Strategic Comparison of Public Cloud versus Hybrid Cloud

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Premise

CIOs understand that a clear cloud strategy is critical for IT today. Wikibon believes the biggest mistake organizations can make is converting major applications into the public cloud (including SaaS) without thinking about the implications to their existing business process workflows. Unlike web giants, most enterprise companies have a large, sprawling and integrated application portfolio. Wikibon recommends that IT develop and implement a hybrid cloud strategy (*see Wikibon's guidance on* creating a hybrid cloud manifesto), using the existing workflows and compliance for both the public and private cloud components in the hybrid cloud.

In order to focus on creating early value for the organization, Wikibon recommends the public cloud be initially used for applications needing a richer development environments (e.g., new developing new mobile and big data applications) and for deploying SaaS applications that offer significant early business benefits. Wikibon recommends these public cloud are accessed and managed through the same hybrid cloud that is implemented to automate and orchestrate existing applications in the enterprise private cloud. This hybrid cloud wrapper will ensure that both applications in both the public and private cloud meets the security, compliance, performance, governance, provenance and privacy edicts of your organization. Enterprises that take this hybrid cloud approach using existing workflows instead of simply pushing everything to public clouds will have a faster breakeven and reduce the risk of project failure or stall during a multi-year conversion.

Executive Summary

The strategic decision facing many CIOs today is understanding the cloud topology options available to their organization as well as the financial and IT value creation implications of those decisions. Wikibon has looked in detail at an illustrative case study to help IT and CXO executives to filter the signal from the noise.

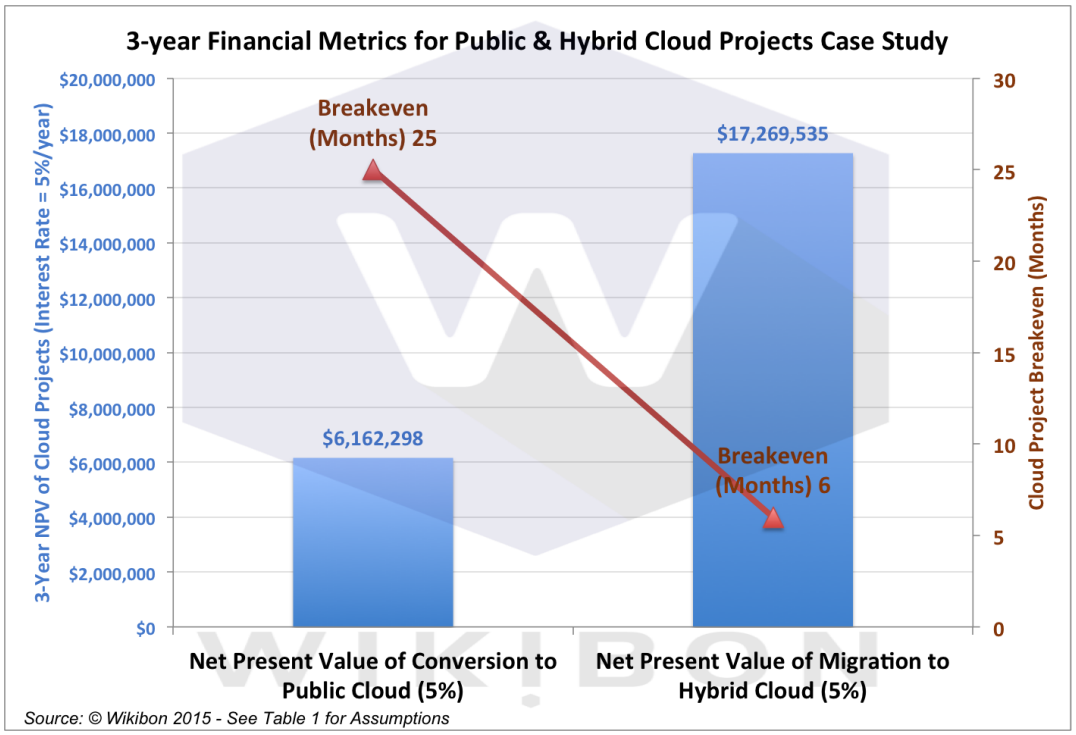

Figure 1: Key 3-year Financial Metrics from Case Study Comparing Public Cloud and Hybrid Cloud Strategies
Source: © Wikibon 2015. See Case study Section and Table 1 and Table 2 for Assumptions & Calculations

Figure 1 compares a hybrid vs. public cloud strategy in terms of financial metrics. The research looked in detail at the strategic value of:

1. Developing applications in the cloud and converting all existing applications to run within that hybrid cloud;
2. Developing applications in the public cloud, and running existing applications in a private cloud and managing all the applications and data with a hybrid cloud.

For the purpose of this research, Wikibon assumed the business and IT models for an organization with $1 billion in revenue and 4,000 employees (see Table 1 in the Strategic Case Study section below).

Given our assumptions, Wikibon believes the hybrid cloud strategy can allow three times more value to be created, with a breakeven of 6 months, compared with a public cloud strategy with a breakeven of 25 months.

