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data thinking

Cloud Migration Essentials

A GUIDE TO MIGRATING SERVERS AND VIRTUAL MACHINES

INDEX

1. Introduction

In recent years, global business has witnessed significant cloud adoption, which provides considerable value over traditional datacenters— achieving greater scalability, cost efficiency, and improved performance.

Many organizations now want to quickly take advantage of the benefits of the cloud by migrating their existing applications and workloads. However, cloud migration requires careful planning and strategy.

To enable successful migration, it's important to have a strong plan in place that covers the end cloud environment, training, and—most importantly—the readiness of your workloads and applications.

This means you need to determine how to:


Create the initial technical plans and business justification.


Ensure your workloads will run as expected.


Perform the migration with limited impact to the business.

Then, once you've migrated to the cloud, you need to make the most of your investment and keep it secure. If you're an IT manager running on-premises applications and servers, this guide can help you start your migration to the cloud.

In this guide, you'll discover:

- Preliminary steps to consider when looking at migration.
- Various approaches for rehosting, refactoring, rearchitecting, and rebuilding your workloads for the cloud.
- Some tools you can use to accelerate your migration project.
- Tips for post-migration success.

Migrating to the cloud doesn't have to be difficult. With the right tools and processes, your migration project can be fast and friction free. Methods such as lift and shift can rapidly move you to the cloud, reducing costs immediately and allowing you to focus on future cloud modernization. In addition, processes for assessment, optimization, security, and management can help throughout your continuing adoption of cloud resources

2. Why Migrate Now?

At first glance, migration might seem like a technical decision, but its core is business related. Ultimately, it raises two fundamental questions: What's driving your business to migrate to the cloud, and why now?

The benefits of the cloud are universal—reduction in running costs, faster modernization capabilities, and increased security. But there's usually a specific catalyst for starting the migration discussion. These can include:

Operational efficiencies and reduced operating expenses. With reduced hardware support, increased manageability, and more efficient processes, you can save an average of 20 to 30 percent on VM resource configuration alone.

Decreased time to market/release. By reducing management overhead and freeing up budget, you can focus more time and effort on rapid software and solution development. Faster deployment of Infrastructure as a Service (IaaS) and Platform as a Service (PaaS) platforms enables your business to release faster and more often.

Support for cost-effective scalability requirements. When you plan for peak usage through on-premises systems, your servers are usually running at less than 20 percent utilization. The cloud releases you from this model, enabling a scale-when-you-need-it approach.

Why Migrate Now?

Renewal of datacenter or hardware leasing. If you're currently extending your budget on renewing hardware or paying for datacenter locations, it's a good time to consider cloud migration. A cloud vendor can host these services for you, eliminating the need for costly leasing.

Renewal of licensing. Nearly all companies have an annual licensing agreement with their major IT providers. These require ample budget to ensure the OS platform and virtualization are sufficiently covered. The cloud can help here as well, providing a pay-as-you-go offering to reduce this cost.

