# Critical Application And Business KPIs For Successful Cloud Migration

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## IDC OPINION

IDC's research shows enterprises around the world are using multicloud strategies to optimize the performance of modern and existing legacy applications running on-premises, in public cloud services, and on legacy systems. In the early days of enterprise cloud adoption, many organizations focused their cloud strategies on enabling net-new cloud-native applications written to take advantage of dynamic cloud infrastructure and pay-as-you-go consumption-based cost models. Early success with these implementations is convincing more and more enterprises to expand their cloud footprint and to migrate existing applications to cloud in order to enhance end-user experiences, optimize cloud resource utilization and costs, and create a more flexible and agile business environment.

Making effective decisions about which workloads to migrate and where they should land is a mission-critical process that depends on LOB, IT, and DevOps decision makers having access to accurate real-time information about application and infrastructure performance, cost, and capacity as well as end-user and business impact. IDC's recent survey of enterprise IT and DevOps decision makers around the world finds they specifically note the need for insight into application performance status when making and managing these migration decisions. Specifically:

>> "Pre" and "post" migration KPIs for business and technical metrics

>> End-user experience and business impact analysis

>> Cloud capacity utilization and cost-per-application evaluations

Enterprises at all stages of evaluating, testing, or managing traditional applications running on cloud platforms are finding that APM solutions can provide these types of mission-critical insights to IT operations and development teams as they study, implement, and assess migration decisions.

IDC's recent survey of enterprise IT and DevOps decision makers around the world finds they specifically note the need for insight into application performance status when making and managing these migration decisions.

# Enterprise Multicloud Strategies Take Hold Worldwide

For many organizations, the first step in their cloud journey focuses on deploying net-new cloud-native applications onto public and private cloud development platforms.

IDC's ongoing analysis of enterprise cloud strategies consistently indicates that over 85% of enterprises worldwide are currently implementing or planning to implement multicloud strategies. The decision about where specific applications are deployed is often based on a number of factors including cost, performance, security, and business priorities.

For many organizations, the first step in their cloud journey focuses on deploying net-new cloud-native applications onto public and private cloud development platforms. More recently, however, many enterprises are also making decisions to migrate existing applications to cloud infrastructure with the goal of reducing costs, improving service levels, and promoting business agility. Since many existing applications are truly mission critical, it is crucial that enterprises make the right decision about where to deploy these applications initially. Enterprises must be able to evaluate whether applications once migrated perform as expected and can be managed and monitored for infrastructure usage, cost, and end-user experience consistently in ongoing production environments. If an application migration negatively impacts revenue generation or customer satisfaction, the source of the problem must be identified and quickly fixed to avoid long-term damage to the business and further migration plans.

IDC recently partnered with AppDynamics to survey 600 enterprises that are actively using or planning to use cloud to support existing applications. The goal of this effort was to better understand the types of application and infrastructure monitoring, analytics, and performance information that are needed to evaluate, deploy, and manage existing applications across multicloud architectures. Enterprises that do not currently make use of cloud to support production applications were excluded. IDC estimates about 60% of enterprises worldwide currently match the profile of organizations included in this survey. The remaining 40% are less mature in that they are currently planning to limit cloud to development uses and/or do not use or plan to use clouds at this time.

Participating decision makers represented enterprise LOB, IT, and cloud operations leaders as well as those in senior developer and DevOps roles. Participating enterprises were headquartered in the United States, the United Kingdom, France, Germany, Australia, and New Zealand. Analysis of the survey data is weighted based on GDP (see Appendix for additional details). The majority (75%) of survey participants are planning to use two to five clouds during the next two years.

Just about every type of existing application is currently being migrated or considered for migration to cloud infrastructure. While each organization's choice of priorities may be different — based on business priorities and/or application development and re-platform priorities and other considerations — the pattern is clear. Enterprises no longer fear migrating existing applications onto cloud architectures. While they rightly recognize that specific applications may have unique infrastructure or security dependencies, more enterprise decision makers believe they can find the right type of cloud to meet the specific needs of their applications and end users.

Overall, almost half (45.9%) of the survey participants reported they had already migrated some custom-developed browser-based applications to cloud, with 38.7% planning to do so within the next two years (see Figure 1).

