

Designing an optimal cloud migration strategy

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Abstract- *In this paper; we highlight the important aspects to be considered in designing an optimal cloud migration strategy. Cloud is today's hype, it not only provides enterprises a means to reduce the carbon foot print and cost but also provides ease of use and networking across the globe. It helps enterprises maintain a common process ground for all their business needs. Day-by-Day we are seeing growth in enterprises switching to cloud. The methodology is defined as Cloud Migration. Despite of successful migration to cloud, many enterprises are suffering from security and other vulnerabilities in not only accessing but also maintaining their data in the cloud. We have taken this as our ground and we are trying to identify a secure way of migrating to cloud.*

General Terms- Cloud Migration, Cloud Security, Security, Algorithms et. al.

Keywords- IaaS; SaaS; Security; Assessment

1. INTRODUCTION

NIST definition of cloud states "Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

This cloud model is composed of five essential characteristics, three service models, and four deployment models.

Cloud computing can completely change the way companies use technology to service customers, partners, and suppliers. Some businesses, such as Google and Amazon, already have most of their IT resources in the cloud. They have found that it can eliminate many of the complex constraints from the traditional computing environment, including space, time, power, and cost.

2. KEY CONSIDERATIONS

There is a need to evaluate the existing IT Infrastructure setup of an organization thoroughly before advising cloud migration. In current situation, companies tend to move towards cloud based solutions primarily to reduce the total cost of ownership and to reduce the operational difficulties. Some may even consider moving to cloud in order to reduce their carbon foot print towards this economy. More than the hype that cloud provides today, the art of green computing is also on the rise.

2.1 Selection of Right Cloud Model

This majorly depends on what solutions / applications are already in your IT landscape. If there are highly customized components and software involved coupled with huge storage requirements, then IaaS (Infrastructure as a Service) will be the best option. For example, the client has their IT hosting spread across multiple data centers and there is a need now to not only reduce the cost and efficiency but also the administration overhead of having multiple data centers, we might suggest consolidation / harmonization of existing data centers in to a IaaS hosting provider.

However, if your applications are out of the box, as is the case with many of the communication and collaboration suites like Microsoft applications, SaaS is a great option.

On the other hand, if the IT hosting consist of development of numerous bespoke applications, involving only continuous enhancement of the code not involving much of personal data (HR related) then PaaS (Platform as a service) is much more recommended.

Given below is a vision of how the Traditional IT hosting environment continued to go beyond outsourced data centers on to the cloud.

ROADMAP FROM TRADITIONAL TO CLOUD



3. DESIGNING THE RIGHT CLOUD STRATEGY

Migrating to the cloud should be considered as part of an overall business strategy and have a defined business

objective addressed. One company might want to leverage cloud services to reduce operating costs and free up IT staff, another might need the ability to rapidly scale capacity, and yet another might need to speed application development.

Keeping the business objective in mind will serve you well as you make the move to the cloud. At each step along the way, you will need to evaluate a provider's processes, procedures, and abilities to see if they fit your needs. Your choices must be based on how well a provider can support and meet your ultimate objective. With this in mind, there are seven steps to take to ensure success.

This consists of the following essential steps in devising the right approach for the target landscape.

Evaluate AS-IS Infrastructure

- This step ideally covers listing of the entire Infrastructure and analysing their usage levels.

Identify low risk opportunities.

- This step requires a thorough analysis of applications that can possibly be migrated to cloud. There are legal implications associated with a way an application is accessed and the data is stored. Such details are to be captured to arrive at a suitable roadmap for cloud migration.

Check for possible virtualization implementations

- If there are virtualized applications in the existing IT setup then probability to move to IaaS is very high and also beneficial. Migration of a non-virtualized environment requires additional work.

Build a Roadmap for future IT

- This step envisions decision to advocate a right strategy for cloud migration and also to arrive at a futuristic roadmap for the future.

3.1 Migration Options on the Cloud

After an application has been identified as a candidate for cloud migration, based on business and technical factors, it is necessary to consider for what type of cloud environment—SaaS, PaaS, or IaaS—the application is best suited.

3.1.1 Infrastructure as a Service (IaaS)

Migration of an application to an IaaS involves deploying the application on the cloud service provider's servers. The initial step in making a decision to migrate to an IaaS model is to determine whether the cloud-based server hardware and operating system (OS) are compatible with the current server's hardware and OS. The ultimate decision to migrate the application is to be dependent on the following criteria. This criterion decides the strategy of migration to cloud.

Table 1. Evaluation Criteria for IaaS Model.

Category	Measurement Criteria
Service Level Agreements	Availability
	Performance of a Server, Network, Storage Infrastructure
	Maintenance and Management Procedures for the Infrastructure
	Handling of Potential Downtimes
Data Portability	Associated DB Instances / Servers of the applications are hosted in the Cloud

	Cloud Service Provider (CSP) to provide the way to replicate or migrate the block or file storage used by the DB Server
Long Term Costs	Compare cost of IaaS application against cost of deploying that application on Enterprise Servers
	Public cloud in some cases might have good benefits due to pay-as-you-go modeling and Dynamic Scalability
User Management	There might be up to three user roles in IaaS Model: 1) Server Administrator 2) Application Administrator 3) Application User
	User Management and Profiles for each of these users have to be thoroughly evaluated.