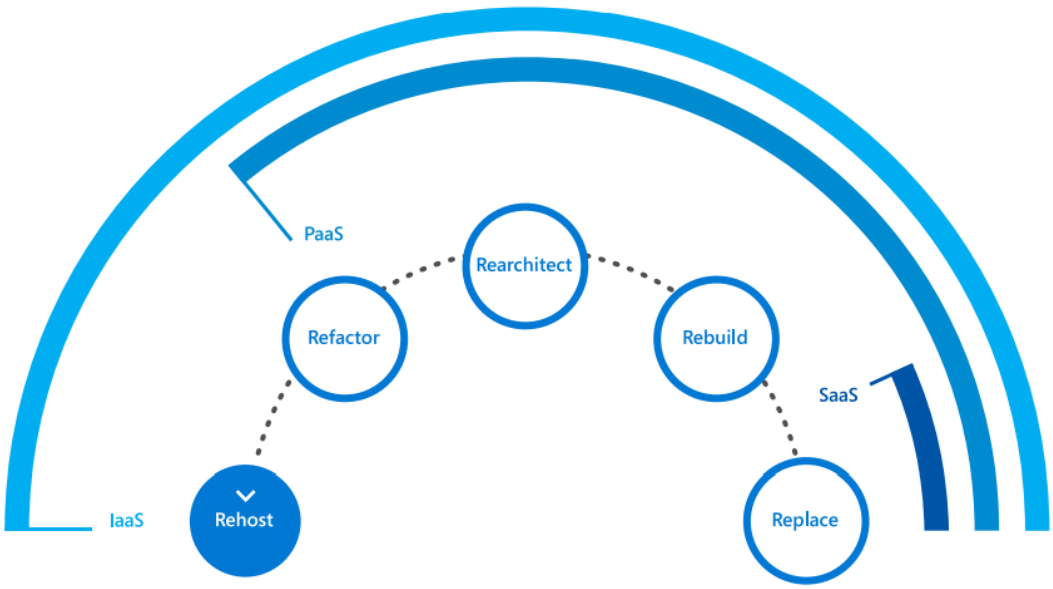
Application development and modernization. Two common challenges for today's businesses are over allocated IT resources and on-premises platforms that limit the adoption of modern services. The cloud provides an integrated platform for modern development that enables teams to increase speed by up to 33 percent.

Software end of support. End of support for Windows Server 2008 and SQL Server 2008 means the end of regular security updates. This can be an opportunity to migrate your end-of-support workloads to Azure to strengthen your organizational security posture and ensure compliance across your hybrid environment.

Ultimately, by migrating your current environment to the cloud, you're putting yourself in a better position to accelerate your business. By reducing costs and making management more efficient, a cloud platform can immediately influence your IT group's ability to invest back into core strategic projects, increasing security and reliability while advancing application development.

3. How do you approach migration?

Your cloud migration strategy will depend on many factors: What are your most pressing needs? What are the skills on your team? Where are your apps in the development lifecycle?

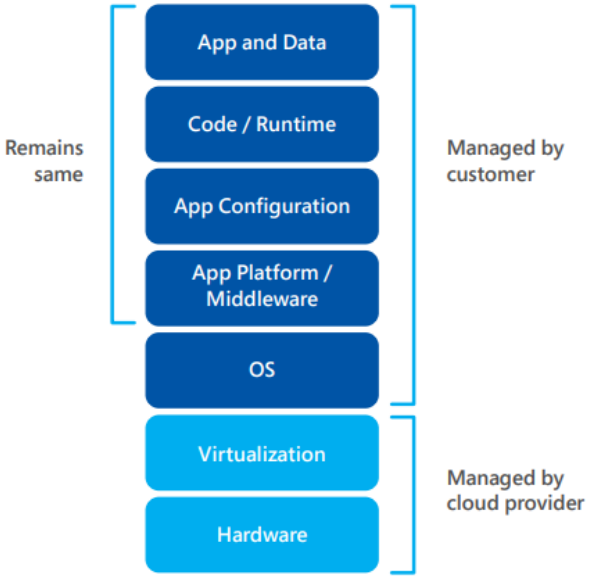


How do you approach migration?

Rehost

Also known as “lift and shift,” this strategy entails migrating your physical servers and VMs to the cloud just as they are.

By simply shifting your current server environment straight to IaaS, you reap the benefits of cost savings, security, and increased reliability. In the new rehosted cloud model, hardware and OS you previously managed yourself are now managed by the cloud provider. All other aspects of the workload or application remain the same. This is a highly popular migration approach because it lets organizations move quickly with little risk or impact and receive immediate benefits. It also allows organizations to see lower TCO faster, enabling investment back into the migration process that can then evolve through the model.

