WHITEPAPER

Migration into the Cloud

Useful Strategies for the Best Results

DATA DYNAMICS

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EXECUTIVE SUMMARY

Data Dynamics has worked with various customers from diverse industries to accelerate their d igital journeys. With more than a decade of experience, we have seen the Cloud revolutionize the IT industry. The Cloud is being widely adopted for i ts financial bene fit s and its ability to help organizati ons quickly and effici ently adopt newer technologies and transform their business compared to tra ditional IT architectures. A ligning organizational business goals to market needs and scaling up e xisting technologies is not always easy. And finding the right strategy and partner is one of m any decisi ons companies must make. Th e first and most difficul t step in that journey is migrating on-premises data into the Cloud. Having worked with some of the fortune 500 companies for migrating their dat a to the Cloud, we have created this white paper t hat compiles all the factors that companies need to consi der as they move their data to the cloud.

INTRODUCTION: THE CL OUD AND DATA MIGRATION

Enterprises across all industries and geographies are moving to the Cloud to reap financial, operational, and technology bene fit s. Cloud strategy for each enterprise could vary accor ding to their business goals and digital strategy. Mos t of them adopt the Cloud for improvi ng efficiency, performance, and ag ility in the sys tem. At the same time, others are focused on innovation and technological expansions. This top ic cou ld fill volumes, but we can summarize it with this SW OT analysis approach:

Strengths	Weakne ss
▪ Extremely fast implementat ion Wide ▪ variety of solutions Expense vs. ▪ Capital ▪ Predictable costs once established	▪ Complexity of integration Requires ▪ training of resources High Bandwidth n ▪ eeded Legacy Systems compatibility ▪ Lack of billing understanding
Opportunity	**Threats**
▪ Respond to business change ▪ New tech with less risk ▪ Save Money/tiering/lifecycle Reduce ▪ Corporate Physical Footprint Data ▪ Reorg	▪ Cost overruns ▪ Consistent Methodology ▪ PII Data Exposure ▪ Less downtime means higher billing

As wit h every technological change, the IT ecosy stem demands change. There will be changes from the purchase process to the deallocation and retirement of storage and compute. This is an opportunity for good change, especia lly in data organ ization and rational ization. A major component of moving to the Cloud is migrating the data. Just as important can be the evaluation of un structured data file assets. Data organ ization and rationalization shou ld be considered in the move. Que stions frequently asked by the busine ss might be:

- Can I use tiering? If so, what levels are availab le, and how do we imp lement that?
- Why do I need to move eve rything?
    - I don't want to move certain data; how can w e filter that?
    - What about old data? Projec t or employee data.

- Are files with content that can't move due to regulations?

- Can I Combine or split directories?

If you don't move your data on a regular basis, you may not know the list of questions or the requirements to be successful.

FEATURES VS. GOALS

Of course, the goal is to get into the Cloud as quickly as possible. It would help if you also considered what you move and the corresponding tier (i.e., cost). Security, access, and compatibility are also key considerations. Let's see what features and approaches you need to consider before making a move.

STORAGE NATIVE MIGRATION

These are tools like SyncIQ from Dell and Snapmirror from NetApp. The great thing about these is their ability only to move the blocks that have changed. A ten thousand block file might only have three blocks changed, and the replication will only impact those.

Additionally, the files are an exact copy in both data and security. The limitations are that the source and target must be of the storage type as well as they must be offered in the target Cloud. This may not be possible in all cases, especially when choosing lower performance tiers.

COMMAND-LINE & HANDWRITTEN TOOLS

We at Data Dynamics have seen many attempts at using command l ines and script s to move data through the years. The numbers from the field are not good on the success of large projects. The number varies from publication to publicatio n. Headlines like "Wh y do 70% of cloud migratio ns fail?" and "83 % of data migrations fail or exceed their budg et" are out. We have personall y helped customers who are stuc k in their migrations. One thing is clear, if you're migrating more th an 10TB, you don't want to do it by hand. Scrip ts are erro r-prone, hard to track, and logging can be inconsistent.

Tools include Robocopy, Rsync, and several others. There are also some free tools from vendors, but they are only good for sma ll migrations. Care must be taken to double-check the data status when it lands. We have seen cases where the data made it, but the created date became the date of the copy .

