asked our survey participants if their organizations have their mainframe systems penetration-tested by internal or external mainframe security experts, about 30% indicated that internal testing had been done. More than 20% indicated that their organizations had done penetration testing by external auditors, while more that 30% reported that they had done both internal and external testing. Almost 15% admitted that they had done no penetration testing at all.

When asked if their organizations had found vulnerable mainframe user accounts in a security audit, 30% admitted that they had, while 70% indicated that they had not. When asked if their organizations had discovered unauthorized techniques used to access the mainframe, 25% indicated that they had, while 75% said that they had not.

Finally, we asked our participants if their organizations had implemented a hardened zero-trust security stance on their mainframe systems, our respondents indicated that 60% had, and 40% had not. At the end of the day, it is worth noting that our security questions had the highest rates for "I don't know" answers and unanswered.

Conclusions

As always, it was an interesting survey this year. Some respondents indicated that the survey was too long —we are listening —and we plan to offer smaller, more focused surveys in the future. We always appreciate your feedback.

New technologies

What was once new, is new again. Technology uptake continues on the mainframe side of the datacenter, as growth has been seen in almost every way. After starting on distributed systems and continuing on the Cloud, technologies like Splunk, DevOps (and DevSecOps), and APIs (to speed up application development) have penetrated the mainframe space over the last number of years and continue to grow their presence at an accelerated rate. The same goes for products like Liberty, Containers/Dockers, Red Hat OpenShift, Java-based applications, IBM Cloud Paks, and even Robotic Process Automation continuously growing usage on the mainframe side. Mainframe-specific technologies like Zowe and Tailored Fit Pricing are being adopted at an increasing rate as well.

Follow the data, follow the money.

We took a close look this year at the mainframe's place within the corporate IT departments, and its visibility and perceived value to the corporation
(as understood by survey participants).

We have seen that the majority of a corporation's enterprise data resides on the mainframe —Figure 28 gives us an idea of how much data. While the numbers don't lie, it is likely, since the mainframe is being used primarily for transaction processing, with most or even all of a corporation's most valuable data residing on the mainframe. While this data may be shared with other platforms –Cloud and local distributed systems —its primary residence is the mainframe. The mainframe very probably houses less valuable corporate data as well, however the ratio of very-important-data to less-important data on the mainframe is almost certainly very high. This is highly likely not the case for non-mainframe platforms, as they house most of a corporation's non-transactional data —user file backup, email systems, HR data and everything else under the sun. To be fair, all of a corporation's data is important, no matter which platform is used. However, the ratio of very-important-data to less-important data on these systems is considerably lower than that of the mainframe.

Conversely, Figure 7 indicated quite clearly that the majority of an organization's total IT budget is consumed by their non-mainframe system and related costs. Additionally, the platform handling the organization's most valuable enterprise data —the mainframe —also handles most of the revenue generation for the organization, as shown in Figure 5. This disparity may not be as egregious as it might seem at face value, as the cited article (https://planetmainframe.com/2021/09/the-ibm-mainframe-the-most-powerful-and-cost-effective-computing-platform-for-business/) explains, these other platforms are just more costly to run when all aspects of computing costs are taken into account. Even so, these non-mainframe systems play important roles in corporate IT —the different platform types just have different strengths.

Having said that, the mainframe has been under siege for a long time, and it continues to this day, albeit to a slightly lesser extent, as workload migration is getting harder to justify. (There is just no way for Cloud and distributed systems can compete on cost with the mainframe for high-value, high-intensity transaction processing workloads.) Figure 22 illustrates this —the majority of mainframers, at least think that the mainframe and its business-critical applications will be around for a while yet.

In the end, we believe the mainframe will (and should) maintain its place in large corporate datacenters. We believe that IT (and business) analytics are a new and powerful ally for the mainframe. Some of the analytics solutions available today are starting to measure like data from multiple platforms. Because analytics gives business analysts a better picture of what's actually happening in the datacenter, analysts are going to get a more clear picture of the business value of different platforms, and eventually, which platforms are most cost effective (without technical bias). And that can only be good news for the mainframe.

To risk a cliché, the mainframe is still alive, and it isn't going anywhere.