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A man with short, light-colored hair and a beard, wearing a light blue button-down shirt and a patterned tie, is sitting at a desk. He is smiling and looking towards a laptop screen. His hands are resting on the desk near the laptop. The background is a dark office setting with a window showing a grid pattern.

Database Migration to the Cloud

CLOUD • ANALYTICS • DIGITAL • INFRASTRUCTURE • SECURITY

Digital Business is Driving Data to the Cloud

Today's cloud-based business intelligence and predictive model solutions are driving agility, efficiency, and competitive advantage. When combined with the explosion of mobile, social, and online information, every enterprise is now in the business of data. But those who don't unlock the value of information and embrace digital transformation will quickly fall behind.

For those ready to move forward, three themes can guide the transition to a data-centric enterprise. First, unstructured data from social, mobile, IOT, and video is undergoing rapid growth which necessitates highly scalable systems. Second, emerging unstructured data solutions, such as NoSQL, Hadoop, predictive analytics, and in-memory fabrics must be used to capture the promise of big data. And third, new security frameworks are needed to effectively govern the combined universe of unstructured data and database (DB) systems.

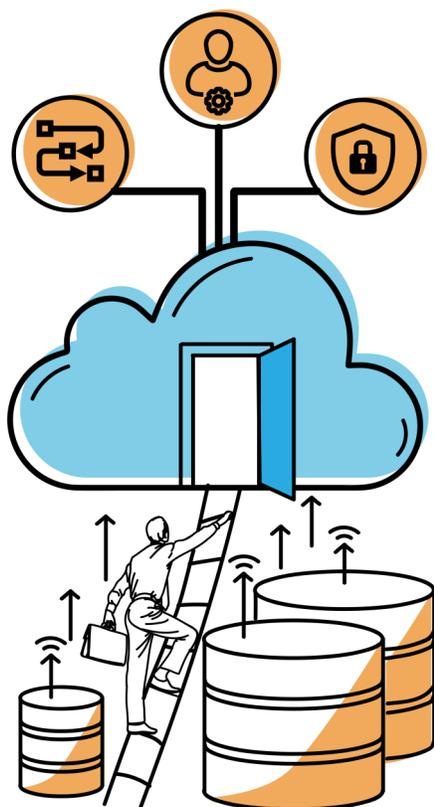
Cloud solutions, in fact, are the foundational technologies across these three themes and enable mobile and social platforms, big data implementations, and modern security frameworks. Thus, leveraging the cloud, in combination with unstructured data, allows companies to make more informed, real-time business decisions and supplement the use of periodic financial results to drive strategy.

Many traditional business applications and relational databases, however, sit outside the cloud, as do various data warehouses. Some of these data stores might benefit from a migration to the cloud on which unstructured data now resides. But transactional data is so foundational to operating success, how and when should enterprises make this move with zero interruption to the business? This Point of View paper presents a perspective on the benefits, considerations, and options for database migration to the cloud, and how to integrate this move with broader cloud strategies and execution.

“
To remain competitive, firms absolutely must mine insights from vast and diverse data sets.”¹
 - Forrester Research, 2016
 ”



¹ TechRadar™: Big Data, Q1 2016, 3/10/16, www.forrester.com/report/TechRadar+Big+Data+Q1+2016/-/E-RES121460



Benefits of Moving to the cloud

- ▶ *Ease of administration*
- ▶ *Higher scalability and availability*
- ▶ *Enhanced security*
- ▶ *Improved business agility*

The Benefits of Database Migration to the Cloud

Big data analysis of unstructured information in the cloud is driving success for upstarts and industry leaders across the globe. The Harvard Public School of Health uses vast DNA sequencing data sets to measure specific genetic markers in a healthy population. And coffee maker Nespresso has gained increased profits and enhanced customer experience using big data to better understand consumer preferences and tastes.

Highly guarded structured data, however, more often resides on premises, separate from the volumes of cloud-based satellite images, sports videos, and grocery shopping patterns. Yet, traditional relational databases (RDB) such as Oracle Database 12c, Microsoft SQL Server, and IBM DB2 can benefit from a move to the cloud in the following ways.