**FIGURE 1**

## Current and Planned Status of Migrating Existing Applications from Traditional IT Infrastructure to Cloud, 2017
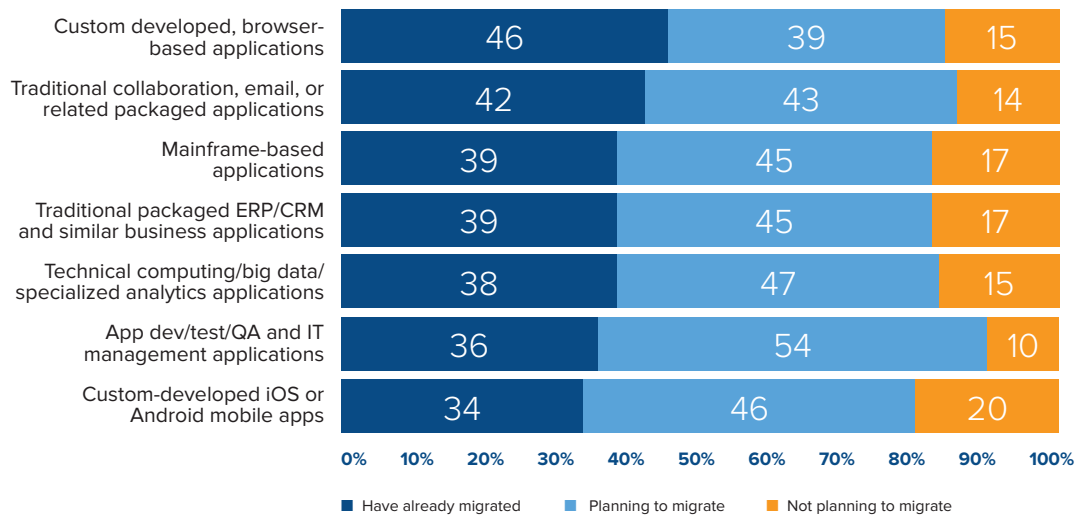


n = 600
Notes: Survey respondents were enterprise IT decision makers with specific intent to migrate existing applications from traditional IT infrastructure to cloud. Data is weighted by GDP.
Source: IDC and AppDynamics' Enterprise Cloud Migration Challenges Survey, June 2017

Of note, iOS and Android applications are the least likely to have currently been migrated to date but are important priorities for the next two years. Among existing applications being migrated to cloud, the most commonly used development languages include JavaScript (65%) and Java (61%).

# Planning, Evaluating and Managing the Migration of Existing Applications To Cloud
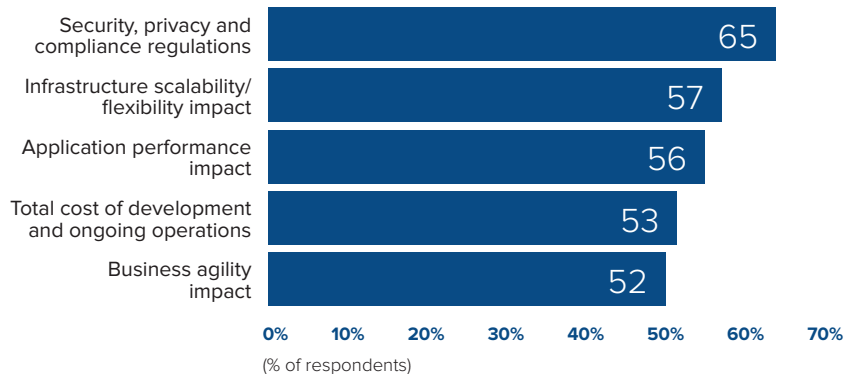
Each existing application presents its own unique set of requirements and evaluation considerations when it comes to determining whether it will benefit from migrating to public or private cloud platforms. Decision makers need to understand specific application dependencies and structures.

As shown in Figure 2, overall, enterprises that are currently making these kinds of decisions emphasize a number of issues. Security and compliance are always a concern; however, these decision makers also emphasize the importance of understanding the balance between infrastructure scalability, application performance, cost, development impact, and business agility improvements.

**FIGURE 2**

## Top 5 Decision Criteria for Migrating Existing Applications to Cloud

**Q. What are the most important criteria used by your organization to make decisions about whether to migrate an application to public and/or private cloud infrastructure?**

| Criteria | % |
|---|---|
| Security, privacy and compliance regulations | 65 |
| Infrastructure scalability/flexibility impact | 57 |
| Application performance impact | 56 |
| Total cost of development and ongoing operations | 53 |
| Business agility impact | 52 |

(% of respondents)

n = 600
Notes: Survey respondents were enterprise IT decision makers with specific intent to migrate existing applications from traditional IT infrastructure to cloud. Data is weighted by GDP. Multiple selections were permitted.
Source: IDC and AppDynamics' Enterprise Cloud Migration Challenges Survey, June 2017

As part of the evaluation process, enterprises must consider the unique architectural and performance requirements of each existing application. Some may have dependencies on mainframes or physical databases that cannot easily migrate to cloud. Others may benefit from the addition or extension of APIs or from being formatted and distributed as Docker-style containers as part of the transition. Containers are playing an increasing role in the decision to

migrate existing applications to cloud since the investment in container formatting is expected to provide enterprises with easier application portability and the ability to take advantage of microservice-based development strategies over time. As shown in Figure 3, among survey participants, 21.5% are currently containerizing existing applications, about a third (36%) are actively planning to implement containers to support existing applications, and an additional 13.7% are actively containerizing new and existing applications. Together, these represent almost two-thirds of survey respondents.