Example:

- Created 3-sep-2021 11:13am
- Modified 2-aug-2017 10:49pm
- Accessed 4-sep-2021 10:43am

According to us, this is corruptio n. What happens when it's time to age t hat file out? I'm not saying the y all fa il and have pro blems, but again, if you'r e migratin g large amounts of data choosi ng one of the pai d-for migration platforms may be a better fit .

DATA MANAGEMENT PLAT FORMS

Cloud migration can add complex ities if not p lanned wel l to ensure timelines s, cost-effectivenes s, and security. Multiple factors need t o be taken i nto considerati on before strategizing a cl oud plant. One of whic h is a selection of the rig ht data management platform. Dat a Management platforms c an do more than migrate data from poi nt A to point B. Choosing the rig ht one can be a critical part of your journe y to the Cl oud. The most common bene fit s of data manageme nt platforms leveraged b y enterprises include:

- Centralized Control
- One Interface
- Most do multiple protocols
- Centralized logging
- Many have multiple options for customizing the migration

There are several data management platforms in the market today, and the process of selecting the right partner can be a daunting task. By mapping requiremen ts with the busine ss objectives and te sting, one can easily choose if the platform mee ts these needs. To check the vendor lock-in clause is important to ensure the flexibility of testing the solution before making the enterprise-wide transformation.

To deliver ma ximum flexibility to organizations in their journey to the cloud, Data Dynamics' uni fied unstructured data management platform delivers po licy-driven data management witho ut vendor lock-in. This platform tightly integrates our unique solutions to address an organization's need for data mobi lity, analytics, security, and comp liance. Read more about the platform here.

WHAT TO LOOK FOR

Some of the key points to consider that should be available on the platform and there should be no need to go to the Storage management interface for these are below:

1. Assessment capabilities – understanding the environment is the key to planning
    a. Ability to report on Shares and Exports
        i. This gives the admins the capability to create reports and plan the move forward
    b. Ability to perform baselining.
        i. Admins should be able to see what's changed week over week.
        ii. Should report on multiple items, not only shares or exports, but also volumes, and management setup
    c. Assess files and folders and their metadata
        i. Scan Shares and apply tags
        ii. Analyze scans grouped by tag or individual scans.
        iii. Standard graph reports
            1. Number/size by last access time
            2. The number of files by size range
            3. Number/size by create date
            4. Graph of file type count/size
            5. Top owners
            6. Percent of files from the query
    d. Each analysis can query any aspect or combination of the file metadata. E.g., owner modified time,
    e. Each analysis can be output to a CSV file and generates graphs mentioned
    f. Analyzations can be put in manually or by restful APIs.
    g. Scans can be scheduled.

2. Automation and customization
   The migration policies should be able to be scheduled at a minimum. Several other areas that you should look for include:
    a. Advanced scheduling. Have multiple schedules by minute, hour, day, etc.
    b. Ability to limit the time of replication. This can be critical if you are migrating a loaded system or network. E.g., Limit the replication to 3 hours.
    c. Filtering either by inclusion or exclusion of items. Filtering by last access or modified can help reduce the amount of data you write to the Cloud
    d. Configure security
        i. By mapping SIDs. This can be critical in mergers or changing ownership for the cloud destination
        ii. Eliminating security. It sounds scary, but many people create a different security scheme and use inheritance to clean up their data.
        iii. Remapping bit settings

e. Batch files. You should be able to have custom batch files that can be created generically and understand the parameters of the migration policy (e.g., Source and Target)

f. Differential Replication that can replicate the portions of files that have changed. This lowers the Bandwidth needed to keep the replication going once the baseline is done.

3. Data Continuity
   Providing proof of the data arriving is important when you first get started. Most of my customers stop worrying when they see Storage X run and deliver 100% of their files successfully.

   a. The product should have settings to do an md5 hash on the files to make 100% sure they arrive.

   b. A listing of all files and what we moved should be available.

   c. File count/folder count and sizing of source and target.

4. Scalability
   Perhaps the most important ability you need is the ability to scale. If migration takes two years, that's two years of data center costs plus cloud costs. You should be able to add components as needed and remove them when done. I'm working with a large company, deployed worldwide, with multiple data centers. We deploy a single server in small deployments and retire it when done. In a larger environment, we can scale up so we can move a Petabyte a month.

