Design and Development of Security Models of Cloud Data Using Um Migrative

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Abstract

Data Migration is a multi-step process that begins with analyzing old data and culminates in data uploading and reconciliation in new applications. With the rapid growth of data, organizations constantly need to migrate data. Data migration can be a complex process as testing must be done to ensure data quality. Migration also can be very costly if best practices are not followed and hidden costs are not identified in the early stage. On the other hand, many organizations today instead of buying IT equipment (hardware and/or software) and managing it themselves, they prefer to buy services from IT service providers. The number of service providers is increasing dramatically and the cloud is becoming the preferred tool for more cloud storage services. However, as more information and personal data are transferred to the cloud, to social media sites, DropBox, Baidu WangPan, etc., data security and privacy issues are questioned. So, academia and industry circles strive to find an effective way to secure data migration in the cloud. Various resolving methods and encryption techniques have been implemented. In this work, we will try to cover many important points in data migration as Strategy, Challenges, Need, methodology, Categories, Risks, and Uses with Cloud computing.

Keywords: Cloud, Organizations, Migration, Data Quality, Advanced Encryption Standard.

1. INTRODUCTION

Migration is a process of moving data from one platform/format to another platform/format [1]. It involves migrating data from an old system to the new system without affecting the active applications and ultimately redirecting all I/O activities to the new device. In simple words, it is the process of fetching data from different source systems into a single target system. Data migration is a multi-step process that begins with an analyzing old data and culminates in the loading and normalizing data in new applications. This process involves scrubbing the legacy data, mapping data from the old system to the new system, designing conversion programs, building and testing the conversion programs that perform the conversion, and matching the converter. Data migration could also refer to as the process of making an exact copy of an organization's current data from one device to another device; preferably without disabling or disabling active applications; then redirect all input/output (I/O) activities to the new device [2]. There are a variety of circumstances that may cause an organization to migrate data, including:

- Server or storage technology replacement or upgrade;
- Server or storage consolidation;
- Relocation of the data center;
- Server or storage equipment maintenance, including workload balancing or other performance-related maintenance.

The above scenarios are fairly routine parts of IT operations in organizations of nearly any size. Data migration, as an essential aspect of legacy systems, modernization projects, has been recognized as a challenging task that can lead to project failure as a whole [3] [4] [5]. Industry survey results [4] reveal that the data migration market is rapidly growing and business companies annually invest billions of dollars in data migration tasks ; however, only 16% of projects successfully complete their data migration tasks (i.e., delivered on time and within budget)—64% of data migration projects failed to deliver on time and 37% were over budget. The main reason for overriding time and budget is the lack of a well-defined methodology that can help deal with the complexity of data migration tasks. In

general, data migration is the process of transferring data from old data sources of an old system to new data sources of the target system, where the old and new systems have different data structures.

Need for Data Migration

In today's world, data migrations for commercial reasons have become common. While replacing the old system is the common cause, some other factors also play an important role in deciding to migrate data to a new environment. Some of them [1]:

- Databases continue to grow exponentially requiring additional storage capacity.
- Businesses are turning to high-end servers.
- To reduce cost and reduce complexity by migrating to consumer and static system.
- Data should be transportable from physical and virtual environments to concepts such as virtualization.
- For clean and accurate consumption data.

The data migration strategy must be designed in an efficient manner so that it enables us to ensure that future purchasing decisions are fully meet for both current and future business and the maximum commercial return on investment.

2. DATA MIGRATION STRATEGY

A well-defined data migration strategy should address the legacy data, mapping data from the old system to the challenges of identifying source data, interacting with continuously changing targets, meeting data quality requirements, creating appropriate project methodologies, and developing general migration expertise [1]. The following are the main considerations and inputs for defining a data migration strategy:

- Strategy to ensure the accuracy and completeness of the migrated data post migration.
- Agile principles that let the logical group of data to be migrated iteratively.
- Plans to address the source data quality challenges faced currently as well as data quality expectations of the target systems.
- Design an integrate migration environment with proper checkpoints, controls and audits in place to allow broken accounts/errors to be identified/reported/resolved and fixed.
- A solution to ensure proper reconciliation at various checkpoints to ensure migration is complete.
- A solution to choose the right tools and technologies to meet the complex nature of migration.
- Must be able to handle high volume data during migration.
- Migration development/testing activities must be separated from legacy and target applications.