**FIGURE 3**

## Role of Container Technologies in Enterprise Application Strategies Over the Next Two Years

**Q. What role, if any, do container technologies such as Docker and Kubernetes have in your organization's application strategy?**



We are not currently considering use of containers — **4%**

We are actively containerizing new and existing apps — **14%**

We are limiting use of containers to new application development activities — **5%**

We are currently containerizing existing applications — **21%**

We are in the early stages of evaluating container technologies — **19%**

We are actively planning to implement containers to support existing applications — **36%**

n=600
Notes: Survey respondents were enterprise IT decision makers with specific intent to migrate existing applications from traditional IT infrastructure to cloud. Data is weighted by GDP. Multiple selections were permitted.
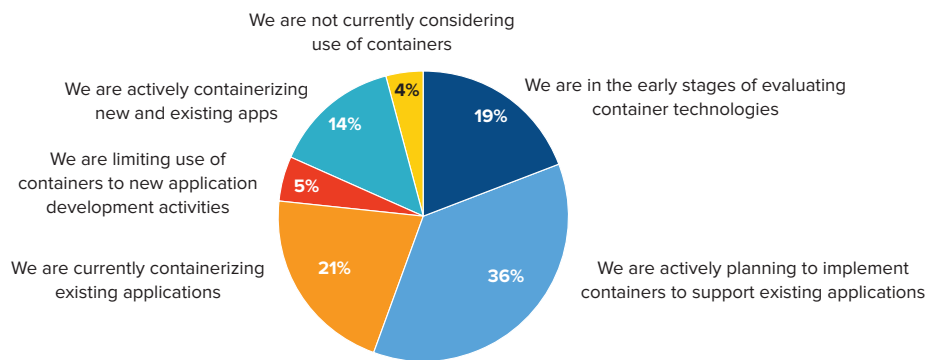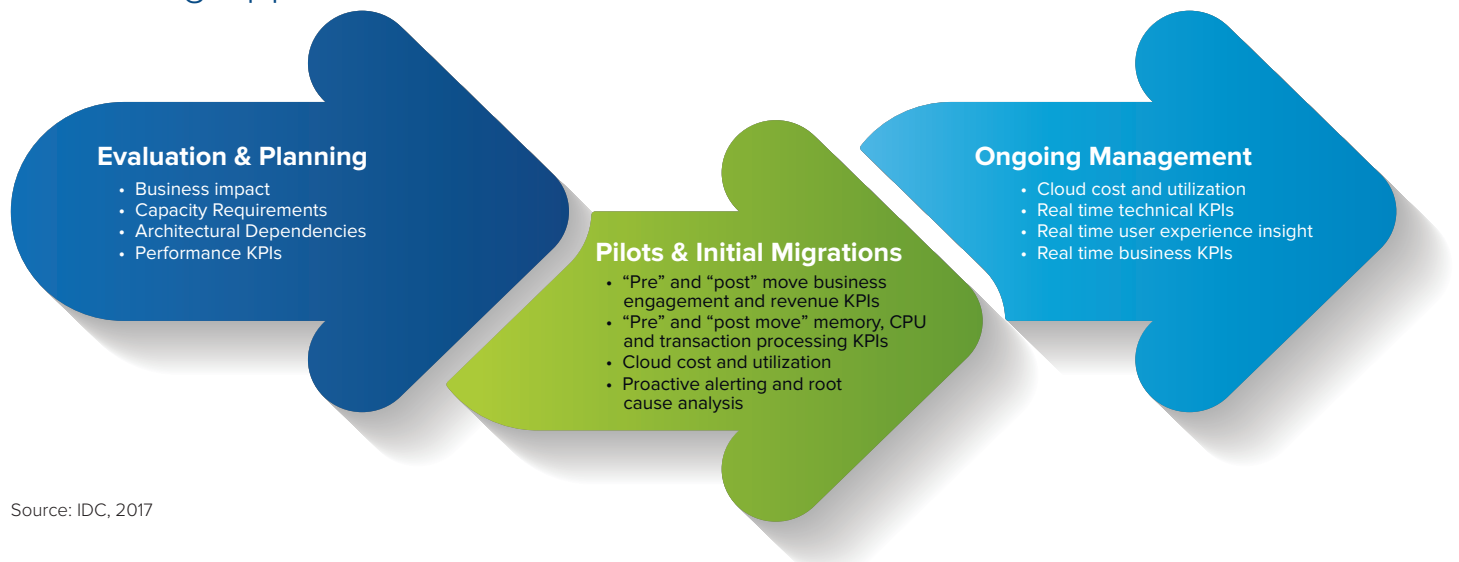Source: IDC and AppDynamics' Enterprise Cloud Migration Challenges Survey, June 2017

IDC finds that once an organization has decided to consider the possibility of migrating existing applications to cloud, there is a common pattern to the evaluation, testing, and implementation process. As is illustrated in Figure 4, the migration assessment and implementation process has three distinct phases:

» **Evaluation and Planning.** This initial phase considers the application's business impact and architectural readiness to take advantage of cloud. Organizations must study application dependencies, business risk considerations, and performance requirements. Applications that are heavily dependent on specific physical computing attributes or are highly regulated or particularly sensitive to latency may not be considered. In some cases, applications may be containerized before being migrated.

» **Pilots and Initial Migrations.** This phase focuses on validating planning assumptions and identifying any unexpected performance, business, or end-user impacts. This phase also focuses on controlled or pilot migrations that can be tested and evaluated. Decision-maker focus on "pre" and "post" move business and technical KPIs includes cost, performance, resource utilization, and stability. The ability to quickly and accurately identify the root cause of problems and to take advantage of proactive alerts to performance issues are top priorities.