At Data Dynamics, we have ensured all these key features while designing the StorageX platform. Read more about StorageX here. Further Data Dynamics recently partnered with Microsoft to accelerate cloud adoption with Azure File Migration Program at zero license cost of migrations into Azure! Let's dig deeper into Azure File Migration Program further in this volume.

AZURE FILE MIGRATION PROGRAM

File-heavy workloads are often stored on-premises, and moving data between disparate storage platforms is difficult. Microsoft is announcing the Azure File Migration program to address this need and reduce the time, effort, and risk involved in the mass migration of file data – Microsoft is announcing the Azure File Migration program.

Microsoft has partnered with Data Dynamics to bring their best-of-breed file migration solutions to Azure customers and partners at no cost through the Azure File Migration program. These tools make it possible to migrate tens of terabytes to petabytes of files with distributed copy engines, centralized control, and automated processes. No need for scripting, babysitting processes, or difficult troubleshooting.

Engaging in the Azure File Migration program is easy. Simply click here, fill out the registration form, and you will be contacted by the ISV, who will guide you through the fundamentals to get you started. This program is helping their customers in simplifying, customizing, and accelerating their digital cloud transformation journey.

Here's a detailed industry-specific application of how Azure is helping businesses reap significant business benefits. In this whitepaper, we have focussed on three industries that have witnessed tremendous transformation with Azure - Finance, Energy, and Healthcare.

AZURE FOR FINANCE

Microsoft Azure has com e to the rescue of ever y fi nancial enterprise to ov ercome challenges , give a technological edge, and transform the financials busine sses to a ne w level. With Micros oft Azure's intelligent sales processes, financial enterprises can improve c lient relationships and boos t sales b y acquiring and maintaining customers at scale. Using machin e learning and predictive analytics to enhance the banking customers ' experience a ssists financial enterprises in growing and different iating their business. Let's explore in what ways does Microsoft Azure enable intelligent banking, modernize trading, and personalize insurance systems:

1. Providing differentiated experiences: As Microsoft Azure and i ts partners like Data Dynamics integrate disparate data sources, they can obtain a 360-degree view of the customer and manage customer experience acro ss all channels. Provide s deep insight into each client intera ction to engage t hem on their preferred channel and manage s service e xpeditions across channels using sentimental analysis to reduce churn and ti me to resoluti on. It recognizes key patterns and recommends actions at the right time and via the appropriate channel based on those pa tterns in real-time.
2. Risk management across the enterprise: Azure Cloud empowers companie s to adapt to rapi dly changing requirements. It provide s the analytics and collaboration capa bilities to identify trends and a seamless framework for risk management proce sses. Azure offers data sourc ing, visualization, and reporting through i ts connections to multiple a pplications. This give s risk management teams a complete picture of risks. It prov ides insight, modeling, and regulatory reporting to improve risk management through scalable compute and analytics.
3. Streamline data management and optimize costs: Utilizing Azure's technologies and strategies, data ingestion, processing, archiving, and deletion can be optimized. With Azure, data is inge sted easily and stored in various data store s depending on i ts type, structure, and other factors. Third-party databases are available in ad dition to SQL Server and SQL Azure.
4. Modernize the core system and payments: Microsoft Azure he lps modernize paymen ts and core systems to reduce co sts and accelerate new product development to meet customer needs more quickly.
5. Streamline security and compliance: Azure offers the broadest com pliance coverage of any cloud provider, along with the latest security innovations. The approach to regulatory comp liance is sim plified with a dedicated program for financial services comp liance. Azure suppor ts the right to audit, transparency in operations, automated audi ts, and self-reporting.

AZURE FOR HEALTHCARE

The Healthcare industry is seeing an accelerated transformation, especia lly after the outbreak of COVID-19. Keen observ ers in the industry are a catalyst by recommending ideas to impro ve the syst em, such as care access, critical care, the safety of the patients and caregivers, and more. Microsoft Azure is working with healthcare customers along with the partners like Data Dynamics to set a course for recovery and resi liency in an ever-changing environment. Let's explore the ways in which Microsoft A zure is accelerating healthcare transformation.

