Key Factors in Calculating TCO for Cloud vs. On-Premise Solutions

Liferay

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More than ever in today's race to win customers, the benefits of cloud and the promises of speed to market make migrating to the cloud an obvious choice for many businesses. According to a Forrester[1] report, "the cloud is not only a viable option for an even larger class of enterprise applications and workloads, it is often the preferred method for gaining competitive advantage in the age of the customer." Cloud systems are often considered to be cost effective, flexible and secure, helping organizations bring products and services to the market more rapidly than before. Cloud service offerings are especially valuable for businesses who have limited capital expense budgets and have difficulty predicting future usage and business needs. Leveraging technologies and applications via a cloud model enable businesses to reduce or maintain operating expenses while offering products and services that are competitive with the industry at large (see Figure 1).

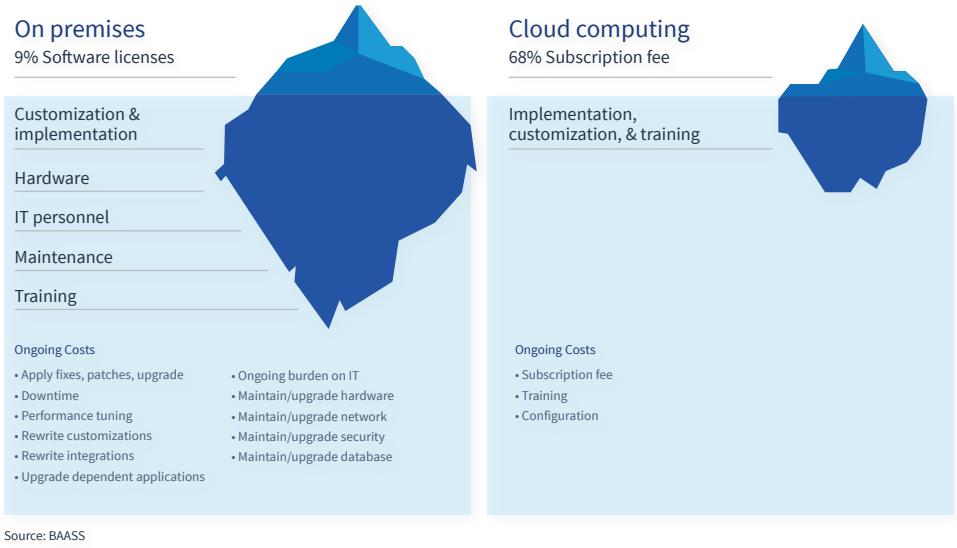

Figure 1: Cost Comparison Between On Premise and Cloud Computing Software

But even with the accepted benefits of cloud, determining whether migrating to the cloud is a tangible action you and your business should take requires hard data and numbers to inform your decision. In order to find out and justify moving your infrastructure to the cloud, you will need to perform a self-assessment and evaluate the entire software or infrastructure lifecycle at

1 Forrester, "Justify Your Hybrid Cloud Future with a Solid Business Case," Dave Bartoletti and William Martorelli, February 10, 2015.

your organization. Trying to accurately compare the total cost of ownership (TCO)of a cloud versus an on-premise application system can be challenging and requires the need to create a true cost comparison that includes ongoing costs to operate, maintain and upgrade a system over its lifetime. And many models fail to capture the personnel cost associated with operating and maintaining an on-premise application system. Lastly, there are several intangible benefits of cloud computing that should also be measured and considered.

The goal of this whitepaper is to help organizations perform a comprehensive comparison between a cloud and on-premise solution by exploring the key benefits of a cloud solution and by presenting a framework for estimating and comparing the total cost of ownership for both approaches.

Total Cost of Ownership (TCO)

As mentioned earlier, organizations make the mistake of comparing ongoing cloud subscription costs to only the initial cost of an on-premise system without accounting for the ongoing cost to maintain and upgrade a system over the application's lifetime. According to Gartner, the annual cost to own and manage software applications can be up to four times the cost of the initial purchase.

