

A REVIEW PAPER ON MIGRATION IN AZURE AND SERVICES OFFERED BY AZURE MIGRATE*

BY

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ABSTRACT

Cloud computing is gaining popularity giving a new direction to accessing computing resources. Cloud integrates with multiple resources and technologies offering flexibility and efficiency to any user, individual, or organization. Microsoft Azure is one of the largest cloud vendors by revenue offering various computing services, including Storage, Data management, AI, IoT, and Virtual Machine management, etc. Azure Migrate provides a centralized hub to migrate as well as assess Azure on-premises services, applications, infrastructure, and data as well as provides a range of assessment and migration tools. This paper explains migration services and tools offered by Azure mainly to migrate Virtual machines to Azure and describes the best practices to keep in mind before migrating assets to Azure.

KEYWORDS

Cloud Computing, Computing services, Azure, Azure Migrate, Virtual Machines.

1. Introduction

In the past few years, Cloud Computing has gained high demand due to its wide range of computing capabilities, services offered by clouds such as Storage, Monitoring, and Networking are being adopted by a lot of organizations to experience an easy and on-demand compute environment. Cloud Computing is changing the way Information Technology (IT) services are developed, deployed, maintained, and scaled. Cloud Computing offers a new approach to the traditional method of storing the data, applications, platforms, etc, and then servicing them on-

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demand on the cloud. This approach proposes to deliver a range of low-cost applications, anytime anywhere using a terminal via various web browsers, smartphones, and other devices to the consumers using software products, delivering business applications as well as decreasing the software and hardware costs and providing flexibility with an easy to maintain environment.

Microsoft Azure is a cloud computing platform used to build, host, and maintain cloud-scale solutions through Microsoft-managed data centers. Azure maintains a directory of Azure services, All the elements are necessary to build a virtual network and deliver applications, which includes Virtual Machines, SQL databases, Azure Active Directory Domain Services, Application services, Storage, etc. Microsoft Azure has numerous benefits including cost efficiency, high availability, data security, and scalability.

Cloud Migration is a process of relocating or moving data, workloads, IT resources, or applications to a cloud infrastructure. There are multiple types of cloud migrations an organization can perform but the most common migration model is from the local or on-premises data center to the cloud. Azure Migrate provides a centralized hub to assess and migrate to Azure on-premises servers, infrastructures, data, and applications. Azure offers on-premises physical server migration, on-premises VMware VM migration as well as on-premises Hyper-V VM migration.

2. Overview of Azure Migrate

Azure Migrate provides a central hub to track the discovery, assessments, and migration of the on-premises apps and workloads, and private or public cloud VMs to Azure. This hub provides Azure Migrate tools for assessment and migration, and third-party independent software vendors (ISV) offerings as well. In the Azure Migration hub, you can access and migrate Servers, Databases, Web applications, Virtual Desktops, and Data.

2.1 Azure Migrate Integrated Tools

2.1.1 Azure Migrate Server Assessment:

Azure Migrate Server Assessment helps assess servers, on-premises VMware VMs, Hyper-V VMs, and physical servers that are in preparation for Azure migration. Server Assessment uses Azure Migrate appliance, which is deployed on-premises. The appliance runs on a VM or physical server, installation is easily done by downloading the template. The appliance discovers on-premises machines and continuously sends machine metadata to Azure migrate, an appliance discovery is agentless.

Here's what Azure Migrate Server Assessment tools do:

Azure readiness: Assesses whether the on-premises machines are ready to migrate on Azure.

Azure Sizing: Estimates the size of Azure VMs or the number of Azure VMware nodes after migration.

Azure cost estimation: Estimates the costs for already running on-premises servers in Azure.

Dependency Analysis: Identifies cross-server dependencies and optimization strategies for moving interdependent servers to Azure. There are two types of dependency analysis

1. **Agent-based analysis:** Here you are required to install agents on each on-premises machine that needs to be analyzed. The agent-based analysis uses the Service Map solution, which discovers application components on Windows or Linux systems and maps the communication between them.

2. **Agentless analysis:** Here no agents are required to be installed on VMs. Agentless analysis polls data from VMware VMs with the help of vSphere APIs. However, this analysis is currently in preview for only VMware VMs.

2.1.2 Azure Migrate Server Migration:

Azure Migrate Server Migration tool helps Migrate servers, VMware VMs, Hyper-V VMs, physical servers, and other virtualized machines as well as public cloud VMs to Azure.

On-premises VMware VMs: Can be migrated to Azure using agentless or agent-based migration. For agentless migration, Server Migration uses the same Azure migrate appliance that is used by Server assessment. Whereas, for agent-based migration, Server Migration uses a replication appliance.

On-premises Hyper-V VMs: Server Migration uses provider agents installed on Hyper-V hosts for the VMs to Azure migration.

On-premises physical servers: Server Migration uses a replication appliance for this migration.