1. Help protect health information: Azure helps ensure the protection of sensitive data to enhance the security and privacy of the customers. It also helps in managing the evolving comp liance regulations while improving data governance.
2. Improve clinical and operational insights: Azure integrates the data acro ss various sy stems to provide one single source of truth that is leveraged to extra ct insights for pre dicting risks and improving patient care, qua lity assurance, and operational ef ficiencies.
3. Enhance patient and provider engagement: Microsoft Azure ensures the secure flow of

data through a ll the data points, virtual and in-person, that helps elevate the patient's experience, easy diagnostics, and improve health conditions.

4. Accelerate research and development innovati on: Azure helps in drivin g faster advancemen ts by modernizing discovery, development, and quality sy stem process to support rap id modeling, improve clinical trial manage ment and accelerate innovation.
5. Enhance collaboration: Azure accelerate s the adoption of digital technologie s that drive co llaboration among healthcare team members for secured coordination and simp lified work flow management.

AZURE FILE MIGRATION FOR ENERGY

Azure tools and services are leveraged globally by companies from various industries to buil d custom solutions that aid their digital transformation journey. Micros oft Azure helps optimize the customer experience, modernize the work flows, improve operational e fficiencies, and reduce cos ts. Azure for the Energ y industry helps build customized and innovative cloud solutions to tackle their digital cha llenges and prepare for the future. Let's dig deeper into the topic and see ho w Microsoft Azure is he lping the Energy industry with this transformation:

1. High-performance computing (HPC): Azure HPC cloud solution is a fully managed sy stem that helps the customer in the Energy segment visualize reservoir simulations to increase drilling hit rates and form making informed decisions.
2. Advanced analytics for be tter decision making: Azure cloud analytics solution helps improve time to insights for better decision-m aking and reservoir produ ction using IoT drilling sensors and advanced analytics.
3. Predictive maintenance: Azure IoT solution accelerators help manage and extend the a sset life cycles with the help of predictive analytics that allows to detect future downtimes and plan maintenance activities accordingly.
4. Digital model of the environment: Azure digital twins solution helps in creating a comprehensive digital model of the entire environment for extra cting better insights to drive customer experience, optimize costs, and improve ef ficiencies.

AZURE FOR MANUFACTUR ING

Digital footprints are multiplying rapidly as the manufacturing sector adop ts newer tech nologies like IoT, AI, and ML in the supply chain, manufacturing operations, packaging and distribution, logistics manage ment, and many more. The fundament al issue these manufacturing comp anies are dealing with is the need for clear insight into their data footprints to safeguard, govern, and use that data as an asset to make strategic business decisions. In addition to addressing these issues, Microsoft Azure is colla borating with data management enterprises and partners like Data Dynamics to offer a comprehensive data management tool that will aid in the modernization of their data and the extraction of value from it.

A fourth industrial revolution is here thanks to Microsoft Azure's manufacturing solutions th at enable the following:

- Build supply networks that are more pro fitable an d resi lient: Through intelligent pla nning and execution, demand sensing, and trace ability, Microsoft Azure helps to improve end-to-end supply chain visibility, agility, and pro fitability. By understanding what d ata manufacturin g enterprises have across their infrastructure and managing this data comprehensively, these enterprises can create a data-driven culture. Data-driven su pply cha in

management uses data strategically to predict real-time production and inventory changes. The result is faster and more intelligent decision-making.

2. Digitally empowering manufacturing operations: The Azure Digital Twins platform lets enterprises digitally represent real-world things, places, processes, and people through the Internet of Things (IoT). This way, companies can create breakthrough customer experiences, optimize operations and costs, and drive better product development.

3. Build futuristic agile factories: Microsoft Azure offers continuous asset discovery, vulnerability management, and threat detection to assist manufacturing organizations in protecting industrial IoT and OT environments. It gives operators a 360-degree picture of the entire plant's systems and workflow, enabling them to assess issues and improve workflow efficiency. To increase throughput, quality, and delivery while lowering costs, Microsoft Azure also aids in developing agile factories and smart manufacturing processes using predictive technologies, IoT, and mixed reality.

