Comparison between cloud and traditional deployment for MIS, NIT Calicut

Atul Golchha (AG)
Arpan Kapoor (AK)
Bobba Praveen (BP)
G. V. S. Rahul (GVSR)
Sachin T. Sany (STS)

B.Tech, Computer Science & Engineering (2012–2016)

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Revision History

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1.1	24.04.15	Dr. Vinod Pathari	Updated *Conclusion*

Contents

1 Introduction

National Institute of Technology, Calicut (NIT Calicut) is one of the leading research and academic institutes in engineering and science disciplines in our country. This document compares between a traditional and a cloud deployment for a Management Information System (MIS) at NIT Calicut. It is prepared as an independent study, with the support of Dr. Vineeth Paleri and Dr. Vinod Pathari, reflecting on the booming transition from the traditional software deployment model to the cloud model.

Before proceeding with the comparison, we will have a look at the current system followed. Then we will describe the characteristics of a traditional and cloud deployment. Finally we will compare the two systems for MIS.

1.1 Current System

Currently, we have a management software called Decision Support System (DSS). Below are some of the details about DSS, as of April, 2015:

- Purchased in 2004 from *Master Software, Nagpur* for around ₹16 lac.
- Used by all students, academic and non-academic staff.
- Supposed to handle usage by around 1500 students, the college strength in 2004. Current strength is 6000.
- Had a warranty period of 3 years. After the warranty, we maintained an AMC with the company till 2011. The contract was canceled in 2011 due to high AMC demanded by the company.
- Since 2011, 1 permanent and 2 ad hoc staff have been appointed for its maintenance.
- Daily backup has to be performed by the staff.
- Current server specification:
  - 2 servers - 1 database server (Oracle 9i) and 1 web server.
  - OS - Windows 2003 Server (32-bit).
  - RAM - 16GB (only 4GB usable, as per the staff).
- Upgrading to Oracle 10g (database) is technically challenging, as per the staff.
- 2 new servers (32GB RAM, 2TB HDD) purchased in 2015 for upgrading the old DSS servers.

2 Traditional solution

- With traditional hosting, the software is deployed on dedicated servers owned by the client.
- As time passes, hardware performance degrades and thus requires upgrades.
- The client pays the software provider for its maintenance.
- Generally, a single unmanaged backup scheme is used.
- Client has to take the burden of hardware maintenance like machines, UPS, network equipments, etc.
- There is limited remote access possibilities with added cost and security issues.

3 Cloud solution

According to the NIST [1], 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.*

It identifies five **essential characteristics** of the cloud model:

1. On-demand self-service
2. Broad network access
3. Resource pooling
4. Rapid elasticity (scalability)
5. Measured service

3.1 Classification

There are 3 basic cloud computing service models. A very simplified way of differentiating these flavors of Cloud Computing is as follows:

- SaaS applications are designed for end-users, delivered over the web.
- PaaS is the set of tools and services designed to make coding and deploying those applications quick and efficient.
- IaaS is the hardware and software that powers it all – servers, storage, networks, operating systems.

3.1.1 Software as a Service

With SaaS, a provider licenses an application to customers as a service on demand, through a subscription. Some of the defining characteristics of SaaS include:

- Web access to software.
- Software is managed from a central location by the provider.
- Users not required to handle software upgrades and patches.
- The client does not own the hardware and hence no maintenance issues arise.

Among the most familiar SaaS applications for business are customer relationship management applications like Salesforce, productivity software suites like Google Apps and Microsoft Office 365, and storage solutions like Box and Dropbox.

3.1.2 Platform as a Service

In the PaaS model, cloud providers deliver a computing platform, typically including operating system, programming language execution environment, database, and web server. Application developers can develop and run their software solutions on a cloud platform without the cost and complexity of buying and managing the underlying hardware and software.

Examples of PaaS providers include Heroku, Google App Engine, Microsoft Azure and Red Hat's OpenShift.