Here is a framework you can use to perform a comprehensive cost comparison, capturing both upfront and recurring costs for an on-premise application system and a cloud solution. There are five phases in the figure below (categorized under Upfront Costs and Recurring Costs) required to successfully implement and manage an on-premise system.

	UPFRONT COSTS		RECURRING COSTS		
	DESIGN	BUILD	DEPLOY	MAINTAIN	UPGRADE
KEY ACTIVITIES	• Identify core business requirements • Identify datacenter, hardware, and software requirements based on business requirements • Identify personnel that will be available for system, network, and database administration	• Purchase required hardware and software including servers, storage, and network equipment • Select datacenter that will meet power, space, and cooling requirements • Select internet provider that will meet bandwidth requirements	• Setup, install, and test new system including hardware, software, and datacenter • Train staff on using and maintaining system • Migration data from old system to new system	• Identify personnel responsible for ongoing support and operations of system • Provide ongoing support and training for system • Perform monitoring, diagnostics, testing, analytics, and tuning on system	• Identify changes to core business requirements • Review existing hardware and software and perform gap analysis • Upgrade existing hardware and software based on business requirements
COST DRIVERS	• Time and effort to identify business requirements • Time and effort to design the infrastructure architecture • Consultant fees for infrastructure design and planning	• Time and effort to assess and select hardware, software, and datacenter • Time and effort to review license agreement, service level agreements (SLAs), and security requirements • Software and hardware upfront costs	• Time and effort to setup, install, and test system • Training for users and administrators • Data migration related costs	• Time and effort to administer, manage, and support systems • Hardware maintenance and software assurance • Datacenter - power, cooling, space and internet bandwidth	• Time and effort to implement upgrades • Infrastructure hardware and software upgrade costs • Application software upgrade costs
RECOMMENDATIONS	• Plan for flexibility, scalability, and future growth by designing infrastructure with excess capacity • Minimize downtime by including a redundant site for disaster recovery • Use business specific data to estimate infrastructure requirements (users per server, storage per transaction)	• Perform apples-to-apples comparison of your planned infrastructure to your cloud provider • Negotiate with vendors and purchase required hardware and software • Select datacenter and internet provider that is comparable to cloud provider	• Include adequate budget for training users and administrators • Include time and effort for testing and tuning the system prior to deployment • Include time and effort for launch activities, awareness, and pilots	• Account for annual hardware maintenance and software assurance (20% of the initial cost) • Use industry benchmarks and comparables to estimate personnel required • Account for costs of compliance and audit requirements (SAS 70/SSAE 16)	• Use a 3 year refresh cycle for hardware and software and 3-year straight line depreciations • Use a 5-10 year model when estimating the total cost of ownership • Apply the industry ave2.55rage discount rate (WACC) and apply discount rate for future hardware purchases

Table 1: TCO Estimation Framework for On-Premise Application Systems
Source: https://michaelskenny.com/points-of-view/evaluating-the-total-cost-of-ownership-for-an-on-premise-application-system/

Upfront Costs

Upfront costs are the investment an organization can expect to pay before going live with a new application system including the design, build and deploy phases.

Design

In the design phase, organizations need to start by estimating the amount of time and effort that will be needed to identify business requirements and to design a physical infrastructure to support those requirements. Depending on the organization's staffing and resources, there may be a need for an external expert on infrastructure design, if one is not available internally, in order to design an infrastructure that will support the business needs and future growth of the organization. Metrics and benchmarks should be used to estimate the number and type of servers, amount of storage, amount of bandwidth, and the datacenter power, cooling and space requirements. If this data isn't available, historical and internal data from existing systems can be used to estimate further requirements.

Flexibility and scalability also must be addressed in the design phase. On-premise models take time to scale and upgrade so additional capacity must be planned for ahead of time. Scaling out and scaling up both present challenges. Many enterprise architectures are designed to support scaling up to more powerful servers rather than scaling out to a larger number of servers. Changing an architecture to support scaling out can be very expensive and in some cases is impossible. Scaling out will also in some cases increase software licensing and datacenter costs.