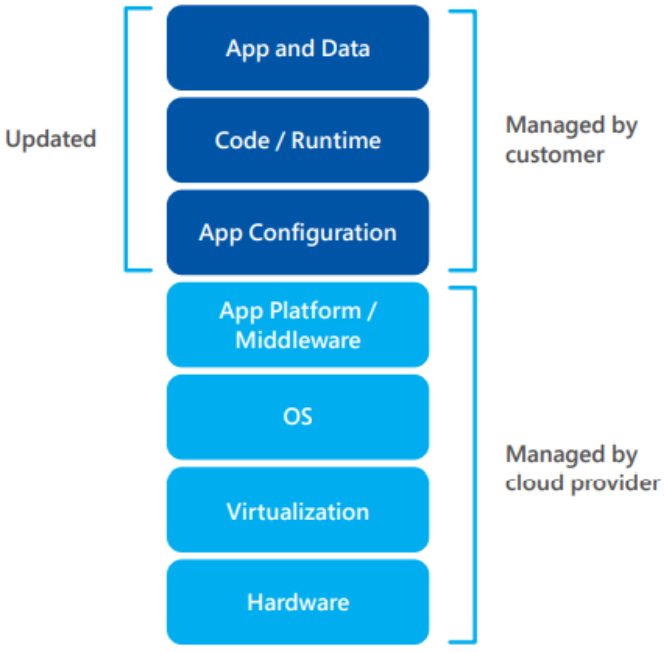


How do you approach migration?

Refactor

This strategy involves using additional cloud provider services to optimize cost, reliability, and performance by refactoring your applications.

In rehost, you only use provider-managed hardware and OS, but in this model, you also take advantage of cloud services to drive down cost. You continue to use your current application as-is, with some minor application code or configuration changes, and connect the app to new infrastructure services like Azure App Service, Azure SQL Database Managed Instance, and containers. By employing modernized services, you can reduce both cost and management.

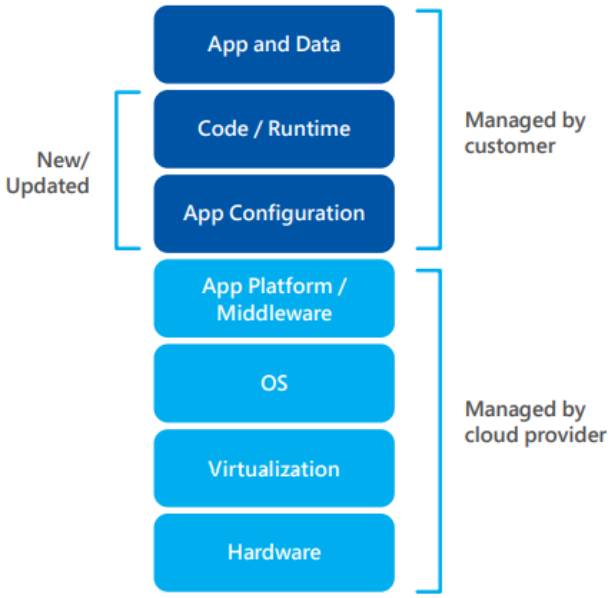


How do you approach migration?

Rearchitect

This strategy involves rearchitecting an application to modernize it—that is, to transform it with a modular architecture.

Rearchitecting is modifying or extending an existing application's code base to optimize it for a cloud platform and better scalability. Cloud provider services can be used directly as backend services of modern apps, which are highly scalable and reliable. This is likely the most time-consuming way to migrate an app to the cloud because it requires app code changes. One example of rearchitecting would be decomposing a monolithic application into Microservices that work together and readily scale on Microsoft Azure. Another example would be rearchitecting a Microsoft SQL Server database to make it a fully managed Azure SQL Database.