» **Ongoing Management.** Once applications are migrated, enterprises need to continue to monitor and optimize end-user experience, cloud utilization, and costs and continue to keep an eye on business and technical KPIs. As usage scales and new application functionality is introduced, the business needs to be sure that end users experience predicted service levels and that cost and consumption of cloud resources are consistent with the original business case that drove the migration decision.

**FIGURE 4**

## Life Cycle for Evaluating, Implementing, and Managing Migration of Existing Applications to Multicloud Architectures



**Evaluation & Planning**
- Business impact
- Capacity Requirements
- Architectural Dependencies
- Performance KPIs

**Pilots & Initial Migrations**
- "Pre" and "post" move business engagement and revenue KPIs
- "Pre" and "post move" memory, CPU and transaction processing KPIs
- Cloud cost and utilization
- Proactive alerting and root cause analysis

**Ongoing Management**
- Cloud cost and utilization
- Real time technical KPIs
- Real time user experience insight
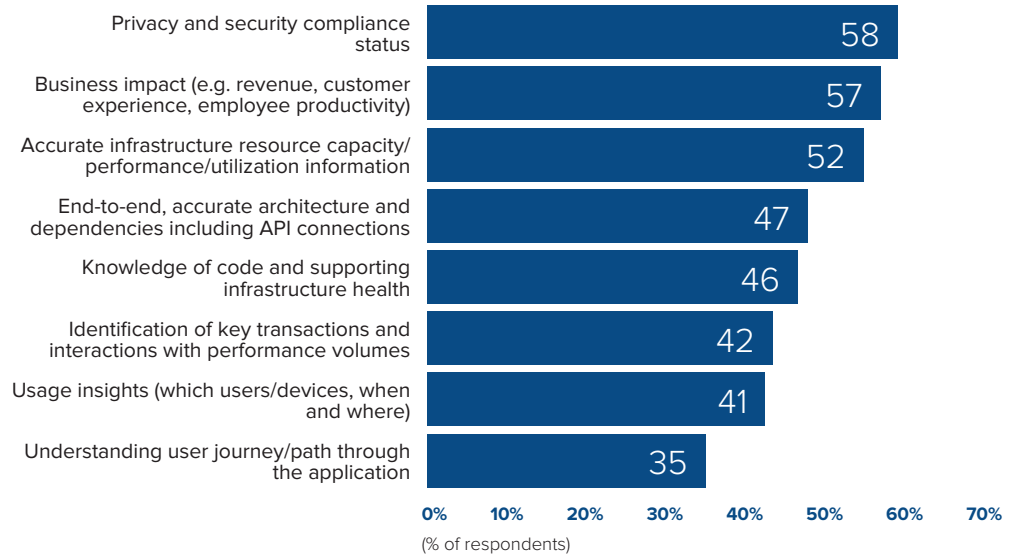- Real time business KPIs

Source: IDC, 2017

Figures 5–7 look more closely at the most critical information required at each stage in the migration assessment and implementation process. In general, business impact, including security and compliance implications, as well as infrastructure cost and application performance needs are the most critical insights needed at the beginning of the process. If a decision is taken to migrate a specific application, the analysis shifts to understanding the operational performance profile of the application across cloud environments. The ability to evaluate "pre" and "post" move business and KPIs in detail becomes top priority. As the application moves into day-to-day operations on cloud infrastructure, cloud utilization and cost along with technical KPIs and end-user experience data become most important to keeping the application and the business it supports up and running as expected.

**FIGURE 5**

## Most Important Information Required to Evaluate and Plan the Migration of Existing Applications to Cloud

**Q. When evaluating/planning for migrating existing applications to cloud infrastructure, what type of information is/will be most valuable?**

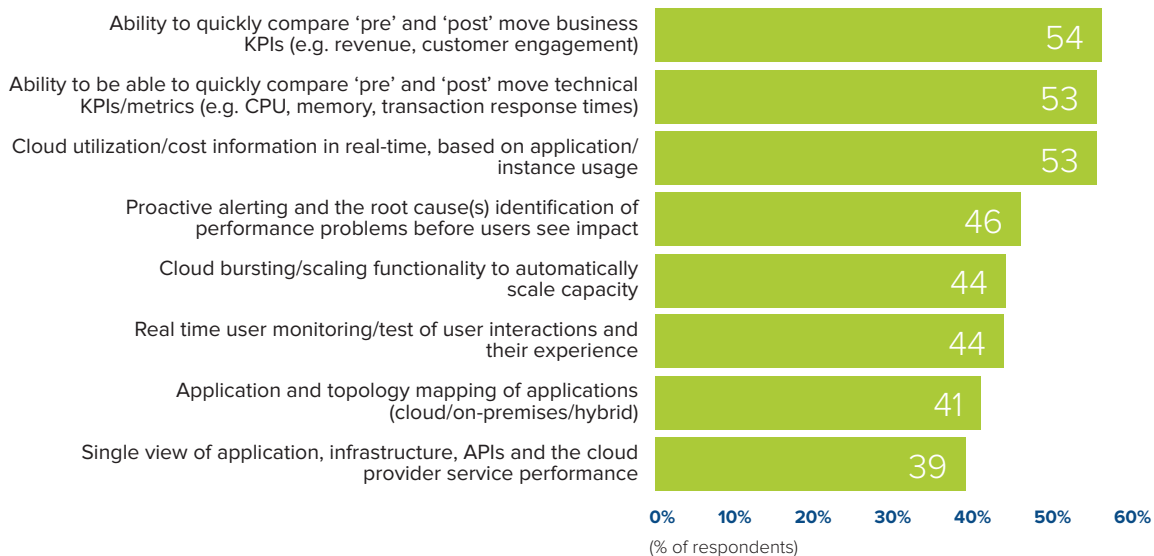| Category | % |
|---|---|
| Privacy and security compliance status | 58 |
| Business impact (e.g. revenue, customer experience, employee productivity) | 57 |
| Accurate infrastructure resource capacity/ performance/utilization information | 52 |
| End-to-end, accurate architecture and dependencies including API connections | 47 |
| Knowledge of code and supporting infrastructure health | 46 |
| Identification of key transactions and interactions with performance volumes | 42 |
| Usage insights (which users/devices, when and where) | 41 |
| Understanding user journey/path through the application | 35 |

