MIGRATING ENTERPRISE APPLICATIONS TO MICROSOFT AZURE

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INTRODUCTION

Migrating applications is a subject that can strike fear into the heart of even the most seasoned IT professional. Stories of poorly executed migrations abound, and they often cost businesses dearly in terms of time and money. As organizations consider migrating applications out of their own data centers and into the cloud, the level of anxiety can grow exponentially.

However, moving an enterprise application to the cloud doesn't have to be a nerve-wracking experience. By following some simple guidelines, you can easily determine the best strategy for migrating your applications and taking maximum advantage of the cloud.

This white paper examines the most common application migration issues and offers guidance on how to manage them.

WHAT IS AN "ENTERPRISE APPLICATION"?

You've probably heard the ancient Indian parable about the blind men and the elephant. Each man touches a different part of the elephant and finds that he disagrees with the others about its identity. Something similar can happen when organizations try to define an "enterprise" application. Quite often, the factor that determines whether an application is considered enterprise-class is simply size or perceived complexity. Factors such as scalability, business criticality, data management and security can also influence the decision.

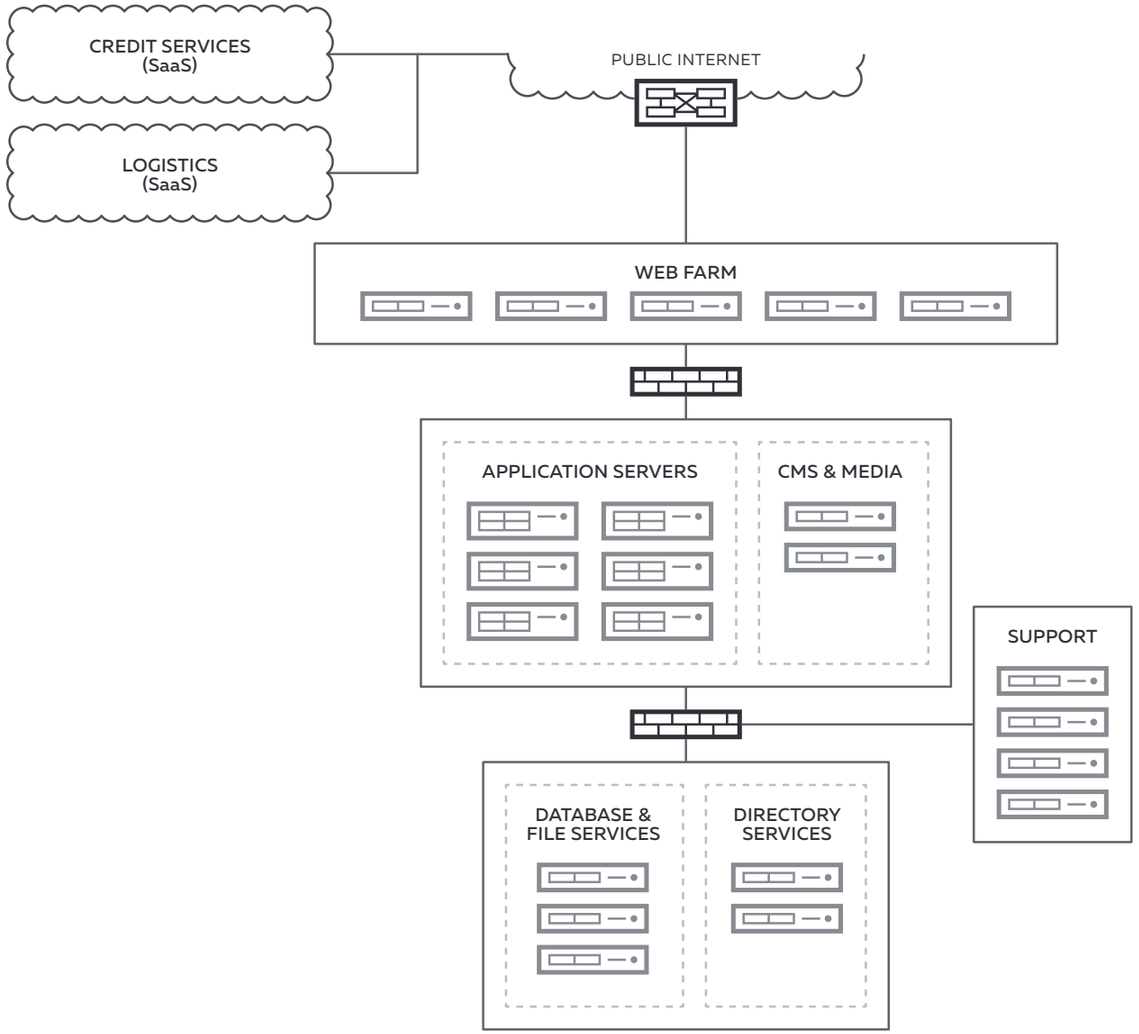
For the purposes of this white paper, we'll assume that an enterprise application is an application of sufficient complexity and value to a business that if it becomes unavailable for an extended period of time, the business will suffer operationally, and potentially financially.