3.1.1 Software as a Service (SaaS)

Based on the type of application, and if SaaS-based alternatives exist, it is worth considering if the SaaS alternatives can meet both business and technical needs. Such a change is no longer an application migration but more of a replacement of the existing application with a SaaS option. There might still be a need to migrate existing data to the new application.

SaaS removes the need to manage both the application and the infrastructure on which the application is deployed. This approach can be attractive, but certain criteria, such as service-level agreements (SLAs), data portability, and long-term costs, must be carefully evaluated when considering a SaaS deployment.

Table 2. Evaluation Criteria for SaaS Model.

Category	Measurement Criteria
Service Level Agreements	Availability
	Performance
	Scalability
	Provide Clear Policies, guidelines for application maintenance and upgrades.
Data Portability	Vendors should provide a way for customers to own and control application data
	Customers should have the authorizations to export all the application data in a format that can be easily parsed and migrated to other external or internal applications.
Long Term Costs	Compare cost of IaaS application against cost of deploying that application on Enterprise Servers
	This model is financially attractive for a small business or an enterprise that has not made any significant investment in its own data center. However, it is necessary to compare long term over time against amortized cost of ownership.
User Management	Overall cost of ownership might be greater for a lease as time and usage increases.
	In this model enterprise users are typically

	managed using directory services to reduce the manual overhead and risks for IT administrators to keep modifying or deleting users.
	This model can contain sensitive corporate data when stored over SaaS provider's data center, transparency is required in service provider's security policies based on the nature of application data.

3.1.1 Platform as a Service (PaaS)

Platform as a service might be an option for migrating business applications that are based on standard application server software such as Java EE 5 or Microsoft's .NET platform. In this model, the service provider manages the application platform software and might provide access to common application services such as SQL databases. The application platform might be shared by multiple applications belonging to different customers. How the application platform is mapped to the physical infrastructure is typically controlled by the cloud service provider.

The decision factors in such a migration will depend on the type and version of the application server used. Some PaaS environments might not support all features of the application server and might require application changes.

Table 3. Evaluation Criteria for PaaS Model.

Category	Measurement Criteria
Service Level Agreements	Application overall availability
	Performance
	Provide clear policies, guidelines for application and version management.
	Compatibility of platform versions with Applications
Data Portability	Application data is stored in Database server provided by cloud service provider.
	Customers should have authorizations to export all the application data in a format that can be easily migrated to other external or internal applications
Long Term Costs	Financial model of this should be compared against those of an internal deployment of the infrastructure and the application server/platform using IaaS and deploying the application server using cloud based services.
User Management	This model requires administrator and application user accounts. Customer must understand how the user management aligns with their existing directory services and user management processes.
	In this model, the same application server might host different applications from different customers. In such an environment additional security becomes necessary in order to reduce vulnerable incidents.

4. ADVOCATING & ADOPTING THE RIGHT STRATEGY FOR CLOUD

When cloud services are provided IT resources of a company are exposed to both well-known and new threats. Whilst devising the right strategy for cloud, one must analyze these threats systematically and must segment them within the framework of Cloud Computing Security reference architecture. As part of this suitable counter measures (controls) have been defined for most of the cloud specific threats, using them as a basis we need to devise the right approach.

At Present, some of the new challenges in the area of security cannot be satisfactorily countered. These so called challenges in multi-tenant IT solutions include Security Monitoring, Identity Management Threats, Hacking and most importantly the life cycle of data and how it is handled / deleted. CSA has however identified the notorious nine threats prevailing in the cloud and researches are on-going to identify and mitigate these threats.

A so called Robust design should at-least cover the most painful areas of security in the cloud. It must also have possible checkpoints wherever possible as an identifier so that extra precautions can be taken for these areas. An ideal model should contain the flow of Cloud Strategy and the process to be followed by relevant cloud vendors.

The below diagram depicts the optimal cloud strategy for IT Organizations. This begins with the following steps:

- Perform a Cloud Assessment Readiness Check for the current organizations.
- Initiate a Requirement Analysis Workshop to document the requirements and necessary details regarding maintenance of sensitive data over the Cloud Environment.
- Arrive at a suitable Deployment Model for Cloud.
- Prepare / Design the Cloud Architecture (to-be) for the organization.
- Analyze and assess the cloud vendors based on various compliance and legal requirements – starting from analyzing the credibility of the vendor until evaluating the vendor towards a Vendor-neutral Certification Program.
- Prepare the SLA Refinement and Cloud Control Matrix that the organization requires for an optimal Cloud environment.
- Decide on the Data Retention periods and identify a means to delete or archive data in to a secure environment. Mostly the Data Archival or Retention steps needs to be exclusively handled by experts at Customer end.
- Together with the Cloud Vendor identify the Operational and Governance credentials and map them with vendor processes.