In order to make a fair comparison with a cloud solution, an on-premise environment needs to provide features covering redundancy, offsite backups and a redundant site for disaster recovery, which will require a similar setup to the infrastructure used on the primary environment.

On the cloud solution side, all of the aspects for the design phase is determined through the cloud solution providers' product offerings. Below in Figure 2 are common elements of a cloud infrastructure for which to plan when developing for any cloud-based solution.

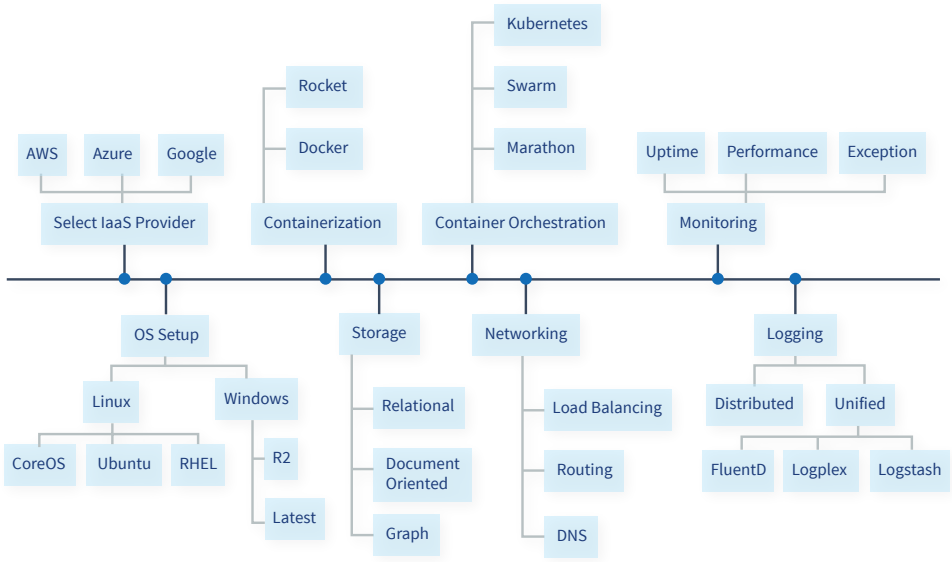

Figure 2. Common Elements of a Cloud Infrastructure

Build

The estimates and the proposed design from the Design phase will define the upfront capital investment required. All components of the infrastructure (e.g., application servers, database servers, network hardware, software, bandwidth, and the datacenter power, cooling and space) should be accounted for at the same levels of performance and quality that would be available through a cloud solution. The time and effort to evaluate all available options and negotiation of the proper purchase price with vendors also needs to be included for building the infrastructure.

The cost to build the physical infrastructure and redundant disaster recovery site are areas where cloud providers have a clear advantage. Cloud providers achieve significant economies of scale and may also be able to leverage volume discounts with hardware and software vendors, datacenter and internet providers, due to their scale and frequency of purchases.

Deploy

The estimates for time and effort needed to deploy a system should include setting up, installing, testing, and tuning the physical infrastructure, as well as any data migration from the old system before the system goes live.

When deploying a new system, it's often necessary to migrate your data from the existing system, and the cost of this migration will depend on the amount and format of the data. Any additional training costs associated with the administration of the new system, network, and database should also be considered. For this phase, it is assumed that these costs will be equal for cloud solutions and on-premise systems, and will represent a one-time, upfront investment.

Recurring Costs

The upfront costs to design, build and deploy a system are only part of the total costs and operating expense to support the enterprise application. The ongoing maintenance and upgrade costs in time and effort also need to be considered as the other part of the total cost of ownership for an on-premise infrastructure.

Maintain

About 20 percent of the upfront cost (SoftwareAdvice.com estimates the ongoing cost of maintenance to be 15 to 22 percent based off of average annual maintenance contracts for on-premise solutions) is needed to cover ongoing support and maintenance for the acquired hardware and software per year.