(% of respondents)

n = 600
Notes: Survey respondents were enterprise IT decision makers with specific intent to migrate existing applications from traditional IT infrastructure to cloud. Data is weighted by GDP. Multiple selections were permitted.
Source: IDC and AppDynamics' Enterprise Cloud Migration Challenges Survey, June 2017

**FIGURE 6**

## Most Important Information Required During Initial Migrations of Existing Applications to Cloud

**Q. During an application migration pilot project, or just after the initial migration of existing applications to cloud infrastructure, what type of information is/will be most valuable?**

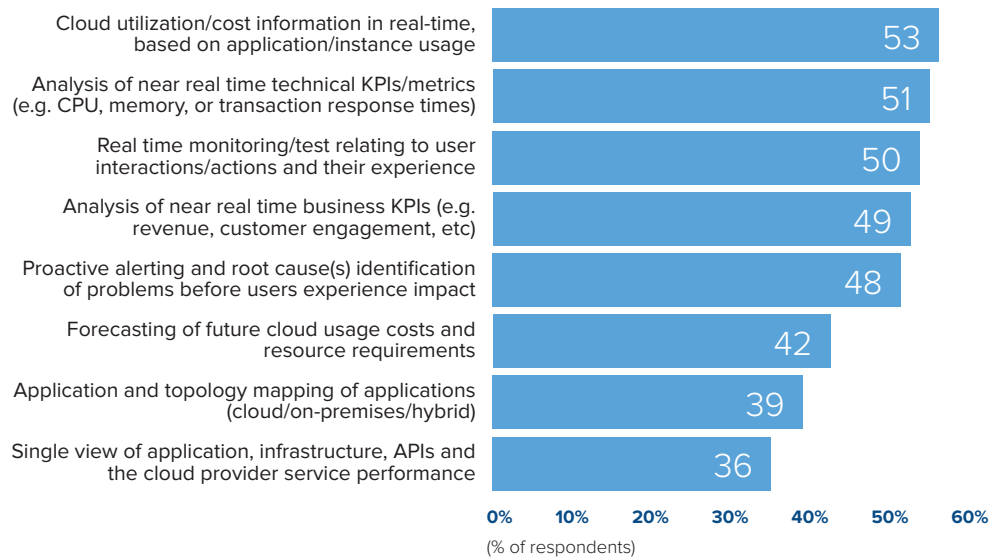| Category | % |
|---|---|
| Ability to quickly compare 'pre' and 'post' move business KPIs (e.g. revenue, customer engagement) | 54 |
| Ability to be able to quickly compare 'pre' and 'post' move technical KPIs/metrics (e.g. CPU, memory, transaction response times) | 53 |
| Cloud utilization/cost information in real-time, based on application/ instance usage | 53 |
| Proactive alerting and the root cause(s) identification of performance problems before users see impact | 46 |
| Cloud bursting/scaling functionality to automatically scale capacity | 44 |
| Real time user monitoring/test of user interactions and their experience | 44 |
| Application and topology mapping of applications (cloud/on-premises/hybrid) | 41 |
| Single view of application, infrastructure, APIs and the cloud provider service performance | 39 |

(% of respondents)

n = 600
Notes: Survey respondents were enterprise IT decision makers with specific intent to migrate existing applications from traditional IT infrastructure to cloud. Data is weighted by GDP. Multiple selections were permitted.
Source: IDC and AppDynamics' Enterprise Cloud Migration Challenges Survey, June 2017

**FIGURE 7**

## Most Important Information for Day-to-Day Management of Existing Applications That Have Migrated to Cloud

**Q. When considering the day-to-day management and optimization of existing applications that have already been migrated to cloud infrastructure, what type of information is/will be most important?**



| | |
|---|---|
| Cloud utilization/cost information in real-time, based on application/instance usage | 53 |
| Analysis of near real time technical KPIs/metrics (e.g. CPU, memory, or transaction response times) | 51 |
| Real time monitoring/test relating to user interactions/actions and their experience | 50 |
| Analysis of near real time business KPIs (e.g. revenue, customer engagement, etc) | 49 |
| Proactive alerting and root cause(s) identification of problems before users experience impact | 48 |
| Forecasting of future cloud usage costs and resource requirements | 42 |
| Application and topology mapping of applications (cloud/on-premises/hybrid) | 39 |
| Single view of application, infrastructure, APIs and the cloud provider service performance | 36 |