2.1.3 Data Migration Assistant:

Data Migration Assistant provides assistance to upgrade to a modern data platform by detecting any compatibility issues that might impact the functionality of the SQL server or Azure SQL database. In simpler words it helps assess SQL Server databases for migration to Azure, also helps detect potential problems blocking the migration, and identifies features that can benefit after migration.

2.1.4 Azure Database Migration Service:

Azure Database Migration Service is a completely managed service designed to allow seamless migration from various Azure database sources with minimal downtime. Azure Database Migration Service integrates with some of the existing tools and services offered by Azure Migrate. This service uses Data Migration Assistant to produce assessment reports that help

provide recommendations for any changes required before performing a migration. It offers on-premises database migration to Azure VMs running SQL servers as well as Azure SQL Databases, and SQL managed instances.

2.1.5 Movere:

Movere is a Software as a Service platform used for assessment and discovery purposes of any IT landscape. Movere automates the process of discovery, scanning, and data collection within any organization.

Movere scans and collects a thorough inventory of an organization's IT environment. It can do this process rapidly at a rate of 1000 servers an hour. Movere also helps identify the location of the assets and how they are used as well as who is in charge of using them and when they are used.

Movere also provides migration recommendations based on the current on-premises footprint of an organization and prepares the assets for migration. As well as Optimizes the applications and infrastructure providing a detailed utilization of data to achieve maximum efficiency and Identifies the security gaps.

2.1.6 Azure Data Box:

Azure Data Box is a cloud solution that helps send data quickly and inexpensively. The data transfer is secure and is carried out by shipping a Data Box storage device, each of these storage devices has a maximum storage capacity of 80 TB and is transported to the data center through a regional carrier. Azure Data Box helps moving media libraries from offline tapes into Azure, creating an online media library, Large amount of data generated periodically and needs to move to Azure. Azure Data Box also helps to export the data in cases such as Disaster recovery as well as Security requirements.

2.2 Azure Migration Process

There are a few stages of the Azure migration process recommended by Microsoft which are mentioned below

2.2.1 Assess

An organization should take important decisions before migrating its assets, a migration plan must be discussed with all relevant stakeholders, and factors like TCO must be taken into consideration. An organization must also evaluate all its assets such as applications to recognize whether they are suitable for a cloud environment and if not then what measures must be taken to allow them to run in that said cloud environment. Azure tools can be used to assess applications for migration and get automated recommendations regarding every asset. There are a few key considerations for the assessment stage, which are listed down below:

Networking: Virtual Networks should be assessed to maintain the same stability and performance, it has in the on-premises data center.

Storage: Storage services must be reviewed as they will help select a solution suitable for the organization's environment and will result in the cost of the storage as well.

2.2.2 Migrate

An organization must select an Azure migration strategy out of the four main approaches, once decided on the approach, it'll be easy to identify the tools and technologies that will help the migration process. Once that is in order, Start small by moving applications and workloads that are at minimal risk or complexity. Microsoft recommends running a test migration in Azure Migrate, before performing a full-scale migration.

The four strategies are as follows:

Rehost: This strategy approach involves moving applications from the on-premises environment to Azure without changing the underlying application. This is often referred to as lift-shift migration.

This strategy provides smaller risks of disintegrating the application and is an easier and faster migration. However, these applications might not use the cloud resources efficiently.

Refactor: This strategy approach involves moving applications from the on-premises environment to Azure, but this time changing applications design a bit. This allows you to leverage various services on Azure including Azure App Service and Azure Logic Apps.

This strategy provides fast and easy, but with improved infrastructure. However, cannot help with making major architectural changes such as splitting applications into microservices, etc.

Rearchitect: This strategy approach involves changing the codebase of the application to integrate it in the cloud, this can be done for applications that need high agility and scalability in the cloud.

This strategy allows creating scalable, easily deployed, and resilient applications that can run on Azure. However, it can be a complex and expensive migration technique with high risks of faults.

Rebuild: This strategy approach involves the rebuilding of an application completely using Azure Platform as a Service capabilities.

This strategy is inexpensive and avoids the complexity of software licensing. However, the apps built will not typically have the same level of functionality as a custom-built app.

2.2.3 Optimize

After an application is successfully deployed on Azure and is working as expected, it should be monitored regularly to observe the ways to improve it. There are a few key considerations for the optimization stage, which are listed down below:

Monitoring the cost using Azure Cost Management and analyzing how it can be optimized with more efficiency and accuracy.

Monitor the performance to ensure that the migration is providing the same performance as it was on-premises.

2.2.4 Secure and Manage

Securing the data and application is very important on the cloud, Azure provides Secure data protection and monitoring options. Like every other process there are a few key considerations for this stage, which are listed down below:

Security: Azure Security Center offers effective cloud security and management as well as advanced threat protection. It is important to test to ensure whether the security measures work and respond to any faults and incidents.

Data Protection: Backup and Disaster Recovery keeps the data secure from any potential threats avoiding total loss of data and causing any business disruption. Azure Backup and Disaster Recovery services help with backup, encryption, and data recovery.