In brief, the Data Migration strategy will involve the following key steps during end-to-end data migration:

- Identify the Legacy/source data to be migrated.
- Identification any specific configuration data required from Legacy app.
- Classify the process of migration whether manual or automated.
- Profile the legacy data in detail.
- Identify data cleansing areas.
- Map attributes between Legacy and Target systems.
- Determine the data and map to migrate to the historical data warehouse solution (archive).
- Collect and prepare transformation rules.
- Conduct disinfection prior Migration when required.
- Extract the data.
- Data Transfer along with limited clearance or standardization.
- Data loading.
- Reconcile data.

3. DATA MIGRATION PROBLEMS

These problems included, but were not limited to them [2]:

- Prolonged or unexpected downtime.
- Data corruption, data missing or loss.
- Application performance challenges.
- Technical compatibility challenges.

In order to stop these challenges from affecting business operations, the huge majority of data migration projects are typically organized to occur during off-hours, firstly during weekends. However, this can lead to an increase in migration costs as a result of employees' overtime, and it can negatively affect the morale of IT personnel. Moreover, stopping the real systems, even over the weekend, can be drastic. It affects business operations, especially if there are problems fetching systems return online. In fact, the prospective problems with data migration causing some organizations to delay deploying new technology, or even delay purchasing new technology. These delays can be damaging in and of themselves, because older devices may require more practical maintenance, and their performance is generally less and more prone to failure. Most organizations strive to deploy new technology to eliminate such challenges; therefore, the delay in implementing new technology represents a commercial risk. In addition, delaying deployment of a new storage device that has already been purchased or the leased one increases its actual cost, as the company amortizes the cost of both old and new devices and pays rental fees for both old and new devices. How organizations can reduce the business impacts of data migration-down Time, data loss and cost increase? The best approach is to use a consistent, reliable and reproducible methodology for migrations that includes planning, technology implementation and validation.

4.   DATA MIGRATION PROCESS CHALLENGES

Data migration as a process leaves organizations with many potential concerns and pain points [6]. Below is a brief description of these points.

1) Data Security Concerns

For any business organization, data is the most crucial resource. It may consist of business-centric data along with other related data critical for its existence [3]. Any compromise or threat to its security is a risk that businesses would not want to undertake. The same notion spills into migrating data to the cloud. A small hint suggesting that the clouds not secure will make organizations develop cold feet towards migration. Any cloud infrastructure will comprise of patchworks of open source code, which creates security vulnerabilities. Additionally, public clouds are multi-tenant, and such elements as vulnerabilities or defects of a co-subscriber's code could substantially affect other applications. To tackle this concern, many cloud vendors are performing "on boarding audits" to reassure prospective customers that their level of security is appropriate. Nonetheless, its level of conviction still needs confirmation.

2) Poor Knowledge of Source Data

The existence of poor knowledge of the source data is a general trend already observed over several data migration processes across industries [7]. Issues such as duplicates, spelling errors and erroneous data are always a hindrance to ensuring complete and proper data migration. Often, organizations become complacent and tend to assume that they can configure their data without any complications. However, any mismatch could mean nothing else but the failure of the data migration process.

3) Vendor Management

From the perspective of businesses, the process of data migration requires businesses to trust their vendor [7]. Concerns exist whether technical issues on the vendor's side could affect data security on the cloud. It is therefore imperative that data migration vendors provide SLAs that prioritize the concerns of their clients. Since cloud computing offers a standardized, multi-tenant infrastructure, cloud vendors may not offer the same levels of SLAs as IT managers are accustomed to.