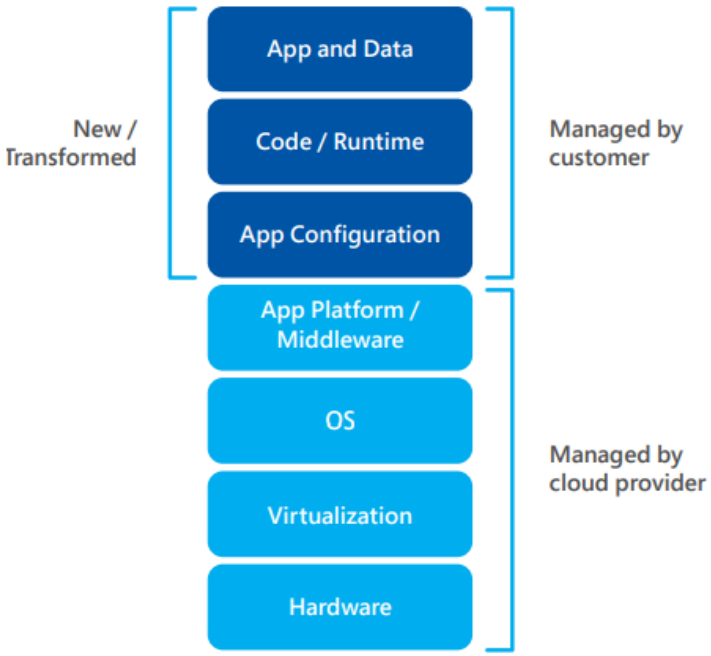


How do you approach migration?

Rebuild

This strategy involves revising the existing application by aggressively adopting PaaS or even Software as a Service (SaaS) services and architecture.

The process encompasses major revisions to add new functionality or to building the app from scratch the application for the cloud. An example of rebuilding would be redesigning code to decompose the original application into smaller chunks, and then deploying using cloud-native technologies.

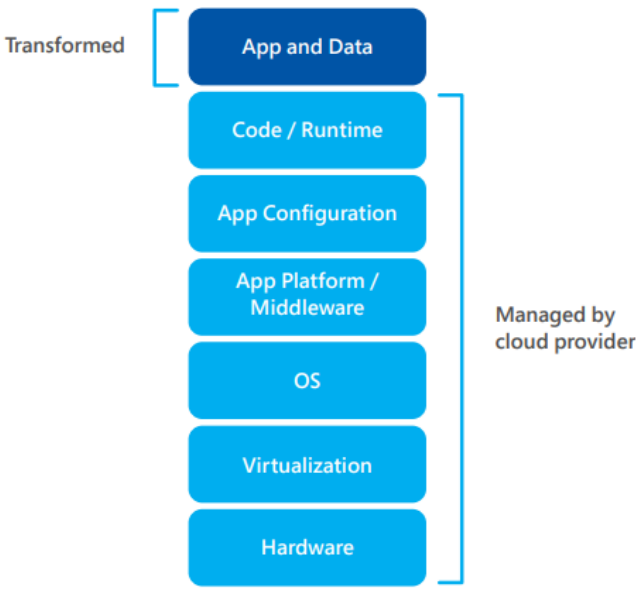


How do you approach migration?

Replace

This strategy involves moving or discarding an existing application and replacing it with commercial software delivered as a service.

SaaS provides a complete software solution that you purchase on a pay-as-you-go basis from a cloud service provider. When you choose this option, all underlying infrastructure, middleware, app software, and app data are managed by a service provider and located in the service provider's datacenter. The service provider manages the hardware and software and, with the appropriate service agreement, ensures the availability and security of the app and its data. SaaS can help your organization quickly launch an app at minimal upfront cost. Typically, you migrate existing data to the SaaS environment and import/export application data with an API or configuration/admin console.



4. Four Steps to Migration

No matter which strategy you choose, you need a solution that makes cloud adoption as smooth and easy as possible—one that lets you migrate at your own pace.

This requires a cloud provider (and core partners) that can deliver a comprehensive set of tools and methods to help ease migration and reduce overall risk. Most of all, this solution should offer a simple process that's easy to follow. With these goals in mind, Microsoft recommends a four-step migration process for moving to the cloud.

Assess. Discover and assess your onpremises resources, such as applications and workloads, to plan where your Azure migration should start.

Migrate. Move resources using powerful, free tools while minimizing downtime.

Optimize. Streamline your cloud resources, improve performance and ROI, and stay compliant.