Monitoring: Azure Monitor provides easy monitoring and regular health checks of the data, applications, and the overall infrastructure on the cloud whilst providing the insights and analytics to help make the environment more fault-tolerant.

3. Architectural Components Of Migration in Azure

3.1 Agentless migration:

Agentless migration does not require any software agent to be deployed on the source VMS or Servers. Agentless migration orchestrates the replication by integrating the functionality provided by the virtualization provider.

Azure Migration: Server Migration tool provides replication agentless for Hyper-V VMs, with the help of a migration workflow that's optimized for Hyper-V and VMware VMs running on Windows or Linux.

Agentless replication option uses mechanisms offered by the virtual provider. According to the mechanism, In the case of VMware machines, VMware snapshots and VMware changed block tracking technology is used to replicate the data from VM disks. Whereas, In the case of Hyper-V VMs the mechanism uses VM snapshots and the change tracking capability of the Hyper-V replica to replicate the data from VM disks.

3.2 Agent-based migration:

Agent-based migration requires an installation of Azure Migrate software agents on the source VMs or Servers to perform the migration. This migration option does not rely on any virtualization platform for replication. Agent-based migration can be used to migrate VM ware VMs, Hyper-V VMS, physical servers, VMs running on other cloud platforms such as AWS and GCP. Azure Migration: Server Migration tool provides agent-based replication, this replication process uses an architecture where the agent relays replication data to an assigned replication server known as a replication appliance. A Replication appliance is an on-premises appliance that acts as a bridge between the Server Migration tool and the on-premises environment. A Replication appliance locates the on-premises inventory which can help the Server migration tool orchestrate the replication and migration process. A Mobility service agent is also an important component of agent-based migration in Azure. The mobility service agent is installed on the machine that is to be replicated and migrated, it sends the replication data from these machines to the Process server.

The Replication appliance consists of two components:

Configuration Server: Helps connect to Server migration tool and synchronize the replication

Process Server: helps handle data replication. It receives the machine data, encrypts, and compresses it before sending it to Azure. Below is the comparison between Agentless and Agent-based migration in process of Azure Migration deployment steps

Tasks	Details	Agentless	Agent-based
Deploying the Azure Migrate appliance	An appliance used to discover and assess machines and migrate machines	Required	Not Required
Add the Server Migration tool	An Azure Migrate server migration tool is to be added to the Azure migrate project	Required	Required
Install the Mobility Service in the VM	The mobility service agent is to be installed on each VM to replicate	Not Required	Required
Deploying the replication appliance	An appliance used to locate the on-	Not Required	Required

	premises inventory to help migrate machines		
Enable VM replication	Configuring replication settings and selecting VM replication	Required	Required
Run a Migration test	Running a test migration to make sure the process goes as expected	Required	Required
Run a Full Migration	Migrating the VMs	Required	Required

4. Azure Migration Challenges

Migrating an environment to a high-performance Cloud solution promises to transform every process in the organization. Hence, it needs to have reliable backup storage options, disaster recovery solutions, high availability, and scalability and Azure provides these. However, there still a few challenges that exist and can be overcome with Azure

4.1 The Paradigm Shift

A primary challenge that arises during the migration in Azure or any cloud is becoming familiar with the new interface, and with that comes misunderstanding the differences between applications hosted on the cloud and those over traditional local deployments. Azure offers unique concepts, So before starting the migration process, an organization should train teams with Azure attributes to prepare them.

4.2 Provisioning sufficient Local Bandwidth

Bandwidth provisioning is overlooked while migrating to an IaaS platform such as Azure. Ensuring the appropriate and sufficient bandwidth is of high importance, especially when using a Hybrid Cloud solution. The traffic which ran over high-speed, low-latency LAN will now run over WAN and this should be considered.

4.3 Migration Downtime

When migrating downtime is unavoidable, but planning out a systematic step-by-step migration can reduce the downtime with minimal impact.

4.4 Dealing with underlying Dependencies

Almost all applications in an environment are interdependent. Hence, while migrating applications to Azure dependencies must be taken into consideration. Some of these

connection configurations might become invalidated while performing a migration. Therefore, proper planning is required to determine these problems even arise.

Even though migration to Azure is an easy task, dealing with these challenges before performing a Migration will ensure smooth use of migration in Azure in the future.

5.Conclusion

Cloud computing should be considered as a business innovation catalyst that offers opportunities for business process integration, reengineering, and leveraging the organization's assets. Microsoft Azure is a global as well as a local cloud computing solution, allowing it the flexibility to run on an individual as well as on an organizational level with the same efficiency. Azure migrate provides multiple migration services and tools to assess and migrate resources providing ease to the whole process. That being said, migrating on Azure is an uncomplicated process but a time-consuming one, with a planned execution of migration on Azure, will result in no migration errors, security failures, or loss of data. However, few challenges need to be taken into consideration before performing the migration to ensure a smooth computing environment on Azure.

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