



# Moving Critical Applications to the Cloud

Understanding the Benefits and Challenges

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## About this paper

A Pathfinder paper navigates decision-makers through the issues surrounding a specific technology or business case, explores the business value of adoption, and recommends the range of considerations and concrete next steps in the decision-making process.

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### EXECUTIVE SUMMARY

Mission-critical applications are leaving the enterprise datacenter behind. This shift is inexorable, and it's increasingly a major part of the conversation about moving enterprise IT forward in terms of efficiency and reliability. The availability of on-demand, essentially limitless access to external IT infrastructure in a reliable and sustainable way is now thoroughly mainstream. Software as a service (SaaS) has been around since long before the term itself was defined, and it now represents the lion's share of overall spending by enterprises on external applications.

The migration of applications and workloads from all corners of the enterprise IT organization into external service environments is well under way, with these external resources either augmenting or replacing on-premises infrastructure. We are now in an era of coexistence among private datacenters, managed cloud environments and self-service public clouds. Enterprises almost universally consume public cloud resources today, and mission-critical workloads are an increasing part of that consumption.

This paper provides definitions of these critical applications and presents quantitative research into the buying patterns and sentiment around them. Buyer's choice for IT infrastructure is the order of the day, and this dynamic is enabling the migration to cloud. Among the many types of IT infrastructure and application services available, IT organizations are essentially seeking the 'best execution venue' – the environment that brings the optimal performance, cost and reliability for any given class of application.

For mission-critical applications, which cannot suffer any downtime without harming the business, the best execution venue is increasingly found in the public cloud. However, there are significant practical and material considerations around the decision to move critical applications out of the enterprise datacenter. These considerations include issues of security and compliance, as well as changes to established operating models. Generally speaking, it is nearly always beneficial to take advantage of external infrastructure services for a number of reasons, but a careful, balanced outlook on the implications and the decision-making process itself is important.

### KEY CURRENT TRENDS IN CRITICAL APPLICATION MIGRATION

- Public cloud consumption is now mainstream within the overall enterprise IT market.
- Over 56% of enterprises have either initial implementation or broad implementation of production applications in cloud environments.
- Public cloud environments are already being used for mission-critical applications.
- There are viable strategies and cloud services for almost any mission-critical workload.
- In terms of their primary approach to cloud-based application deployment, 53% of surveyed organizations cited cloud deployment for existing applications.
  - 32% of surveyed organizations plan to primarily 'refactor and shift' applications.
  - 21% surveyed organizations plan to primarily 'lift and shift' applications.
- Managed IaaS and SaaS are the most frequently cited cloud environments for migrating various enterprise applications – including database, data analytics (BI) and ERP workloads – in the next two years.

## Introduction

This paper examines one of the dominant current trends in IT infrastructure operations: migrating mission-critical enterprise applications from existing datacenters to on-demand 'as-a-service' environments operated by third-party providers – namely, cloud computing environments. Public cloud environments are self-service, and were not designed for any specific applications. They are highly reliable and easily available, and have long been the playground of web developers, spawning entirely new ways of thinking about applications and computing, as well as new markets. However, until recently, most standard enterprise applications have remained firmly in the enterprise datacenter and out of the cloud.

We are now finally seeing a strong trend in terms of migrating some of these critical business applications to various types of cloud environments. But what are the implications, and what factors must be considered before pushing a 'critical application' out of the well-understood and relatively secure confines of the enterprise-operated datacenter?

## Critical Applications Defined

What constitutes a critical application? Of course, to administrators, every application is critical, and obviously every industry has highly specific applications that are indeed mission-critical. Examples here include point-of-sale systems for retail operations, websites for e-commerce, and high-speed transaction systems for financial institutions.

This paper focuses on a few classes of critical applications that exist in nearly every industry and have been highlighted in our extensive end-user research. We use a simple definition of 'critical application' here: if the application fails, some part of the business will effectively stop functioning, and revenue will be lost.