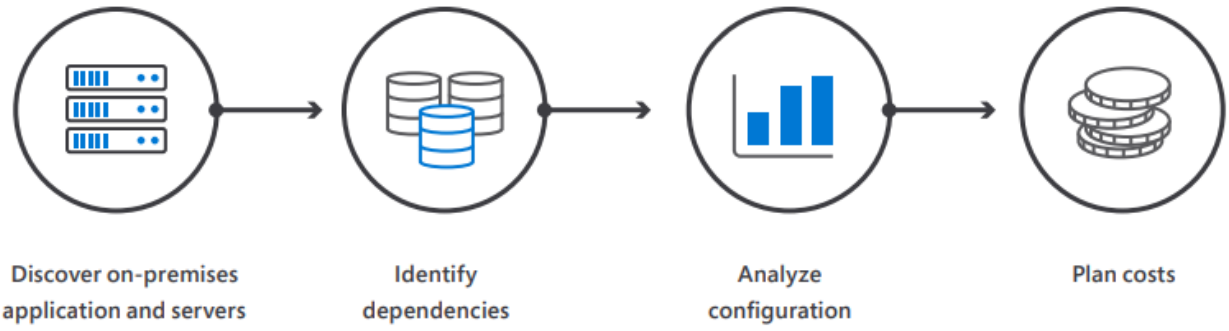
Secure and manage. Ensure security and fine-tune management of your cloud environment.

Asses

When beginning a migration, you first need to get a better understanding of what your applications are, how many servers and/or VMs you have, and how you'll plan to move components to the cloud.

Uncertainties about the total savings and perceived complexity can get in the way of taking this step. Many organizations have found that moving existing workloads to Azure can yield significant benefits. Justifying the investment requires confidence that you'll save a significant amount on operational costs and that your current workloads will work as expected in the cloud. Many workloads can run immediately on Azure without modification, while other workloads that have operational and application dependencies in an on-premises environment require further analysis and planning. If your applications are composed of multiple servers or VMs, you should invest in consolidated planning to identify them and shift them to the cloud. This is not a manual process, and you'll need intelligent planning tools to do it. Similarly, getting accurate cost comparisons can be challenging when you're estimating the load and Azure VM instance. Without automated analysis to map on-premises capacity to VM instance, your estimations might fall short—causing performance issues. Or your estimations could be too high—stretching your budget.

Assessment Plan



Migrate

Once you've completed your assessment, it's time to prepare for the next step: cloud migration.

This is when, after you've decided on your migration goals and gathered all requirements and constraints, you can choose the best method of migration. In the Migrate step, you'll determine the strategy that best meets your requirements—and this is usually best addressed on a per-application basis. In this step, you're essentially physically moving your workloads and applications (including their data) to the cloud and planning to retire the on-premises versions. Every organization will have a different approach, and you might mix rehosting, refactoring, rearchitecting, rebuilding, and replacing your applications.

This e-book focuses on the rehost strategy—moving applications running on traditional servers and VMs to Azure IaaS. In many cases, organizations will start with lift and shift to drive rapid migration and early cost savings. Lift and shift requires no change in an app or workload framework or architecture; it simply means hardware and OS are managed by the cloud provider. This approach requires confidence regarding two key issues: Can you easily migrate a workload without too many manual steps? And will the workload function as expected in the cloud? As such, several decision points come into play based on what's being moved and especially how (or if) you want to access it while the migration is taking place. The lift-and-shift method most often employed for server or VM migration is real-time replication because of its flexibility and support for a staged migration. Real-time replication allows the workload to remain online and accessible during the migration. Plus, modern tools enable the system to cleanly migrate real-time data even when the system is actively being used.

Optimize

Once you've implemented your cloud migration strategy, you'll want to ensure that you're taking full advantage of the cloud's performance, scalability, and costsaving benefits.