(% of respondents)

n = 600
Notes: Survey respondents were enterprise IT decision makers with specific intent to migrate existing applications from traditional IT infrastructure to cloud. Data is weighted by GDP. Multiple selections were permitted.
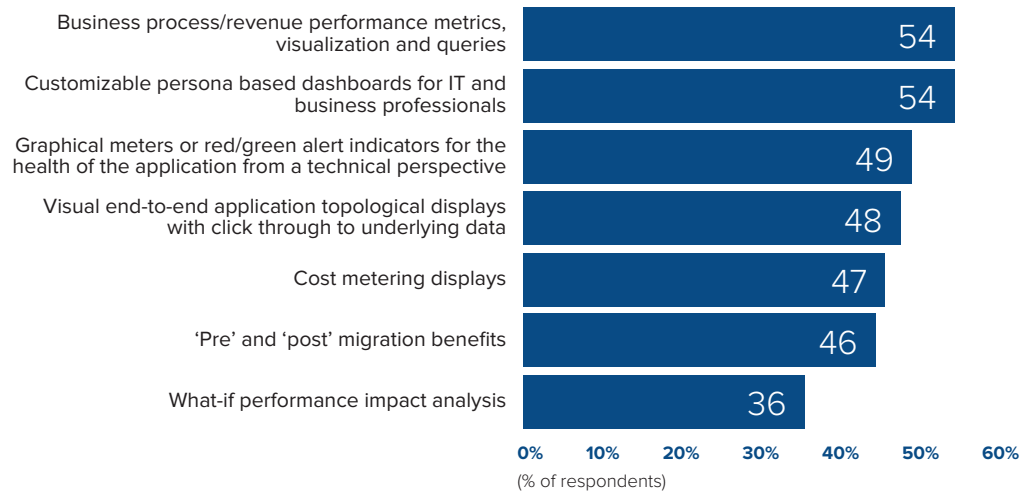Source: IDC and AppDynamics' Enterprise Cloud Migration Challenges Survey, June 2017
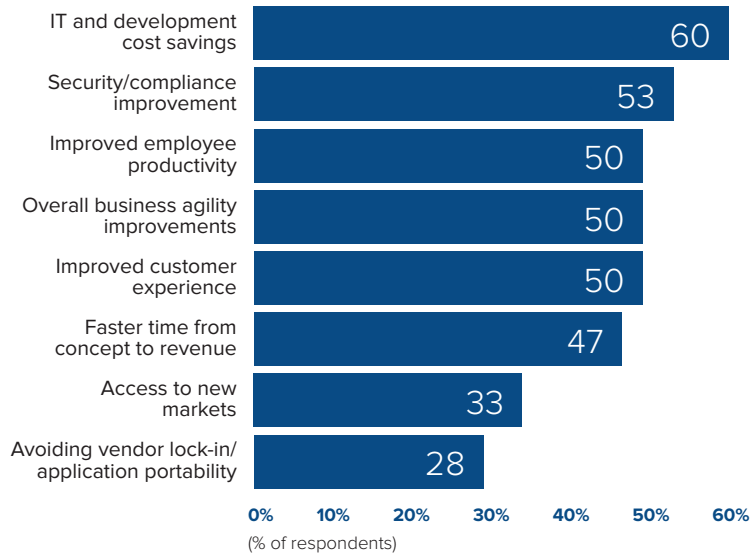
Because the decision to migrate existing applications to cloud impacts LOB, development, and IT operations teams equally, survey participants reported it was important for them to be able to put performance, cost, and end-user data in the business context, such as being able to associate end-user experience with revenue or business process completion times. Customizable persona-based dashboards are particularly important to ensure that both business and IT professionals can get full value out of the performance, usage, and cost information (see Figure 8).

**FIGURE 8**

## Most Important Analytics and Visualizations Need to Manage Existing Applications Migrating to Cloud

**Q. What types of analytics and visualizations will be the most useful to you when planning and managing application migrations to cloud infrastructure?**

| | |
|---|---|
| Business process/revenue performance metrics, visualization and queries | 54 |
| Customizable persona based dashboards for IT and business professionals | 54 |
| Graphical meters or red/green alert indicators for the health of the application from a technical perspective | 49 |
| Visual end-to-end application topological displays with click through to underlying data | 48 |
| Cost metering displays | 47 |
| 'Pre' and 'post' migration benefits | 46 |
| What-if performance impact analysis | 36 |