### DATABASE

The database is the foundation for almost every enterprise application, but most importantly, it is essentially the functional core of the business. After all, databases are where business records are stored, analyzed, read out and used in every way to ensure that revenue-generating processes are functional and accurate. If the database stops working, or is lost, the business effectively stops functioning. It's typically the first thing to get backed up and the first thing to be troubleshot, and it is still the domain of specialized skill sets and job titles, especially within large enterprises. Most databases extant today are structured relational databases, but unstructured databases are also increasingly used in mission-critical applications within the enterprise.

### ENTERPRISE RESOURCE PLANNING

The domain of managers and business analysts as much as administrators and developers, ERP is critical to orchestrating the consumption and distribution of real (and virtual) goods and services. If the ERP system stops working, deliveries aren't made, shipments aren't picked up, offices and factories aren't supplied, fleet fuel isn't purchased, and so on. ERP is also the province of datacenter infrastructure that serves applications from vendors that have often spent decades building, adding to and supporting incredibly complex code bases in very specific ways, which are not typically amenable to change.

### DATA ANALYTICS (BUSINESS INTELLIGENCE)

Data analytics and business intelligence represent the top-line functions of the database. These are applications designed to take that stored structured or unstructured data and make it useful, often in real time, not just to count incoming transactions, but to identify trends, anomalies and opportunities, and present actionable data to decision-makers. Advanced analytics can include decision-making applications that implement changes to business processes automatically, well beyond simply generating reports. Its criticality lies in its value as a windshield and a dashboard; without it, you're essentially flying blind.

### CUSTOMER RELATIONSHIP MANAGEMENT

CRM software has come a long way from its genesis as a tool to divvy up sales contacts and keep track of customer information. CRM platforms now represent a critical part of marketing and sales operations, and they have been specialized to cater to nearly every industry vertical. Typical CRM functions today include fulfillment and productivity tracking, supply chain and vendor management, and data analysis and prediction.

HUMAN RESOURCES

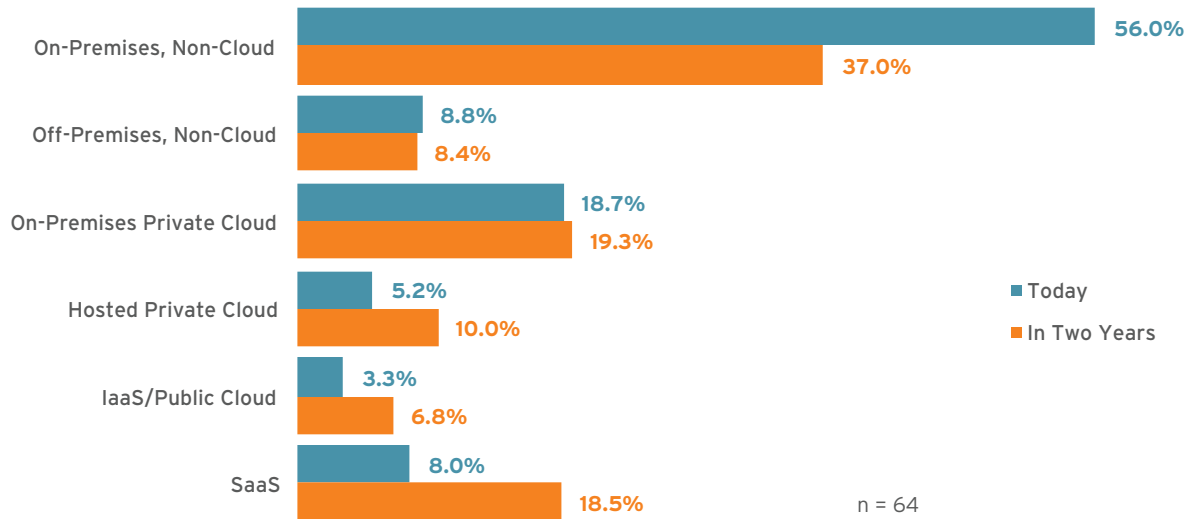
HR software platforms, especially for large enterprises, are critical systems that govern payroll and benefits and track employee performance, career development, education and certifications. They also help automate the tasks of talent search, recruitment and on-boarding, all with the help of powerful database tools that are integrated with day-to-day business operations. The data stores of personnel information and compensation actions are critical to a functioning workplace.