4. Accelerate time to value in a comprehensive and scalable manner: Data generated by smart factories can reach 1 petabyte per day. This data offers opportunities for creating novel services and business models. Most companies are not utilizing 1% of their data, much less developing effective business models based on it. Enterprises require Microsoft Azure's capabilities that enable intelligence at the edge and in the cloud to fully comprehend any manufacturing enterprise data estate and generate its desired results.

AZURE FILE MIGRATION PROGRAM AND DATA DYNAMICS' STORAGEX

While Azure Migrate hub offers various tools and services from Microsoft and ISV partners to automate and simplify database and server migration, and the current offerings do not address unstructured file data. Hence, Microsoft Azure has partnered with Data Dynamics to bring onboard the best data migration solution to their customers. Azure is sponsoring the use of Data Dynamics ' StorageX Migrations to migrate data into Azure.

StorageX is Data Dynamics ' award-winning unstructured data management solution that delivers policy-based data management with no vendor lock-in. It uses an automated, scalable, and policy-based engine to ensure intelligent and swift petabyte-scale migrations into Azure at ZERO license cost. It comes with robust security features such as automated access control and file security management. Organizations can now migrate their unstructured files, Hadoop, and object storage data into Azure at zero additional cost to the customer and no separate migration licensing. Having migrated over 400 petabytes of data encompassing hundreds of trillions of files without a single byte of data lost, Storage is trusted by several Fortune 500 enterprises. Here are 11 reasons why.

StorageX Vs. Traditional Migration Tools

A comparative study

Parameters	Conventional Migration	StorageX Migration
Petabyte Scalability Across Heterogeneous Environments StorageX is built for petabyte-scale as well as smaller environments, while most of the solutions available in the market are only suited for smaller environments of 100TB or less. The Platform is purpose-built for the modern enterprise with the ability to scale out to meet performance needs and have the flexibility to adapt to complex hybrid, multi-cloud, and legacy environments.	○	●
Versatile Azure Support Ability to create policies intelligently to move certain data into different cloud storage tiers including Azure Files (Premium, TX Optimized, Hot, Cool), Azure NetApp Files (Ultra, Premium, Standard), Azure Blob (Premium, Hot, Cool)	○	●
Single-Software Data Management It is a more robust and fully-featured platform, where each solution is architected from inception to specifically meet a data challenge for data management and governance personas.	○	●
Zero Cost Migration into Azure Azure is sponsoring the use of StorageX to help organization migrate unstructured file and object storage data into Azure at no additional zero license cost of migration*. Customers only need to register their migration project information with Data Dynamics and start the data migration process.	○	●
Data Enrichment using Analytics Along with metadata discovery and tagging, StorageX also helps with data enrichment by providing capabilities to discover, classify and use custom tags. This helps in intelligent data classification and cataloging.	○	●
Automated, Policy-Based Data Migration The platform uses automated, policy based file data migration from heterogeneous storage into Azure storage ensures minimal to no risk with automatic access control and file security management.	○	●
Automated access control and file security management Policy-based and robust file permissions management including preserving, repermissioning, and security reassignments vis SID Mapping.	◐	●
Data Replication Unlike other solutions, StorageX enables migration in phases preserving the original copies and performing baseline and incremental copies to ensure replication of new, locked, or recently modified files on the source to the destination and allows the verification of the migration completion	◐	●
Automated Cutover StorageX namespace management abstracts a physical data storage environment into a logical view used in conjunction with migration policies to automatically update DFS namespace links that reference the old source to the new destination during the cutover phase.	○	●
API Integration StorageX's robust API ecosystem provides unique API based automation and orchestration for process and workflow modernization.	◐	●
Stubless / Always Direct Native Access to Data StorageX delivers a solution where there is nothing in the way of your data. There is No Gateway, No File Virtualization, No Proprietary Namespace, and No Stubs.	○	●

○ No capability ◐ Partial capability ● Full capability

Data Dynamics, a global leader in enterprise data management, stands at the forefront of the industry-wide shift towards Digital Trust & Data Democracy. Trusted by 300+ organizations, including 25% of the Fortune 20, the company is recognized for its commitment to creating a transparent, unified, and empowered data ecosystem. Whether addressing data risk, privacy, sovereignty, optimization, sustainability, or facilitating seamless, policy-driven data migration across hybrid and multi-cloud environments, the company is ushering in a new era where data ownership, control, & actionability reside with the data owners.

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