AN EXAMPLE APPLICATION LANDSCAPE

The following diagram represents a traditional multi-layer architecture for a series of enterprise applications. GlobalCo has built out its enterprise application architecture over a period of years and has a stable environment in which to deploy its systems.

GlobalCo is a typical Microsoft-based shop, using Internet Information Services (IIS) for the web front end and application servers, SQL Server for database management, Active Directory for identity management, and Exchange for email. GlobalCo also uses two Software-as-a-Service (SaaS) providers for credit management and logistics. The entire environment is housed in GlobalCo's on-premises data center in Minneapolis.

We'll use the following depiction to frame our discussion of migration scenarios.



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THE MIGRATION APPROACH

Almost every enterprise application has unique attributes that require special attention. Many variables are involved, from special data handling requirements to rules about security and compliance. However, most migration scenarios can be addressed by following a simple four-phase approach*:

Let's examine each of these phases.

PHASE 1: ASSESS

There are a wide variety of methodologies for assessing an application's current state. There are fewer for assessing the application's cloud readiness. Although some automated tools exist, including Microsoft's own Azure App Service Migration Assistant (see the Resources section at the end of this paper), every approach involves examining the application components for feasibility and suitability.

Although there are many non-technical characteristics to consider during an application assessment, we will focus primarily on four attributes: operating platform, data, connectivity, and security and compliance.

PLATFORM

An application's operating platform is a collection of the various technologies required to execute the application. Hardware, operating systems, application server subsystems and the actual code for the application all combine to create the platform. And as you consider moving an application to the cloud, the technologies you are using may limit your ability to migrate efficiently.

*This approach does not address the portfolio analysis required to determine which applications to move. For more insight into this topic, see our white paper "Seven Steps to Get Started With Microsoft Azure."

While the hardware you are using in an on-premises or colocation environment may not matter much in the cloud, you might be utilizing a specific operating system version that is required for your application but not supported in the cloud. An example of such a limitation is Microsoft Windows Server 2003, which is not supported on virtual machines in Azure.

Another platform consideration is the application server technology being used. While many Microsoft-based enterprises (like GlobalCo) use IIS as the application server of choice, more and more organizations are employing other technologies, such as Node.js and NGINX. This diversity of technology presents even more variables to consider during the assessment process.

The main objective of assessing the platform is to understand the functionality being provided and the requirements it meets.

DATA

Very few applications exist without managing some sort of data. Large corporate data stores have traditionally been housed in relational database management systems (RDBMS), such as Microsoft SQL Server, Oracle and IBM's DB2. However, enterprises increasingly use NoSQL data storage systems, such as Redis and MongoDB, to take advantage of more document-based storage. This is especially true in environments that are experiencing a mismatch between entity representation in the application and storage of that entity in the persistence layer.