Simplified administration – Easier cloud RDB management can drive operational efficiencies as upgrades, and 24x7 maintenance are handled by cloud providers. In cloud RDBs, leading-edge tools are more accessible, version control is minimized, and add-on services (i.e. backup and disaster recovery) improve productivity. These benefits allow companies to refocus reduced database administration (DBA) hours on business applications and digital strategies.

Lower cost – Public cloud-based RDBs, such as Amazon RDS and Azure SQL Database, help shift expenses from upfront hardware, software, and support costs to economical pay-per-use operating fees, often with no long-term commitments. Furthermore, reduced DBA expenses and free open source tools can offset cloud service fees.

Higher scalability and availability – Many cloud RDB services offer highly scalable compute and storage resources with minimal capacity constraints as well as quick and low cost DevTest replication. Additionally, industry-leading availability is made possible by automated backups, periodic snapshots, host replacements, and synchronous replication across availability zones (AZs).

Advanced security – Astutely aware of clients' security concerns, cloud-based RDBs are built with strong threat prevention including robust access control, isolated VM instances, IPsec VPN connections, and encryption at rest and in transit. Many cloud RDBs also offer industry compliance features, such as PCI governance, that evolve with changing business regulation.

Improved business agility – Cloud-based RDBs open doors to faster innovation, improved staff and partner access, and quicker time-to-market, often provisioned in minutes verses weeks for on-premises solutions. Furthermore, reduced vendor lock-in increases access to advanced tools and best practices.

Use Case Examples

The following are strong use cases for cloud-based RDBs.

Web & mobile applications – that need high throughput, massive

Database Migration Considerations and Options

The important first step of any RDB migration to the cloud is a close look at the considerations and options for each on-premises database. This includes careful evaluation of the **source** database and the many **target** database options. Whether source and target are the same (homogeneous) or a different solution (heterogeneous), the migration to the cloud project steps and costs must be documented.

Database Migration Considerations

Source DB architecture – Deployment age and supportability both impact a DB's ability to handle future business requirements as do unstable hardware and software architectures. For these DBs that are ready for retirement, a heterogeneous migration to the cloud can quickly remove complexity and improve performance. If a homogeneous migration is preferred, a target database service provider that meets all requirements must be identified.

Scalability, availability, and performance – Cloud deployment scalability presents few constraints as most can grow to meet large RDB needs. Cloud locations and WAN connectivity, however, could impact RDB performance depending on the type of data and user profiles. In all cases, source DB requirements must completely match with target cloud DB SLAs including metrics for planned maintenance, backups, and recovery RTOs and RPOs.

Security and governance – Some data governance models can mandate rigid storage locations. Others specify exact security requirements. Business strategy and risk factors will also guide the feasibility of a source DB's migration to specific target clouds. To meet these requirements, it's critical to scope the target cloud DB's security features such as multi-AZs, database snapshots, role base access, and automated backup and host replacements.

Real-time or near real-time – In some cases, it may be more prudent to replicate source data on a cloud-based enterprise data warehouse (EDW) in near real-time versus conducting a full DB migration. Popular highly scalable EDWs in the cloud include Amazon Redshift, Azure SQL Data Warehouse, Cloudera Hadoop as a Service, Oracle Hyperion in the Cloud, and Teradata Managed Cloud. All five can handle large-scale business intelligence and data analytics needs.

Business goals and migration cost – Moving data to the cloud can achieve greater accessibility to staff, partners, and customers, and enable big data analysis to meet specific business goals. However, benefits must exceed costs. Before any DB cloud migration, a comprehensive 'rent vs. buy' model, including source, target and migration costs, is the best way to understand the migration TCO and ROI.

“Amazon RDS provides cost-efficient and resizable capacity while managing time-consuming administration with six DB options.”²

- Amazon Aurora, PostgreSQL, MySQL, MariaDB, Oracle, & Microsoft SQL Server

² <https://aws.amazon.com/rds/>

Database Migration Options

Homo - or heterogeneous migration – The first task is to assess the feasibility and benefits of a heterogeneous migration versus all possible heterogeneous alternatives, for which you should create a list. Then use the above considerations to rank the options.