This will enable you to pay only for the services and resources you use, achieve a greater ROI, and receive additional savings by using the latest cloud capabilities. This is also the best time to start looking at new services for modernizing your application—migrating to PaaS and even SaaS, where applicable. On-premises tools are not built for cloud scale and agility. Plus, they're simply not aligned with the new usage models enabled by the cloud. Continual optimization is a critical third piece of your migration journey. Optimization targets two main areas—ensuring peak performance and driving continual cost efficiency.

Optimize

Ensure continual cost efficiency and optimization

Performance monitoring can help you achieve cost optimization. During the Assess step, you performed rightsizing for on-premises workloads based on a point in time. Once those workloads are moved to Azure, their usage could change. For example, if you move a moderately used app from on-premises to Azure, initially a middle-tier VM and D2 v3 instance (2 vCPU and 8 GB RAM) might be recommended. However, after six months, if the use of that application has declined, you'd want to downsize to a lower VM instance to reduce costs. Azure Cost Management shows you usage and costs so you can track trends, detect inefficiencies, and create alerts. All usage statistics and cost data are displayed in intuitive dashboards and reports. With Azure built-in cost management services, you can continually monitor for CPU and memory usage. This enables recommendations for VM instances that can be further rightsized. These services can help you detect over-utilized VMs and upsize, as needed, to ensure performance SLAs. These services can also help you discover underutilized VMs for potential downsizing. For example, Azure cost optimization can provide a regular view of your current total VM utilization. At a glance, you can determine the number of VMs that are consistently underutilized (that is, running below 90 percent). Then, with Azure cost optimization sizing, you can find recommendations for which VMs should be resized, as well as the suggested instance change (including potential annual savings). As you continue to use your new IaaS environment, targeting maximum cost savings through Azure Reserved VM Instances becomes attractive. Reporting available in Azure Cost Management can point out the workloads that would benefit from Reserved VM Instances, maximizing your TCO.

Secure and Manage

Once you've migrated, you'll want to keep your VMs continuously secure, protect your data, and monitor your cloud health. All that's easy to do with Azure—once you have an understanding of the full suite of available controls and capabilities.

Secure cloud resources Ensuring strong security for your cloud-based resources is a responsibility that's shared between you and your cloud provider. Azure is built with a foundation of trust and security, compliance, privacy, and transparency. The Azure platform provides a solid foundation on which to host your infrastructure, with built-in security controls and capabilities to help further protect your data and applications.

Azure Security Center provides unified security management and advanced threat protection across hybrid cloud workloads. Azure Security Center enables you to take advantage of capabilities like these:

Centralized policy management. Ensure compliance with company or regulatory security requirements by centrally managing security policies across all your hybrid cloud workloads.

Continuous security assessment. Monitor the security of machines, networks, storage and data services, and applications to discover potential security issues.

Actionable recommendations. Remediate security vulnerabilities—before they can be exploited by attackers—with prioritized and actionable security recommendations.

Secure and Manage

Advanced cloud defenses. Reduce threats with justin-time access to management ports and whitelisting to control applications running on your VMs.

Prioritized alerts and incidents. Focus on the most critical threats first by taking advantage of prioritized security alerts and incidents.

Integrated security solutions. Collect, search, and analyze security data from a variety of sources, including connected partner solutions.

Protect Data

Protect data Azure helps ensure workloads and data are fully backed up and protected from disasters while providing encryption of stored data for internal and customer security. Azure can also automatically encrypt your stored data—while allowing full accessibility to all applications and users.

VM disk encryption. Azure Disk Encryption enables encryption of Windows and Linux Azure Virtual Machines disks. Azure Disk Encryption uses the industry-standard BitLocker feature of Windows and the dm-crypt feature of Linux to provide volume encryption for the OS and data disks. The solution is integrated with Azure Key Vault to help you control and manage the disk encryption keys and secrets in your key vault subscription while ensuring that all data in the VM disks is encrypted at rest in your Azure storage.

VM backup. Azure Backup is a scalable solution that protects your application data with zero capital investment and minimal operating costs. Application errors can corrupt your data, and human errors can introduce bugs into your applications. With Azure Backup, your VMs running Windows and Linux are protected.