CONNECTIVITY

It's a given that no server exists as an island. The simple fact is that users (and other servers) need to gain access to resources across the environment. This means that connectivity planning is a must, even in the simplest of application landscapes.

For example, lack of adequate bandwidth can be a major concern, especially if you're considering a hybrid scenario where applications are in the cloud but data is kept on-premises or in a private cloud environment. Depending on how much information you're moving between on-premises and cloud, you may need to budget for increased bandwidth.

Inconsistent network performance can hamper users' ability to connect to applications or prevent applications themselves from accessing critical data stores or identity systems. Network issues that might not adversely affect users who are only emailing or accessing the web might prove disastrous for business application stability and continuity.

Because of the dependence on external network connectivity in many cloud scenarios, ensuring that your network provider has adequate service level agreements (SLAs) in place is a critical part of any cloud migration strategy.

SECURITY AND COMPLIANCE

Many organizations still believe the cloud is inherently insecure. This perception persists despite overwhelming evidence to the contrary. The major cloud providers devote more resources to securing their data centers and infrastructure than many organizations combined, and they can often attract and retain staff with greater expertise.

Given the number of high-profile data breaches in corporate data centers, it should be obvious that cloud security is not a function of control of the data itself. Rather, safeguards like identity management, access control and managed security offerings are the key to securing cloud environments.

However, it is possible that poorly designed and implemented applications that are less vulnerable behind a corporate firewall are more prone to compromise in the public cloud. This is a key reason that security assessment of the application itself is critical to cloud success.

Where compliance is concerned, the issues are potentially greater. It is entirely possible that moving your enterprise application to the cloud will hamper or prevent compliance with standards such as SOX, HIPAA or PCI. For example, while Microsoft's Azure environment is in compliance with PCI-DSS v3.1, it's entirely possible that your

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company's policies and procedures are not adequate to protect data in a public cloud environment.

As with security, consistent and continual risk assessment is critical to operating in the public cloud with a high degree of security and compliance capability. For more information regarding Azure's security and compliance posture, visit the Microsoft Trust Center listed in the Resources section.

PHASE 2: PLAN

The effectiveness of an application migration plan depends heavily on the quality of the application assessment. If the assessment is performed with reasonable depth and attention, planning should be a fairly straightforward task. That's not to say that planning will be simple or quick — often, migration planning for the public cloud can take much longer than the assessment itself.

When planning for application migration, there are three distinct options to consider, and each has numerous permutations influenced by a wide range of factors. The three options are: lift and shift, application evolution (partial refactor), and application rearchitecting (complete refactor).