4) Lack of Technical Integration

Data migration often involves various kinds of technologies and data platforms [3]. This lack of parity may lead to failure in data transfer between the multiple phases of data migration—analysis, development, testing, and implementation. Such failures not only cause financial repercussions but also compel businesses to re-engage time in the migration of missing data, leading to a loss of precious man-hours.

5) Cumbersome Data Cleansing Process

Data cleansing refers to the process of altering data intended for migration [7]. The mechanism takes into consideration incomplete data, data relevance, data accuracy and data duplication as factors of validation. It focuses on maximizing data accuracy in a system. Additionally, it uses parsing or other relevant methods to omit syntax errors and typographical errors in records. Despite there being cases where data cleansing leads to increase in response time and hampers efficiency, its significance in a fruitful data migration is second to none.

5. DATA MIGRATION TYPES, CATEGORIES, METHODOLOGY, RISKS AND SOLUTIONS

1. Types of Data Migration

- **Data Base Migration**

When you migrate data from one current database resource to another database resource, the current database is updated to the most recent version. For example: IBM DB2 Database to Oracle Database.

- **Data Center Transfer**

When the data center is moved from one site to another site, we need to migrate the data from the old data center database to the target data center database.

- **Application Migration**

When migrate an application, for example migrating from a local activity server to a cloud or from one cloud domain to another, the underlying data must also be migrated to a new application.

- **Business Process Migration**

When a business process changes due to merger, acquisition, or business improvements, depending on the nature of the changes in business processes, the data must be transferred between a different storage system or app or location.

2. Data Migration Categories

Data migration could be broadly categorized into two major categories [7].

1) Infrastructure Migration

The term "Infrastructure Migration" mentions the process of migrating all layers of a computing platform along with the applications that support business functions. This type of migration is a more complex exercise that has the potential to significantly impact entire IT operations more than other strategies would. For example, an infrastructure migration can include changes to the following [7]:

- Applications that support business functionality.
- Application infrastructure that supports the applications, such as web servers, application servers, middleware and database technology.
- Third-party products provided by ISVs.
- Computing and storage platforms, e.g. SAN or attached storage.
- Network infrastructure.
- Facilities infrastructures, such as power, ventilation, and cooling.
- Management policies.

- ▪ System monitoring and management tools.
- ▪ Locally written scripts to manage applications and data.

2) Application Migration

The term "Application Migration" applies to applications rather than infrastructure. It generally applies to custom-written applications and refers to modifying or normalizing the code of an application. Its objective is to recompile and deploy on a new hardware platform that supports a different operating system (OS). Application migration has an innate association with modifying the code base of an application to allow replication of the functionality provided by Application Programming Interfaces (API) of the existing OS and supporting software products in the new target environment. Application Migration is more of a mechanical effort for making the application compatible with the new environment. It requires the integration of the application with a new development environment, as well as with a new operating system. While source code, scripts and data are shifted, compilers, source code repositories and software tools are replaced by advanced versions that are compatible with the target platform.

3. Data Migration Methodology

As illustrated in Figure 1 data migration methodology could be represented in three phases as follows [2].