Reasons for Moving to External Infrastructure

As noted, most enterprises are pursuing a multi-cloud approach these days, with a mix of on-premises IaaS operated by the enterprise (private cloud), managed private cloud (hosted externally), and public cloud resources. Meanwhile, buy-side research shows that public cloud consumption for critical business applications is growing, while traditional ‘non-cloudy’ on-premises deployments are decreasing. Figure 1 provides deployment distribution data for ERP, which is representative of deployment of critical business applications more broadly.

Figure 1: ERP Distribution - Now and in Two Years

Q. Approximately what percent of Enterprise Resource Planning (ERP) workload is deployed in the following environments today?  
 Q. Approximately what percent of Enterprise Resource Planning (ERP) workload is deployed in the following environments in two years' time?



Source: 451 Research's Voice of the Enterprise, Cloud Transformation, Workloads & Key Projects 2017

The advantages of migrating critical applications to the cloud are generally seen in terms of shedding aging infrastructure and datacenters that were once considered sunk costs in favor of adopting a more flexible on-demand model of operations. After the initial work has been done to migrate applications and data, resources can be quickly increased or decreased with minimal additional work or penalty. Pay-as-you-go options are flexible, and range from per-minute to per-month billing options in most cases. Enterprises will still sign term-based contracts for cloud services or buy reserved capacity in return for discounts, but the bill is now monthly or quarterly instead of a large up-front capital investment to build a datacenter. Licensing terms from most ERP vendors are also more flexible when used in conjunction with an on-demand environment.

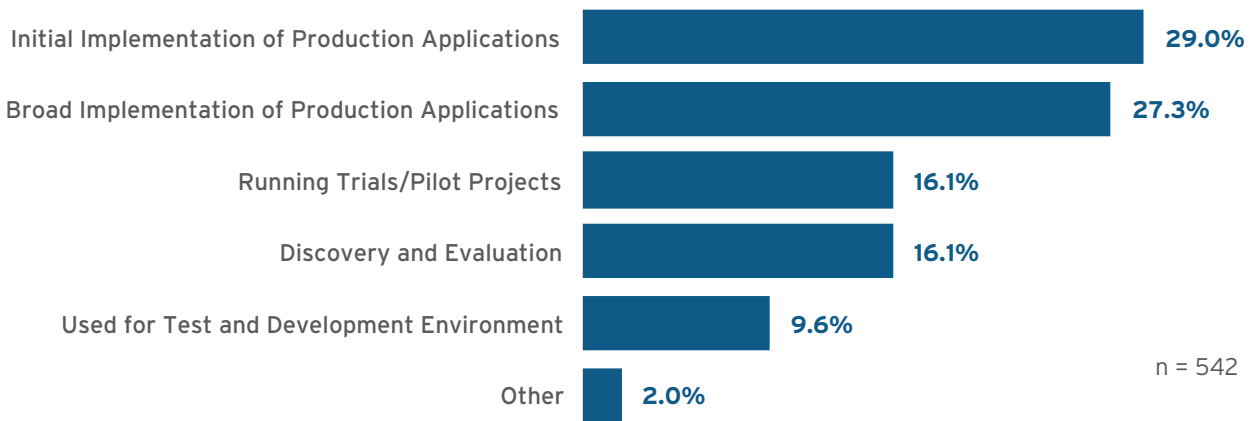
Other significant advantages of cloud migration include relief from datacenter operations overall, which frees up staff from maintenance duties that do not advance the business. Physical security and infrastructure reliability are also improved to the point where they are almost an afterthought, although IT organizations are still responsible for their own application and internal security and compliance. Performance is another cloud benefit – high-performance environments and hardware that might be prohibitively expensive for many organizations can be consumed from suppliers ranging from specialty HPC vendors to cloud providers with a portfolio of instantly accessible bare-metal hardware to choose from. For those that want it, a supercomputer is effectively available on-demand.