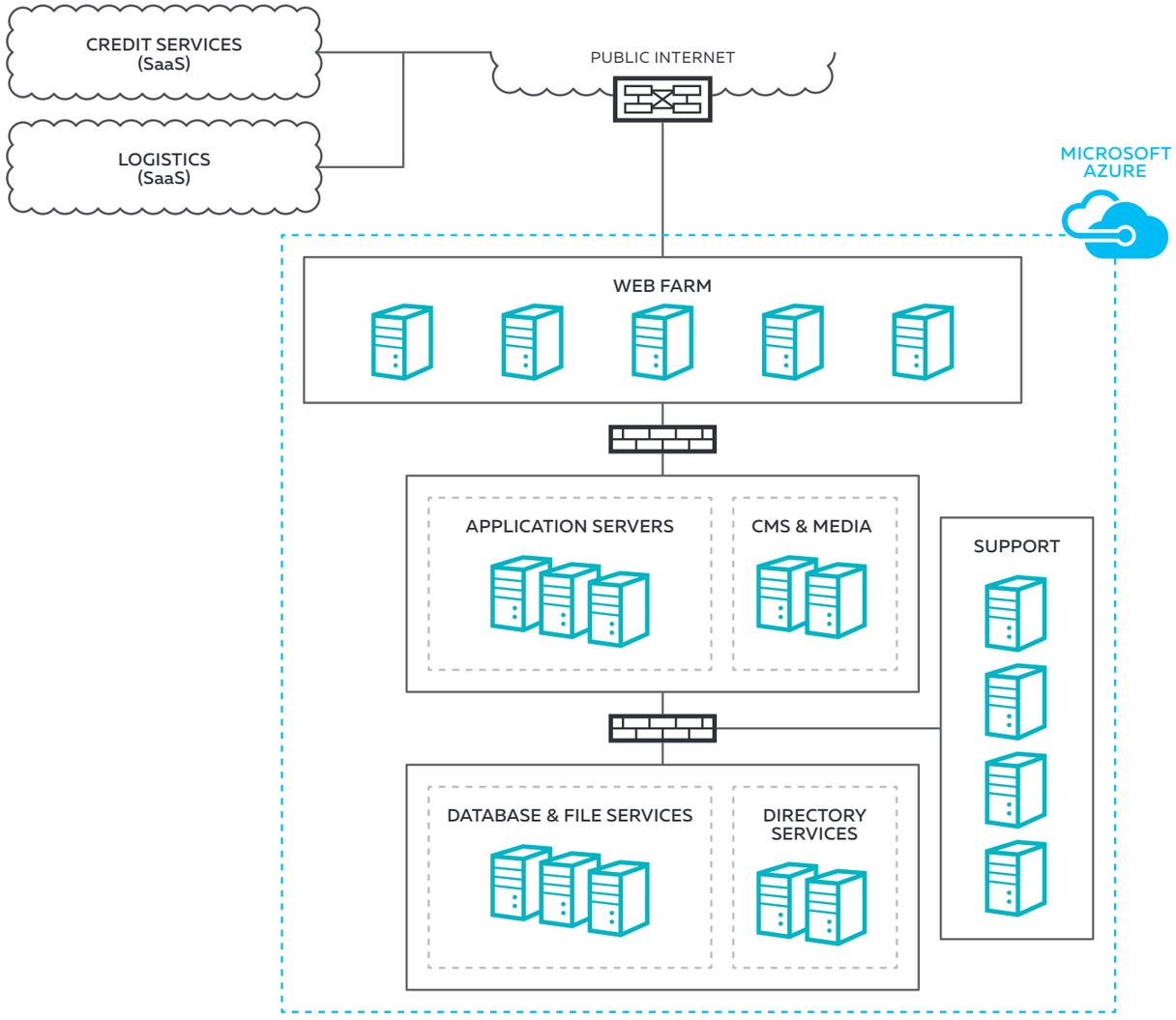
LIFT AND SHIFT

The term "lift and shift" refers to duplicating the existing on-premises environment as precisely as possible in the public cloud. In our example environment above, this would mean creating a one-for-one version of each server and a duplicate network layout.

Assuming that each of the servers shown in our diagram is a physical machine, a one-for-one migration might include:

- Designing the same networking environment (including IP ranges, subnets, security controls, etc.)
- Creating virtual machine (VM) images from each server
- Enabling connectivity to and from the various VMs in a manner almost identical to the physical environment

If the servers are already virtualized on-premises, then the lift and shift move may be even easier.



As shown in the diagram, not much has changed in the environment's overall design. In actual implementation, the firewalls are replaced by Azure network security groups (NSGs) within the virtual network. But this is a one-for-one, server-to-VM scenario that minimizes

application code changes and presents a familiar, albeit remote, operating environment.

APPLICATION EVOLUTION

Evolving an application to the cloud involves identifying application areas that can be refactored easily to use cloud capabilities and technologies. In our example application, this might mean moving databases from Microsoft SQL Server to Azure SQL Database, the Database-as-a-Service (DBaaS) offering within the Azure environment. It might also mean moving email to Office 365 or identity management to Azure Active Directory.