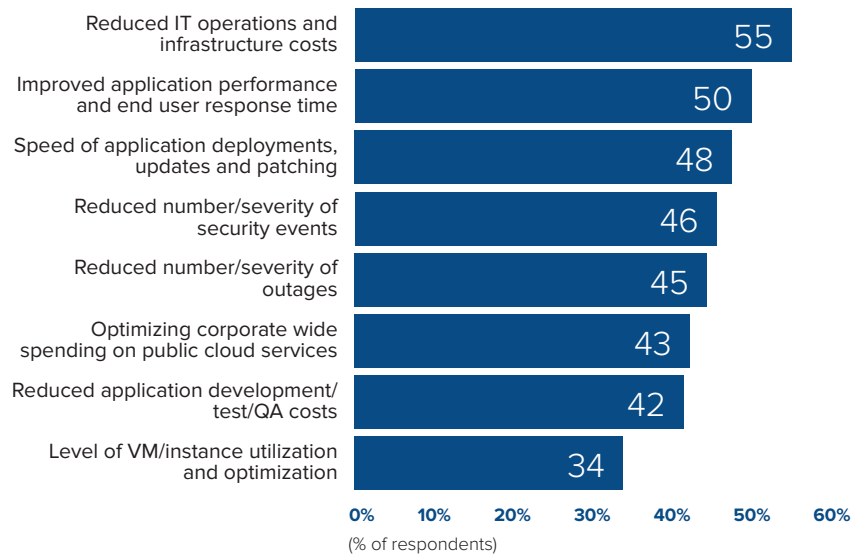0%   10%   20%   30%   40%   50%   60%
(% of respondents)

n = 600
Notes: Survey respondents were enterprise IT decision makers with specific intent to migrate existing applications from traditional IT infrastructure to cloud. Data is weighted by GDP. Multiple selections were permitted.
Source: IDC and AppDynamics' Enterprise Cloud Migration Challenges Survey, June 2017

# Benefit of Migrating Existing Applications To Cloud

Overall, enterprises indicate that to date, they are able to achieve the bulk of their goals when they implement migrations of existing applications to cloud. The greatest business benefits realized typically relate to cost savings for IT operations and development as resources can be accessed and used only as required, and the organization is able to provide infrastructure much more quickly when it is needed and then shift usage or turn off resources that are not needed at other times. Employee productivity and business agility improvements are also frequently reported (see Figure 9).

From a technology perspective, IT operational cost savings, end-user experience improvements, and faster application updates, patches, and deployments are typically seen. The move to cloud, particularly when coupled with use of containers, allows enterprises to more consistently standardize infrastructure and applications deployment, automate and audit changes and patches, and resolve any end user–impacting problems with configurations and code more quickly than ever before. At the same time, enterprises are able to better link infrastructure spending to business priorities and associate IT costs with revenue, customer satisfaction, and business performance (see Figure 10).

**FIGURE 9**

## Most Important Business Benefits Expected from Migrating Existing Applications to Cloud

**Q. Which of the following business benefits are most important when it comes to measuring the effectiveness of application migrations to cloud infrastructure?**

| Benefit | % |
|---|---|
| IT and development cost savings | 60 |
| Security/compliance improvement | 53 |
| Improved employee productivity | 50 |
| Overall business agility improvements | 50 |
| Improved customer experience | 50 |
| Faster time from concept to revenue | 47 |
| Access to new markets | 33 |
| Avoiding vendor lock-in/ application portability | 28 |

(% of respondents)

n = 600

Notes: Survey respondents were enterprise IT decision makers with specific intent to migrate existing applications from traditional IT infrastructure to cloud. Data is weighted by GDP. Multiple selections were permitted.
Source: IDC and AppDynamics' Enterprise Cloud Migration Challenges Survey, June 2017

**FIGURE 10**

## Most Important Technical Benefits Expected from Migrating Existing Applications to Cloud

**Q. Which of the following technical benefits are most important when it comes to measuring the effectiveness of application migrations to cloud infrastructure?**

| Benefit | % |
|---|---|
| Reduced IT operations and infrastructure costs | 55 |
| Improved application performance and end user response time | 50 |
| Speed of application deployments, updates and patching | 48 |
| Reduced number/severity of security events | 46 |
| Reduced number/severity of outages | 45 |
| Optimizing corporate wide spending on public cloud services | 43 |
| Reduced application development/ test/QA costs | 42 |
| Level of VM/instance utilization and optimization | 34 |

(% of respondents)

n = 600

Notes:  Survey respondents were enterprise IT decision makers with specific intent to migrate existing applications from traditional IT infrastructure to cloud. Data is weighted by GDP. Multiple selections were permitted.
Source: IDC and AppDynamics' Enterprise Cloud Migration Challenges Survey, June 2017

# The Role of APM Monitoring and Analytics In Successful Application Migrations and Multicloud Operations

IDC's research shows that application performance monitoring and analytics are increasingly required to support effective planning, validation, and operations of existing applications as they are migrated to public and private multicloud architectures. In many cases, these traditional applications were originally developed for environments that assumed tightly coupled applications, middleware, and infrastructure stacks and expected applications and infrastructure to be fully stateful and available. In those types of environments, infrastructure monitoring could often provide enough insight to alert the systems management team to application outages and limited APM monitoring of high-value applications could help triage problems quickly.

In today's modern multicloud environments, infrastructure is much more dynamic and applications, particularly web, browser, and mobile-based customer-facing applications, are driving more and more customer interactions and revenue-generating activities. In digital enterprises, every application needs to be proactively monitored and managed using solutions that understand the flexible nature of cloud and container-based infrastructure.