3.1.3 Infrastructure as a Service

IaaS is a way of delivering Cloud Computing infrastructure - servers, storage, network, and operating systems as an on-demand service. Rather than purchasing servers, software, storage space or network equipments as in a traditional system, clients instead buy those resources as a fully outsourced service on demand.

- Resources are provided as a service.
- Allows for dynamic scaling.
- Has a variable cost, utility pricing model.
- Generally includes multiple users on a single piece of hardware.

Some of the popular IaaS providers include Amazon Web Services, Google Compute Engine, Rackspace Open Cloud and IBM SmartCloud Enterprise.

3.2 Data Migration

3.2.1 Entry

Cloud providers generally accommodate multiple formats to import client data.

3.2.2 Exit

To prevent vendor lock down, the client should be able to export his data in a non proprietary format like CSV, XML, etc. These constraints should be specified in the software requirement specification by the client.

3.3 Reliability

The reliability depends upon the cloud provider. At data centers, generally professionals are employed who monitor 24×7 and thus guarantee higher availability and minimum impact of any failures.

3.4 Security

When an organization elects to store data or host applications on the cloud, it loses its ability to have physical access to the servers hosting its information. As a result, potentially business sensitive and confidential data is at risk from insider attacks.

In order to conserve resources, cut costs, and maintain efficiency, Cloud Service Providers often store more than one customer's data on the same server. Hence, the data isolation aspect should be kept in mind when choosing the cloud provider.

3.5 Cost

Generally, the cloud model has an annually recurring expenditure, which has to be clearly stated at the point of choosing the cloud provider.

The current MIS SRS states the requirements at a very high level, thus a precise estimate of the cost cannot be made.

3.6 Adoption in India

There are over 8000 companies in India, as of 2015, that are using cloud solutions, including large enterprises such as Tata Motors, Reliance Entertainment, NDTV, Narayana Health, Macmillan India, EROS International, Malayala Manorama and Sony Entertainment [7].

The Government of India's UID (Aadhar) project is entirely based on cloud technology [8].

4 Comparison

4.1 Ownership

In a traditional system, the client owns the software and data resides on the client's server. When it comes to cloud, there are 3 service models viz. SaaS, PaaS and IaaS. In SaaS, client doesn't have the ownership, whereas in PaaS and IaaS, there is possibility for the client to have ownership of the software.

In case of client ownership, maintenance can either be outsourced to a company or client can hire their own professionals.

In our case, it would be difficult to hire technically knowledgeable professionals, so possessing ownership doesn't have any significant advantages. In this regard, SaaS is preferred.

4.2 Comparison Table

The following table assumes the SaaS service model for the cloud solution.

Topic	**Traditional**	**Cloud (SaaS)**
Ownership	Client owns	No ownership
Data migration	Entry and exit follows standard formats	Possible charge for data export
Reliability	24×7 monitoring not possible, higher Mean Time To Recovery (MTTR)	24×7 monitoring done, lower MTTR
Security	Client's responsibility for physical security	Chances of *insider's attack* and *improper data isolation*
Manpower	Trained professionals required to run and maintain the system	Requires minimum manpower for administrative purposes
Scalability	Not rapidly scalable	Can easily meet higher service requirements at peak times
Hardware maintenance	Burden of hardware maintenance	No maintenance
Software maintenance	Supporting software may require upgrades	Upgrades are transparent to the client
Cost	Unable to estimate due to lack of complete SRS	

5 Conclusion

Choosing between cloud and traditional deployment is hard without the complete specification for MIS. Ownership of the software is beneficial only if professionals can be hired for its maintenance, which is difficult in our case. Hence it is recommended that a cloud solution would be better for NITC MIS.

In the cloud deployment options, Software as a Service (SaaS) is the suggested choice. The following two points must be studied and well-addressed while opting a SaaS model:

- Data format for possible migration should be specified upfront. The suggested format should be in-line with the industry standards to ensure easy migration as and when NITC chooses to exit from the service provider.
- The service level agreement (SLA) should clearly specify quantifiable parameters for reliability, scalability, maintenance etc. with associated financial implications, where necessary.

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