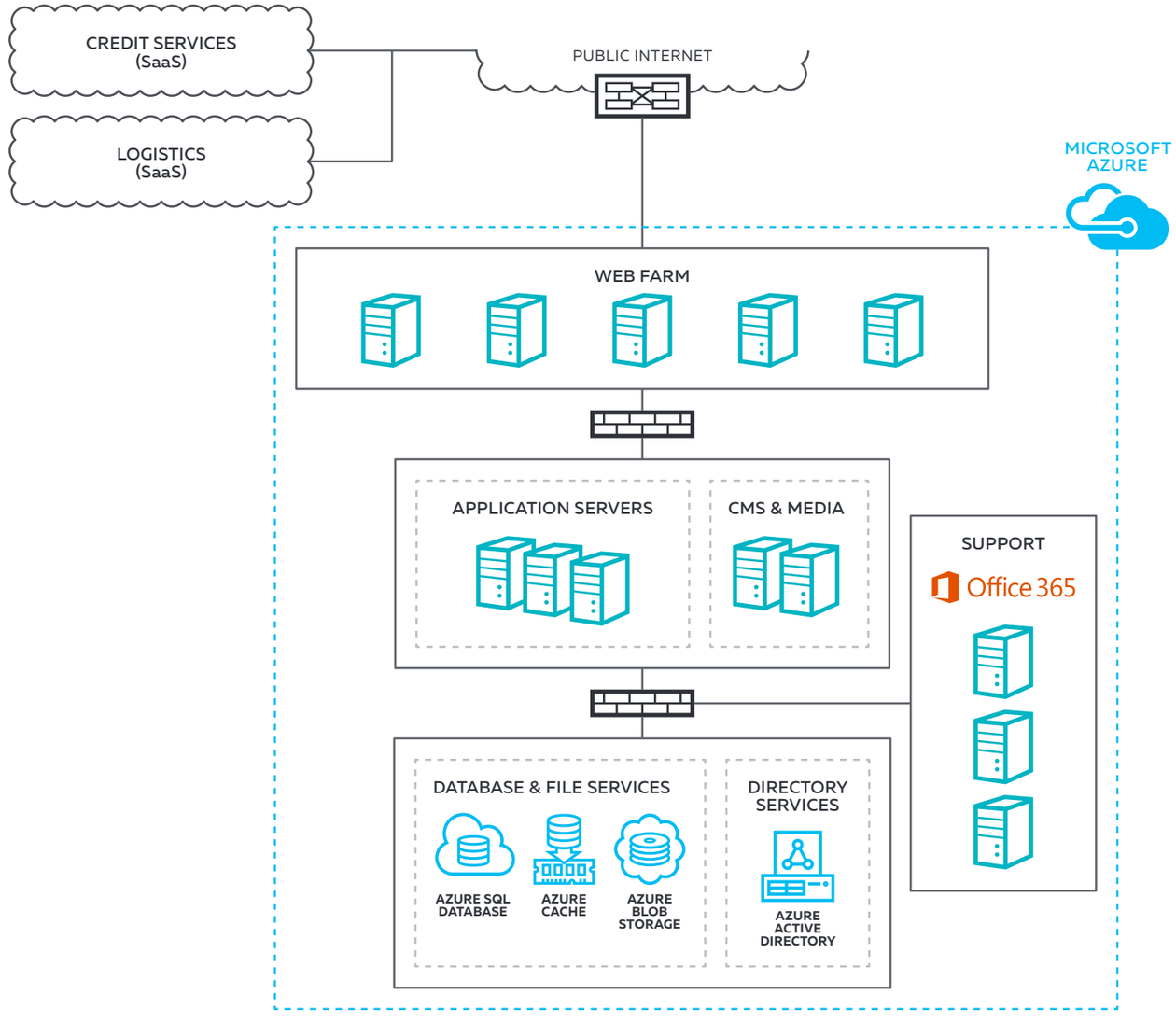
This evolutionary method allows for a phased approach to adopting new cloud technologies, without the overhead of a complete revolution in the application architecture.