- Finalize the Scope of Work and Signing of Contract.
- Take up the Steady State Support with the Vendor chosen for Cloud provision.
- Assess, Audit and Document the Vulnerabilities, Outages and take appropriate actions against refinement of Cloud architecture.

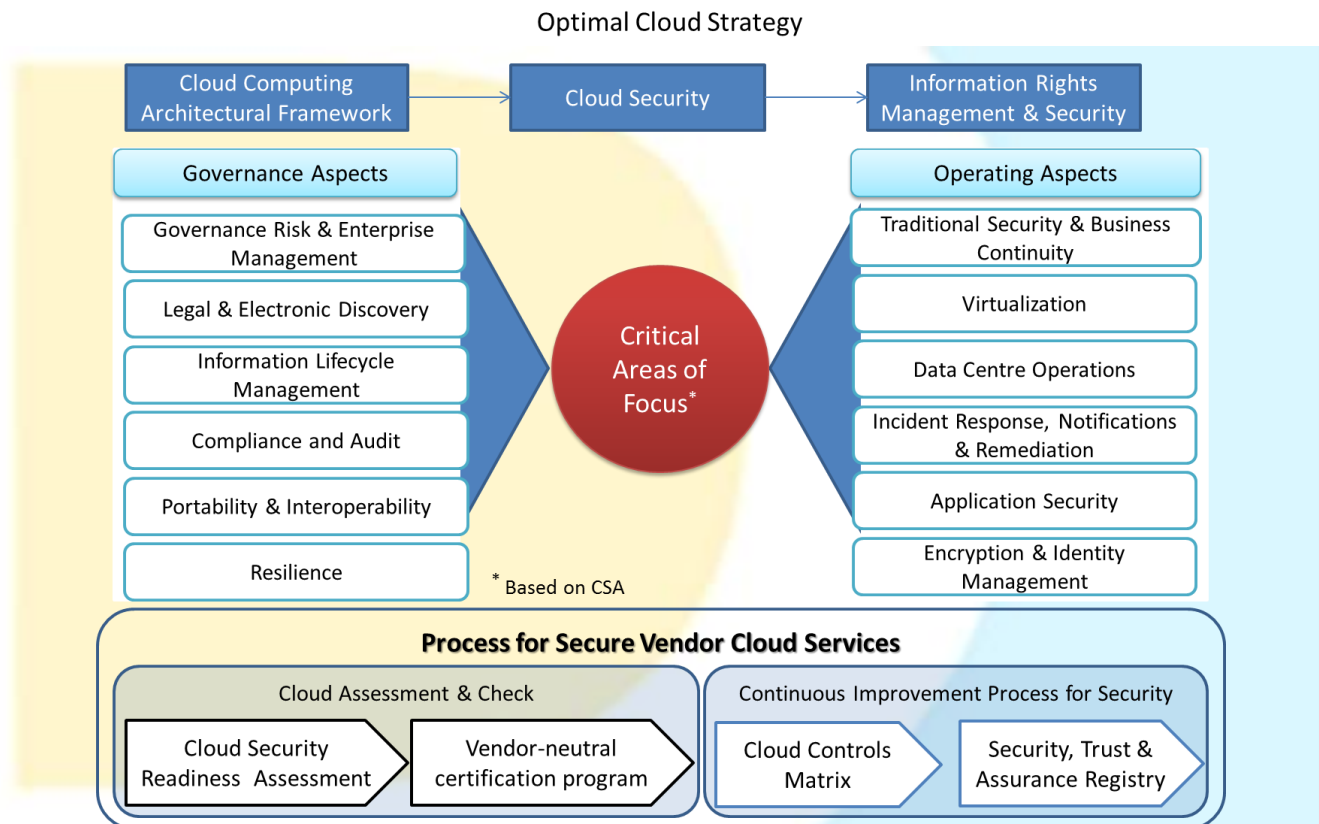


Fig 1: Proposed Cloud Strategic Model

5. CONCLUSIONS

Although cloud computing in general has reached the peak of its hype cycle, the proposed strategic model will continue to become the preferred option for the enterprises by meeting the below identified benefits.

The main benefits of this model would be the following:

Benefits	Description
Cost Reduction	Significant Cost Savings in Comparison with Traditional IT Sourcing Model.
Improved Productivity	Minimizing the downtime and improving productivity in the longer run
Transparency	Reporting on various services provided, Stringent SLA's mutually agreed between parties, Quantities (cost and Inventory Procurement) visibility and KPI Adherence.
Flexibility & Resilience	Provisioning Faster Recovery, automated backups and Archival of Data along with World wide availability and extension.
Audit and compliance	The whole strategy will serve the need to not only migrate to cloud but also to operate within the stated legal boundaries and compliance standards with in time and regular audits.

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