As shown by IDC's research, APM and related analytics are playing a crucial role in helping enterprises evaluate and implement the migration of existing applications to cloud while helping maintain service levels once the migrations are complete. Important APM-generated insights supporting this process include:

» "Pre" and "post" move business and technical KPI assessments

» End-user experience and business impact analysis

» Cloud capacity utilization and cost-per-application evaluations

To be successful, enterprises need to be able to pinpoint end-user impact and find the root cause of problems in real time — before the customers are aware and regardless of whether there is a problem with code, infrastructure, or networks. Business and IT decision makers need simultaneous access to share data but need to be able to interpret it in the context of their own day-to-day activities and needs.

APM solutions that capture real-time end-to-end data about end users, transactions, code, and infrastructure provide the critical insights that are needed to support existing applications in the cloud as more and more enterprises transition their infrastructure and operational models.

**In today's modern multicloud environments, infrastructure is much more dynamic and applications, particularly web, browser, and mobile-based customer-facing applications, are driving more and more customer interactions and revenue-generating activities.**

# Next Steps

For enterprises that are considering migrating existing workloads to cloud, the results of this worldwide online survey conducted by IDC in partnership with AppDynamics show that the benefits of these migrations — in terms of cost, agility, and end-user experience improvements — more than make it worth the effort, so long as the process is supported with appropriate information to enable effective decision making at each stage of the evaluation, validation, and ongoing operations life cycle.

Before an organization begins the journey to transition existing applications to the cloud, it is critical to take stock of available application monitoring, analytics, and reporting solutions and ensure that the organization has access to state-of-the-art tools and best practices at each step in the journey.

# Appendix: Survey Methodology

During May and June 2017, IDC partnered with AppDynamics to conduct a worldwide online survey of enterprise LOB, IT, and development decision makers across six countries, as shown in Figure 11. For the purposes of this analysis, data is weighted based on GDP to provide a more accurate view of worldwide trends (see Figure 12). In the United States, all organizations had a minimum of 1,000 employees, and in Europe and Asia they had a minimum of 500 employees. See Figure 13 for distribution of company sizes based on the number of employees.

**FIGURE 11**

## Participant Geographical Representation

**Q. In which country is the majority of your organization's IT infrastructure, cloud, and application deployment and hosting decisions made?**
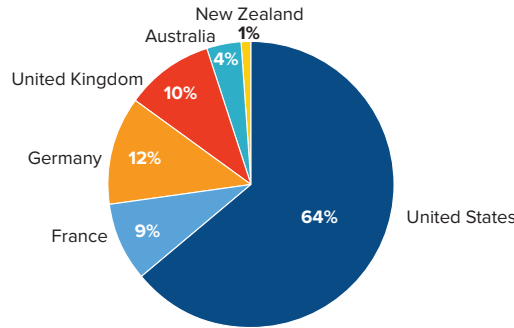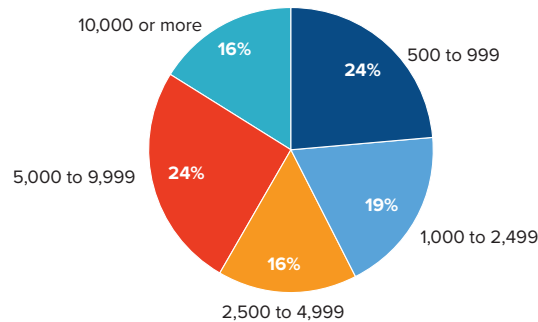


Total = 600
Note: Survey respondents were enterprise IT decision makers with specific intent to migrate existing applications from traditional IT infrastructure to cloud.
Source: IDC and AppDynamics' Enterprise Cloud Migration Challenges Survey, June 2017

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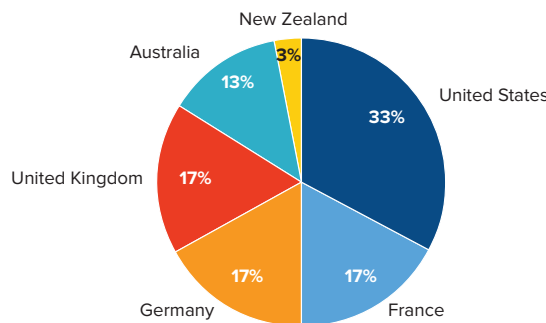
**FIGURE 12**

## Participant Geographical Representation (Weighted by GDP)

**Q. In which country is the majority of your organization's IT infrastructure, cloud, and application deployment and hosting decisions made?**



Total = 600
Note: Survey respondents were enterprise IT decision makers with specific intent to migrate existing applications from traditional IT infrastructure to cloud.
Source: IDC and AppDynamics' Enterprise Cloud Migration Challenges Survey, June 2017

**FIGURE 13**

## Participant Company Size

**Q. How many people are employed by your worldwide organization?  Please include all locations.**



Total = 600
Notes: Survey respondents were enterprise IT decision makers with specific intent to migrate existing applications from traditional IT infrastructure to cloud. Data is weighted by GDP.
Source: IDC and AppDynamics' Enterprise Cloud Migration Challenges Survey, June 2017

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