1) Plan: IT organizations recognize the critical importance of planning for technology deployment. While the planning amount depends on the size and scope of the migration, the process of planning should totally include [2]:
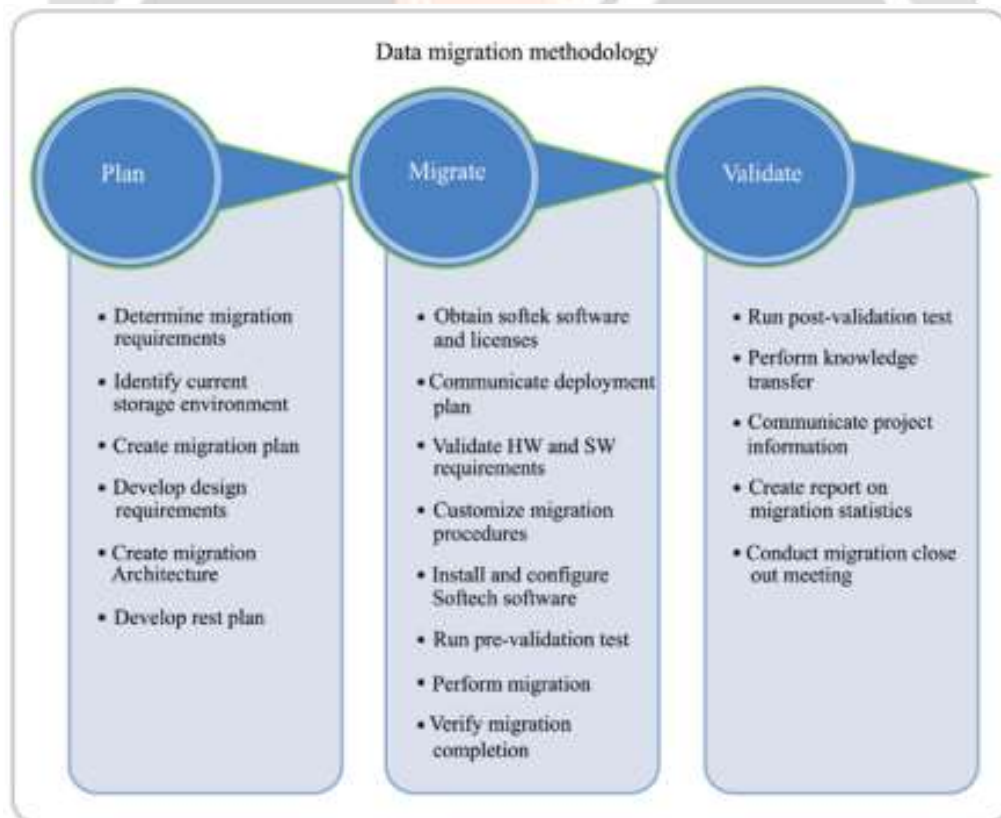
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Figure 1. Migration methodology

During the planning stage, it is required to define the hardware or software required to successfully perform the migration. Design requirements include migration engineering, specific hardware and software requirements, migration procedures, and designation and testing plans. When necessary, the IT organization must also obtain any

software licenses it needs to perform the migration. Consistent migration planning can help determine where potential problems occur and how to avoid them, and IT professionals can help identify mitigation strategies if problems are inevitable. Migration planning can also help you decide which data to migrate first, and whether offline applications are taking too long and whether internal and external audiences will be notified about the migration. Correct migration planning involves more than just the IT staff. Business owners should also include the applications and data they migrate-particularly because the IT organization determines how important a particular application or set of data is to business. When planning a migration, it is important to understand design requirements such as migration/replication requirements, schedule, vendors involved, and hardware configuration. When determining the size of data migrations, there are several key elements to consider such as the number of servers, operating system levels, amount of storage, volume managers, types of databases and applications, network speeds, and server clusters.

2) Migrate: During the migration phase, the IT organization needs to communicate its plans; obtain, setup and design any necessary software; and perform the actual data migration. It is recommended that you run the data validation test before migration, as well as the post-migration validation test. These tests confirm that the data is in the same state after migration as before. The most important part at this stage is clearly the migration itself. As shown above, software technology can simplify this process by improving migration speed, by reducing or eliminating application downtime, and/or by enabling migration during normal business hours, helping the organization get back to work as quickly as possible.

3) Validate: After the migration is complete, the IT organization must compile migration statistics and make a report to discover what worked and what didn't and the benefits learned. The report must be propagating with all members of the migration team. These types of reports are important in building a repeatable and consistent process through continuous process enhancement-based on what worked and fix or change what didn't. Moreover, documenting the migration process can help train employees, and simplify or streamline the next migration, which reduces costs and risks.