Depending on the source database, target options may include established architectures from Oracle, Microsoft, and IBM, or newer technologies such as Hadoop, Hortonworks, and MongoDB. Some common migrations include:

- IBM DB2 to Apache Cassandra
- Microsoft SQL Server to MongoDB
- Microsoft SQL Server or Oracle 12c to IBM Netezza Analytics
- MySQL or SAP Adaptive Server Enterprise to Microsoft SQL Server
- Oracle Hyperion to Teradata Active EDW
- Teradata Active EDW to Hortonworks Cloud Solutions

Service providers – The list of global service providers has narrowed recently to include: Amazon Web Services (AWS), Google Cloud Platform, IBM Cloud Services, Microsoft Azure, and Oracle Cloud. However, almost every regional telecommunications provider offers cloud services.

Sizing and migration tools – If sizing and migration tools offered by the chosen cloud service provider are not sufficient, a third party tool such as Trianz DataVision+, an end-to-end solution that enables consistent migration and post migration testing, should be acquired. Additionally, thoroughly cleaning the source data before a migration will reduce the migration time and cost, and subsequent service fees.

Migration services – Select cloud providers and third party consultants offer migration services as an alternative to an internally staffed migration. AWS Data Migration Services and Trianz Database Migration Services are two examples. Choosing the right provider can significantly minimize database and application downtime.

To ensure success and minimal downtime, established DB migration providers employ rigid processes including the following steps:

- Source DB assessment
- Migration framework
- Project management
- Target DB design
- Migration implementation
- Post migration testing



Considerations for DB Migration:

- ▶ *Source DB architecture*
- ▶ *Scalability, availability and performance*
- ▶ *Security and governance*
- ▶ *Real-time or near real-time Business goals and migration cost.*

How Trianz Can Help

Trianz' database migration proficiency stems from years of experience and innovation building unique cloud models to address complex migration challenges. Trianz' structured approach and frameworks, combined with Trianz Datavision+, a testing tool developed in-house to test the data migration at a column level, strengthen its end-to-end migration service. The Datavision+ tool, beneficially, reduces migration testing efforts by at least 40 percent, removes migration complexity, and helps achieve operational success with minimal downtime.

The Trianz' Database Migration Service covers a comprehensive set of pre- and post-migration activities for homo- and heterogeneous environments. To achieve client success, Trianz' certified consultants maintain expertise in on-premises RDBs such as Microsoft SQL Server, My SQL, and Oracle 12c, as well as EDW and cloud-based unstructured data technologies. Trianz also offers post migration DBA services for IBM Oracle, SAP, and some custom DB solutions.

Furthermore, by passing a capability audit and demonstrating a record of client success, Trianz has achieved the AWS Service Delivery Partner status for the AWS Database Migration Service within the Amazon Partner Network (APN).

Moreover, with the ability to frame a database migration to the cloud within a larger cloud and business strategy, Trianz can help increase productivity, reduce downtime, and achieve scale, across technologies, industries, and geographies.

In summary, through a holistic approach that combines business and technology expertise, Trianz can provide support for all stages of a database migration to the cloud, helping clients envision, architect, deploy, and operate data stores in public, private, and hybrid-cloud environments.

As an AWS Service Delivery Partner Trianz helps clients envision, architect, deploy, and operate data stores in public, private, and hybrid-cloud environments.

About Trianz



Trianz simplifies digital evolution through effective strategies and excellence in execution. Collaborating with business and technology leaders, we help formulate and execute operational strategies to achieve intended outcomes by bringing the best of consulting, technology experiences, and execution models. Powered by knowledge, research and perspectives, we serve *Fortune* 1000 and emerging organizations across industries and geographies to transform their business ecosystems and achieve superior performance by leveraging Cloud, Analytics, Digital, Infrastructure and Security paradigms. For more information, visit www.trianz.com.

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