Most of the maintenance costs are made up of the time and resources required to manage the on-premise system. For businesses who self-host, at least one system administrator, one network administrator and one database administrator are required. Business requirements for uptime, availability and support responsiveness should not be underestimated and could be significant for the personnel required to support the system. Other requirements, like repeating scheduled operation tasks, system security and regulatory compliance management also need to be considered as part of the maintenance costs.

Cloud providers offer resources dedicated to maintenance, support and operations for the system, but the cloud provider's SLAs should be reviewed in order to make an equal comparison to what needs to be included for this comparison.

Finally after determining the number of employees required for each role, the average salary (including any additional benefits and overhead) can be used to estimate the ongoing personnel expense.

Upgrade

Hardware and software depreciate over time, and usually has about three to five years of useful life. This depreciation and the accompanied tax benefit should be accounted for when assessing the cost model. For hardware and software to keep up with the latest technologies, it is recommended to reassess and refresh the core business requirements and upgrade the infrastructure every three years.

The traditional cloud model includes regular and automatic upgrades, and the cost to upgrade to new versions of the software and underlying infrastructure is usually included in the cloud service offerings. The typical service life of a major application system should provide the framework of time, in order to do an accurate TCO and ROI comparison of an on-premise application system and cloud solution.

Intangibles

In addition to completing the cost comparison using the framework above, there are intangible factors that should also be considered and accounted for in the TCO model. These are the areas that are harder to quantify that cloud solutions provide. Below are key features of intangibles to consider:

	RISK MITIGATION	SECURITY	FLEXIBILITY AND SCALABILITY	OPPORTUNITY COST
DESCRIPTIONS	Hedge against downtime, loss of revenue, and damage to brand reputation by transferring risk and accountability for system uptime to cloud provider	Comprehensive security policy of cloud provider including firewalls, encryption, monitoring, anti-virus and anti-intrusion software	Ability to scale resources up and down including processing power, memory, storage and bandwidth to meet unexpected demand, support growth and improve time to market	Value of the best alternative forgone for the time and money spent on self-hosting including personnel and capital expenditures that comes at the expense of other projects and initiatives
RECOMMENDATIONS	• Compare service expected for self-hosting with the cloud provider's SLA • Estimate the cost of a redundant infrastructure • Estimate the revenue loss from downtime	• Compare internal security to cloud offering • Estimate the cost of maintaining compliance and audit requirements • Estimate the cost of monitoring, alarms, surveillance for datacenter, and software (monitoring, anti-intrusion, anti-virus)	• Estimate the additional cost of an infrastructure to support additional capacity • Estimate the cost of hardware and personnel time to support scalability • Account for potential loss of business due to slower time to market and poor performance	• Estimate revenue loss from not pursuing other projects and initiatives • Estimate the cost of delaying new product or service releases • Perform study to evaluate projects impacted by pursuing a self-hosted model

Table 2: Intangibles and Recommendations for Cloud Cost Estimation
Source: https://michaelskenny.com/points-of-view/evaluating-the-total- cost-of-ownership-for-an-on-premise-application-system/

It is recommended when evaluating the intangibles to consider other aspects of opportunity costs related to downtime, like lost productivity, and time and effort required for remediation, loss of revenue, SLA liabilities and loss of goodwill.

These risks are usually passed onto the cloud provider in a cloud solution. In order to address these risks in a cloud computing model, cloud providers provide features like high availability and uptime guarantees of a certain percentage to prove the value of reduced risk on the client.

Conclusion

Determining hard-dollar cost comparisons with a common TCO framework for cloud vs. on-premise is complex, even with the outlined phases and factors, and much of it will depend on the specific solution being deployed on the infrastructure. For this framework, the true cost comparison between cloud and on-premise application systems reveals that cloud is more cost effective for various types and sizes of organizations. Most of the significant costs of the TCO of on-premise application systems is the ongoing cost to monitor, support and upgrade the system, which can take anywhere from 50-85 percent of the total costs of the application. Businesses can benefit when taking into account the intangible factors, involving flexibility, scalability, security and risk mitigation. Cloud services help accelerate innovation by freeing an organization's resources and focus from infrastructure management to their core competencies.

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