6. CLOUD COMPUTING AND ITS IMPACTS ON DATA MIGRATION

Over the past several decades, IT society has been overwhelmed by a new buzzword of "going Cloud" [10]. The basic premise of cloud computing is that consumers (individuals, industry, government, academia and so on) pay for IT services from cloud service providers (CSP). Services offered in cloud computing are generally based on three standard models (Infrastructure-, Platform-, and Software as a Service) defined by the National Institute of Standards and Technology (NIST) [11]. As more cloud-based services available to users, their oceans of data are outsourced in the cloud as well. The cloud becomes, then, the tools of choice for more data storage services.

7. CONCLUSION

Cloud computing is a multi-sharing environment, in which resources are shared. Threats can be happened from anywhere; inside or outside the common environment. Deciding whether to migrate or retain sensitive data in the workspace is one of the most important decisions faced by personal users, as well as small and medium-sized enterprises. We have described throughout this paper a number of key points starting from explaining why we need data migration, its strategy, data migration problems and challenges, data migration phases, when performing data migration and when don't, data migration policy, data migration types, categories, methodology, risks and solutions, cloud computing and its impacts on data migration, solutions to secure cloud, and finally we suggested to overcome the Security and Privacy issues of cloud storage and risks associated with cloud data storage and examining current ways to mitigate data security and privacy threats. The suggested model based on the combination of AES-256, IDAs and SHA-512 consists of encoding and decoding data on premise and guarantees data confidentiality, integrity, availability and leakage. Suggested model consists of encoding operation that includes: AES-256 Encryption to ensure data confidentiality, IDA with Cauchy Reed-Solomon code to break the encrypted data into n slices such that we can recover from m and then SHA-512 Hashing algorithm for signature and decoding operation that includes a verification process to check data slice integrity, IDAs to reconstruct the encrypted data from m slices, and, finally, the decryption process to recover the original data. Suggested model achieves far a greater degree of security and also better performance for small and large data files. Future work, which is already in progress, will take title named (DMig 2) referring to complete searching in the same field data migration because, as it is clear from the title of current paper called (DMig 1) that means first paper in the field of data migration.

8. REFERENCES

[1] Sarmah, S.S. (2018) Data Migration. Science and Technology, 8, 1-10.

[2] Best Practices for Data Migration (2007) Methodologies for Planning, Designing, Migrating and Validating Data Migration. IBM Global Technology Services.

[3] Thalheim, B. and Wang, Q. (2013) Data Migration: A Theoretical Perspective. The Journal of Data Knowledge Engineering, 87, 260-278. https://doi.org/10.1016/j.datak.2012.12.003

[4] Howard, P. and Potter, C. (2007) Data Migration in Global 2000, Research, Forecasts and Survey Results. A Survey Paper by Bloor Research. http://www.bloorresearch.com/research/survey/876/data_migrtaion_survey.html

[5] Hull, R. (1984) Relative Information Capacity of Simple Relational Database Schemata. In: Proceedings of Principles of Database Systems, ACM, New York, 97-109.

[6] (2004) Rapid Application Development (RAD) for Data Migration = White Paper Solutions by Premier International. http://www.premier-international.com/pdf/Applaud_White_Paper.pdf

[7] Alibaba Cloud. Data Migration Methodology. aliyun.com, Alibaba Migration Platform and Related Solutions.

[8] Nordic Backup (2017) 7 Steps to Include in Your Data Migration Plan. https://medium.com/@NordicBackup/7-steps-to-include-in-your-data-migration-pl an-42d571dc01ab

[9] Chellamuthu, P. (2014) Data Migration Challenges and Solution for Successful Implementation.

[10] Sighom, J.R.N., Zhang, P. and You, L. (2017) Security Enhancement for Data Migration in the Cloud. Future Internet, 9, 23. https://doi.org/10.3390/fi9030023

[11] NIST (2017) Cloud Computing Program-29 July 2016: Cloud Computing. https://www.nist.Gov/programs-projects/cloud-computing

[12] Wolfgang, G. (2017) Cost Reduction Remains Chief Reason to Adopt Cloud, Confusion Still Apparent. http://www.tomsitpro.com/articles/cloud_survey-kpmg-tech_adoption-provider-its ecurity,1-803.html