The same benefits apply to uptime and reliability – public cloud providers that operate at scale have practically no downtime compared with enterprise datacenters, and data loss is almost unheard of. The providers have a vested interest in protecting user data and uptime, since those are the foundations of their revenue generation. Mission-critical applications can also be implemented in high-availability (HA) modes (concurrent or failover replication modes) with incredible ease and minimal cost, especially compared with traditional disaster recovery/business continuity (DR/BC) models. In fact, the advent of public cloud has reshaped the entire DR/BC industry by lowering barriers to HA operations by orders of magnitude, bringing what was once the domain of hospitals, critical infrastructure and high finance to pretty much any application. Some cloud providers offer custom DR/BC services on their platforms, while others offer explicit best-practices guides and assistance in configuring and testing HA workloads in their environments. But if reliability and data security are significant concerns, in many cases the public cloud is arguably a better place for critical applications than an enterprise datacenter.

Enterprises are generally well aware of these dynamic benefits of cloud migration. To wit, over 56% of surveyed organizations now say they have either initial implementation or broad implementation of production applications in cloud environments.

**Figure 2: Overall Cloud Adoption for Production Applications**

Q. Which of the following best describes your organization's adoption of cloud computing models?



Source: 451 Research's Voice of the Enterprise, Cloud Transformation, Workloads & Key Projects 2017

## Barriers to Cloud Migration

The primary obstacles to migrating critical applications to the cloud lie in overcoming organizational hurdles and ensuring the proper planning and deployment for each specific situation. The market does not lack for the required technology, tools or skills. While they will need to acquire these tools and skills, enterprises don't have to invent or create from scratch ways to tackle workload migration. There are always individual challenges and ramifications specific to each situation that enterprises must address (this is why realistic assessment, planning and implementation is necessary, and is a highly significant portion of investment associated with migration), but the technology, experience and services that enterprise will need are already available in the market.

More options exist for 'lift and shift' migration than ever before, including bare-metal servers and platforms designed to replicate application network topology. The only technical barriers to adoption lie in the immutable operational details that will always exist, and in the quirks of existing platforms already in use for the critical applications, which demand careful planning and analysis.

The fundamental mechanisms and tool sets required are mature and well understood: APIs, scripting and orchestration, monitoring and automation for IaaS are all standard today. While the benefits of using external infrastructure are increasingly clear, they have to be balanced with the reality of changing what is usually a settled, mature and deeply invested enterprise IT organization. These barriers aren't technically challenging (beyond a change from one platform to another), and the eventual outcome of adopting cloud for critical applications should yield significant improvements, but a major change can be scary. Thus, the top concerns among enterprises have been remarkably consistent over years of asking the question: What's the major obstacle to cloud migration?

- Security/Compliance
- Migration/Integration/Skill Sets
- Cost

More than 80% of all enterprises surveyed consistently respond that security and compliance are their top concerns in any cloud migration or transformation effort, followed by concerns over exactly how to effect a migration and how to identify and acquire new skills and resources.

Security considerations change when moving a workload to a cloud environment. Cloud providers by default have better physical, virtual and network security than most enterprises, so moving a critical application to the cloud brings a net benefit in terms of reducing the security domains that must be addressed. Instead, enterprise concerns revolve around how to adapt, adjust or replace existing security operations. It can be a real challenge for a security organization, especially a large one, to integrate the use of infrastructure hosted outside the enterprise into their existing procedures, because traditional security and compliance practices are often rooted in having physical access to the datacenter and IT infrastructure, which is not the case when utilizing a cloud provider. Best practices may need to be altered or even replaced entirely.

Formal compliance is a similar headache – adopting any new infrastructure can mean obtaining new certifications around the compliance and reporting requirements for a given application. Hauling compliance and security frameworks around while moving critical applications results in nontechnical but unavoidable chores that represent additional investment in the migration process. These barriers are shrinking, however – all major cloud providers and managed cloud service providers have compliance programs that can help enterprises with fresh audits, and since security on a basic level is almost always superior with the external provider, security organizations can put resources elsewhere after an understanding is reached.