We've replaced some of the VMs with Platform-as-a-Service (PaaS) components. Most notably, we're now using Azure SQL Database, Azure Cache and Azure Blob Storage for database and file services. We're also using Azure Active Directory to handle the identity management functions and Office 365 to replace our Exchange servers (while providing significantly more enablement features).

We're still running our applications on IIS in VMs, but we will need to do some minor configuration changes to point the applications at the new database and file service locations. In the unlikely event that GlobalCo is using features of SQL Server that do not exist in Azure SQL Database, we may need to retain the SQL Server VMs for a period of time.

APPLICATION REARCHITECTING

To take full advantage of the public cloud, applications often must be completely rearchitected. While this can be a complex undertaking, the long-term gains usually far outweigh the short-term pains. And public cloud capabilities have matured to the point where completely refactoring an application to be "cloud-first" is not quite the challenge it used to be.



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In Microsoft Azure, the availability of the Azure Service Fabric and Azure Functions for creating micro-service architectures is a compelling argument for refactoring. Coupled with Azure Container Service and features such as App Services, the Azure landscape has changed dramatically in terms of its ability to support the creation of forward-looking application architectures.

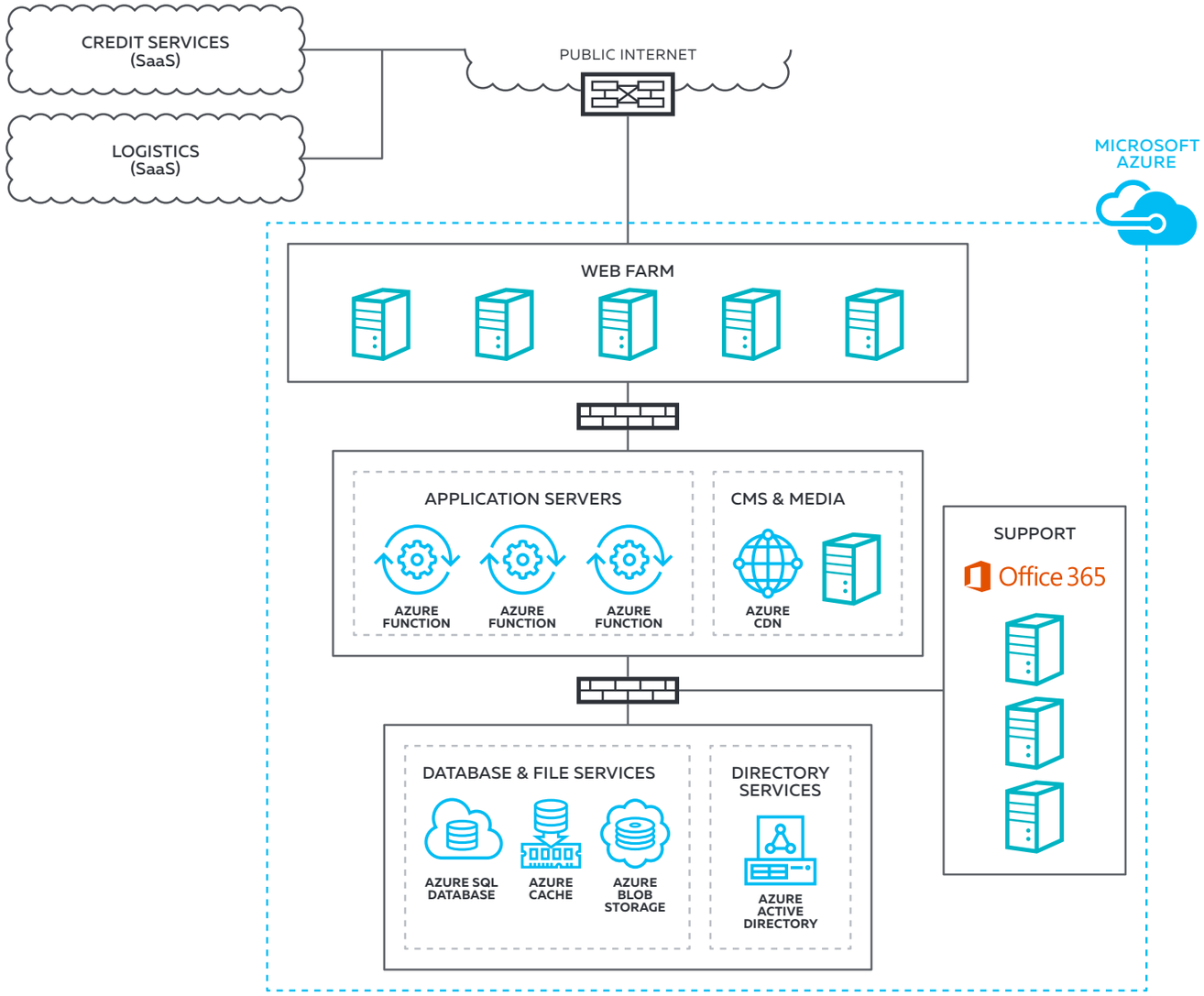
Now we've replaced our application server VMs with Azure Functions to take advantage of the power of "serverless computing." We're also using Azure Web Apps as the front end, which provides some significant advantages for deployment, testing, etc. And finally, we're using the Azure Content Delivery Network to replace our older media servers.