Azure Site Recovery. An important part of your organization's business continuity and disaster recovery (BCDR) strategy is figuring out how to keep corporate workloads and apps up and running when planned and unplanned outages occur. Azure Site Recovery helps orchestrate the replication, failover, and recovery of workloads and apps so that they're available from a secondary location if your primary location goes down.

Monitor Cloud and Health

As with any system, monitoring cloud health is important to drive both proactive and reactive analysis. Azure provides many monitoring services targeted at applications, workloads, and core service health to ensure you have full visibility into current system status—and access to important data when you're working with a break-fix situation.

Azure Monitor. Azure Monitor enables you to monitor Azure services by collecting metrics, activity logs, and diagnostic logs. For example, the activity log tells you when new resources are created or modified. Metrics are available that provide performance statistics for various resources—and even for the OS inside a VM. You can view this data with one of the explorers in the Azure portal, send it to Azure Log Analytics for trending and detailed analysis, or create alert rules to notify you of critical issues proactively. Standard metrics are free and include select metrics originating from Azure resources, services, and first-party solutions. More advanced metrics—including insights into the availability, performance, and usage of your applications, along with health monitoring and alert rules—are also available.

Service Map. Service Map provides insight into your IaaS environment by analyzing VMs and their dependencies on other computers and external processes. It integrates events, performance data, and management solutions in Log Analytics. You can view this data in the context of each computer and its relation to the rest of your environment.

Network Watcher. Network Watcher provides scenariobased monitoring and diagnostics for various network scenarios in Azure. It stores data in Azure metrics and diagnostics for further analysis.

Service Health. It's important to be aware of any issues with the Azure services your applications depend on. Azure Service Health identifies issues with Azure services and helps you plan for scheduled maintenance.

Azure Advisor. Azure Advisor constantly monitors your resource configuration and usage telemetry. It then gives you personalized recommendations based on best practices. Following these recommendations can help you improve the performance, security, and availability of the resources that support your applications.

Many premium management solutions are packaged sets of logic that provide insights for an application or service.

They rely on log analytics to store and analyze the monitoring data that they collect. Azure Log Analytics enables deeper visibility into your hybrid IT environment and allows you to diagnose performance issues from an advanced analytics portal with one click. With Azure Log Analytics, you can:

Analyze data. You can use provided dashboards to run log searches by constructing queries to analyze collected data. These dashboards can be customized with graphical views of your most valuable searches. Once you have a defined collection of operational data from your Azure VMs and activity logs, you can perform powerful searches.

Visualize data. Log Analytics dashboards can visualize all your saved log searches, giving you the ability to find, correlate, and share IT operational data.

Get data alerts. Alerts in Microsoft Azure inform you about important information in your repository. They are created by alert rules that automatically run log searches at regular intervals and match certain criteria. With Action groups, you can perform advanced actions with alerts, such as creating an email notification, launching an automation runbook, or creating an incident record in your ITSM incident management system.

CONCLUSION

The key to a successful cloud migration is breaking the process into steps—regardless of why your organization wants to move or how compex your current environment is.

You can use the information outlined in this e-book to start with a few applications, and then continue to expand to more of your environment. First, you need a clear plan that takes into careful consideration your servers, VMs, and workloads—and what's required for these to function in the cloud. Along with this assessment, you need to determine your true usage of resources and analyze any configuration dependencies for your workloads. Then, as you move forward with migration, you need to make sure that your workloads in the cloud are in sync with your on-premises system in real time. Along with this, you'll want to test the health of your system so that your final cutover is smooth. Finally, you should continue your cloud journey by pursuing even greater cost efficiency through optimization and by keeping your workloads operating securely at peak performancelex your current environment is.

The benefits of migration can be immediate in terms of time and budget. The cloud can help you be more agile and, in many cases, help you respond to business needs faster. The cloud can help you in reducing your TCO, freeing you to take that massive savings and invest it back into your business to drive faster modernization. Plus, you can explore PaaS and SaaS options, decreasing your TCO even more while expanding your IT capability.