Assessment and planning work around migration efforts represent another organizational challenge. There must be a thorough formal assessment of exactly what should be migrated, as well as how it should be done. With legacy applications, this may run right down to the bare metal, including legacy hardware licensing, custom firmware and whatever else is found at the bottom of the existing stack. Once that assessment is done, planning has to begin, in great technical and organizational detail. Many organizations at this stage turn to managed service providers, which have relevant experience and skills that can be rented instead of hired. Above all, there must be a clear end state in view that represents a tangible benefit to the organization.

Concerns over cost typically involve how a cloud service will fit into existing budgets or how to demonstrate a clear return on investment. But often straight ROI isn't the best way to measure a critical application, and new metrics for value, such as cost returns over performance for BI or ERP, may have to be considered. The consumption of on-demand resources usually encompasses a far more dynamic approach to accounting than traditional datacenter investment.

The most important takeaway from our Voice of the Enterprise research is that none of these roadblocks are insurmountable. Enterprises we have surveyed are successfully moving critical applications to the cloud on a regular basis. In fact, a majority (53%) of enterprise adopters want to either refactor and shift (32%) or lift and shift existing applications *en suite* (21%) into the cloud. In the initial phases of public cloud adoption, almost all the applications involved were cloud-native or net new development projects – but today that has definitively shifted to existing workloads, including mission-critical applications.

Figure 3: Cloud is Not Just for Net New Applications

Q. Which of the following best describes your organization's primary approach to cloud-based application deployment?



Source: 451 Research's Voice of the Enterprise, Cloud Transformation, Workloads & Key Projects 2017

Refactoring is a term typically associated with application development, describing a scenario where the internal code base of an application is updated or changed while the external functions of the application remain the same. Refactoring an application for cloud typically means updating the code to make use of the cloud platform's APIs and endpoints (such as network addresses and storage media) instead of those built for the enterprise datacenter. It also means ensuring that the application architecture is updated to make the best use of the target environment's specific capabilities in terms of virtual machine sizes and types of storage and network resources. Again, the goal here is a net benefit to performance and management, so deciding exactly how to refactor an application for public cloud is a critical part of assessment and planning.

For 'lift and shift' activities, the requirement is essentially broad compatibility in terms of compute, storage and networking, and the only changes made are usually to IP endpoints, DNS servers and namespaces. The application servers and data are copied into the cloud environment and tested before the application is up and running in the cloud. A cutover is then made, and the original equipment and applications are shut down. From a planning and feasibility standpoint, this is often the easiest migration choice, especially for critical applications that are clearly defined and not reliant on specific hardware. High availability can be easily enabled in lift-and-shift operations by copying the application infrastructure and data into more than one cloud environment and setting up failover protocols – a significant advantage to using this migration model.

### Conclusion and Recommendations

- Enterprise organizations would be remiss in not taking a serious look at previously untouchable mission-critical applications and how they can be improved or transformed by the use of external infrastructure like public cloud. The exploratory process itself is educational in terms of the array of capabilities available today.
- There is now a strong public cloud option for almost every kind of application and computing workload. An entire generation of IT talent has now effectively grown up with the IaaS model. All major software vendors are essentially on board, enabling migration and integration between traditional large enterprise applications and public cloud services.
- There is a competitive and wide-ranging market for cloud management integration frameworks and tools. For critical applications, enterprises should identify long-standing, expensive pain points or gaps that have gone unaddressed, and determine whether adoption of cloud services can help, either by migrating an application wholesale, or by refactoring it for the public cloud to gain new capabilities.
- If organizational resistance is high, enterprises should look for ways to work around it. In a buyer's market, cloud adoption can be achieved in small nibbles at first, with bigger bites whenever the organization is ready. Regardless, critical applications should now be considered prime candidates for cloud deployment by enterprises of every size.