We're still using a VM for our CMS since we've highly customized it, and we still have some VMs for support functions such as management tooling. But overall, we've made significant strides in improving our cloud environment, and we've gained some real benefits along the way.

PROS AND CONS

There are obviously pros and cons to these approaches. In a December 2015 article in The Doppler (see the Resources section below), author and cloud expert David Linthicum presents a table summarizing the pros and cons of these three paths to the cloud:

	PROS	CONS
LIFT-AND-SHIFT	· Minimal work required to move application · Faster migration and deployment	· Typically does not take advantage of native features of the cloud platform · May cost more to operate in a cloud
PARTIAL REFACTOR	· Only parts of the application are modified · Faster migration and deployment than complete refactoring	· Only takes advantage of some features of the cloud · May cost more to operate in a cloud
COMPLETE REFACTOR	· Applications typically offer higher performance · Applications can be optimized to operate at lower costs	· Much higher cost since much of the application must change · Slower time to deployment



A Note on Organizational Readiness*: Although the subject of organizational readiness for the cloud is beyond the scope of this white paper, it bears mentioning because a lack of readiness can spell certain disaster for any migration effort. Moving an application to the cloud without adequate people and processes in place to manage it is both risky and unwise.

PHASE 3: PREPARE

Preparation for migrating an application to Azure involves two key tasks: proof of concept and pilot.

PROOF OF CONCEPT

All too often, organizations assume that everything they have heard and read about the cloud is 100% accurate and applicable to their situation. Proof of concept (POC) is a targeted, low-risk method for ensuring that the selected migration approach (one of the three options previously discussed) is appropriate for the application being moved. Conducting a POC can provide valuable lessons that may reduce complexity and save time and money.

The key to an effective POC is having a solid consensus among stakeholders about what is being proven. An example might be proving the connectivity between Azure regions and the home office if resources are to be shared across network connectivity (in the case of a hybrid application). Or you may be interested in understanding and estimating application performance by moving a portion of an application workload into Azure to test a subsystem's operational characteristics using various tiers of service.

If the POC adequately confirms the application's ability to operate in the cloud, you can move to the next stage of preparation.

PILOT

A pilot generally consists of operating the application in conditions that resemble those of the real world as closely as possible. The pilot may not necessarily be a performance indicator, because cost or time constraints may not allow the entire application environment to be replicated. In our example, this might mean a single web server, a single application server and a single database instance, and no external connectivity to SaaS applications. The goal is to have end users interact with the application to determine usage characteristics and identify any potential barriers to success.

A pilot is usually more complicated and time-consuming than a POC, since it involves operating the application as intended. Activities like setting up proper test data and creating cloud identities play a role in ensuring a successful pilot. And as with a POC, it's critical to determine the success factors prior to pursuing the pilot.

PHASE 4: MIGRATE

During this phase, the migration is undertaken. If the preparation in the previous phase was adequate, you will likely have developed automation capabilities (tools, templates and processes) that ease the actual work of migrating the application.

Microsoft Azure offers Azure Resource Template technology, which allows you to define your infrastructure and services in a reusable format that can be deployed and redeployed at will. This type of automation (and many others) provides a consistent, repeatable means of creating environments within the cloud.

As mentioned, Microsoft offers automation tools to simplify the migration, but numerous providers offer migration services to completely manage the process using expertise and tools developed over numerous migration projects with customers. Rackspace Professional Services offers such capabilities, along with assessment and readiness offerings.

CONCLUSION

Migrating enterprise applications to Microsoft Azure can be challenging. The sheer number of options available to application architects and developers can be overwhelming. Beyond the technical considerations, many other variables can also influence the migration effort.

This white paper has presented a simple four-phase approach to migration. Each phase is intended to move the migration effort forward with maximum learning and minimum risk.

And you don't have to make the migration journey alone. A trusted partner brings experience and support to the table, which can reduce the burden on your organization's staff. For initial migration efforts, it's especially handy to have a guide that has been down that road before.

To find out more about how Rackspace can help you get started with Microsoft Azure, visit our Azure website at www.rackspace.com/azure.

Kent Kingery is a cloud practitioner/evangelist at Rackspace. He has extensive hands-on experience transforming applications to take advantage of cloud capabilities. His current areas of interest are containers, serverless computing, and Internet of Things (IoT), and he loves talking to customers about how to be successful in the cloud. Connect with him on Twitter and LinkedIn.

*For more information about cloud readiness assessment and strategic cloud enablement, please contact Rackspace Professional Services at www.rackspace.com/en-us/professional-services.

RESOURCES

MIGRATING A LEGACY ENTERPRISE ENVIRONMENT TO AZURE

https://channel9.msdn.com/Events/dotnetConf/2015/Migrating-a-Legacy-Enterprise-Environment-to-Azure

MOVING APPLICATIONS TO THE CLOUD ON MICROSOFT AZURE, 3RD EDITION

https://msdn.microsoft.com/library/ff728592

SEVEN STEPS TO GET STARTED WITH MICROSOFT AZURE

https://dab35129f0361dca3159-2fe04d8054667ffada6c4002813eccf0.ssl.cf1.rackcdn.com/downloads/pdfs/microsoft-azure-7-steps-to-get-started-with-microsoft-azure-whitepaper.pdf

MICROSOFT AZURE APP SERVICE MIGRATION ASSISTANT

https://www.movemetothecloud.net/

MICROSOFT TRUST CENTER

https://www.microsoft.com/en-us/trustcenter

"REFACTOR VS. LIFT-AND-SHIFT VS. CONTAINERS"

Article from The Doppler, published by Cloud Technology Partners
https://www.cloudtp.com/doppler/refactor-vs-lift-and-shift-vs-containers/

AZURE FUNCTIONS – SERVERLESS COMPUTING

https://azure.microsoft.com/en-us/services/functions/

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Rackspace, the #1 managed cloud company, helps businesses tap the power of cloud computing without the complexity and cost of managing it on their own. Rackspace engineers deliver specialized expertise, easy-to-use tools, and Fanatical Support® for leading technologies developed by AWS, Google, Microsoft®, OpenStack, VMware® and others. The company serves customers in 150 countries, including more than half of the FORTUNE® 100. Rackspace was named a leader in the 2015 Gartner Magic Quadrant for Cloud-Enabled Managed Hosting, and has been honored by Fortune, Forbes®, and others as one of the best companies to work for.

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