One of the most important metrics Wikibon tested was the comparative operational productivity of public cloud environments and hybrid cloud environments. Amazon Web Services (AWS) was used for the public cloud and for hybrid cloud, a VMware-based solution (Federation Enterprise Hybrid Cloud from EMC) was chosen, as it would match a typical existing enterprise data center

environment. The philosophies of the two environments are, of course, very different with the existing workflow in the hybrid cloud replicated in an automation and orchestration layer. In the AWS case a new workflow was established with the AWS toolset. Once established, however, the productivity and time-to-deploy of the environments was very similar, as discussed in the Hybrid Cloud/Public Cloud Time-to-deploy Comparison section below. A well-run private cloud can be as cost-effective as a public cloud. There will be, of course, specific applications that will run better on one or the other at a given moment in time . But a hybrid cloud umbrella will allow migration as the landscape changes.

The main difference between the hybrid cloud and public cloud approaches is that the hybrid cloud is an extension of the existing workflows, with very little change made to any of the processes or procedures except the outer automation/orchestration layer. The elapsed time for migration to a hybrid cloud environment was assumed to be four months. In the public cloud case, there needs to be a conversion over to a different workflow, which takes longer and requires freezing the applications while the conversion takes place.

The key to the success of the hybrid approach is that work better suited to a cloud solution can be migrated to one or more clouds, while the existing management workflows are retained in place. Wikibon believes that many of the claimed benefits of public cloud, i.e., bursting, following the sun, and migration of workloads because of local emergencies have exaggerated value. While a few examples of these benefits exist, the fact is that a vast majority of workloads are held in place by data which is expensive and difficult to move. The increasing use of low-latency storage environments will make it imperative that most data be kept close together, with an increasing amount of data sharing.

Wikibon believes in general that a hybrid step-by-step approach is a much better strategy for the majority of mid-sized and large IT organizations, which will allow lower conversion costs now and greater flexibility in the future.

Strategic Case Study

The strategic case study looks at the three year business case for two cloud scenarios:

1. Converting everything to a Public Cloud, including development and all current systems;
2. Migrating to a Hybrid Cloud, using the current workflow with improved orchestration and automation for both the private and public portions of the hybrid cloud. The development is moved to the public cloud to take advantage of the greater choice of tools and software.

The assumptions and calculations are given in Table 1 below. The "organization" used in the study is the standard "Wikibon organization" with $1 billion in revenue, 4,000 employees and an IT budget of $40 million (4% of revenue). The percentage of budget spent of application development (including application maintenance) is assumed to be $8 million (20% of $40 million).

Wikibon uses the term *application value* to describe the value of an application to the business. The basic assumption is that end-users will be at least as productive using IT as they are in all the other activities they perform (meetings, travel, planning, telephone, factory work, etc.). The revenue per employee of the Wikibon organization is $250,000. The amount of time an average employee is *actively* using IT (being just signed in does not count) is assumed to be 12% (of course knowledge workers will be much higher, and other workers lower). The application value from IT is calculated as 12% of the revenue per employee, an average of $30,000 per employee. The total application value for the Wikibon organization is $30,000 x the number of employees, which equals $120 million. The IT spend is $40 million, so the value multiplier for IT is 3.

Applications and IT in general lose value each year if they are not maintained. The business world is constantly changing, and unless IT is updating the application and IT, the value of IT will decrease over time. Wikibon has done extensive work in this area, and the assumption used for the business case is a 10% loss each year, which we believe to be conservative. $12 million is lost in application value if there is no application maintenance or replacement (similar to asset depreciation).

IT is assumed to spend 80% of application development keeping the lights going and maintaining the current application environment. This resource is applied to avoid losing the $12 million in application "depreciation", about $1 million per month. 20% of AD goes to new applications, and assuming the same value multiplier, $4.8 million is created each year in new application value.

Comparative Strategic Business Case for Conversion to Public Cloud and Hybrid Cloud		
Business Value Created by IT		
a	Annual revenue	$1,000,000,000
b	Employees	4,000
c	Revenue per employee/year	$250,000
d	Annual IT budget (4% of Revenue)	$40,000,000
e	Percentage of budget spent on application development	20%
f = d x e	Annual IT development budget	$8,000,000
g	Percentage of time employees actively using applications	12%
	Assumption: time using application is as productive as other end-user business activities	
h = b x c x g	Value created from all applications/year	$120,000,000
i	Percentage of value lost/year from application aging	10%
j = h x i	Value lost/year from application aging	$12,000,000
	Assumption: value lost from application aging is equal to value added from application maintenance	
k = j	Value added from application maintenance/year	$12,000,000
l	Percentage of application development dedicated to application maintenance	80%
m = h/d	Multiplier of value added to IT spend	3
n = f x (1 - l) x m	Additional value created by application development/year	$4,800,000
Cost of Conversion to Public Cloud		
o	Number of months for conversion & migration from in-house to public cloud	9
p	Cost of conversion & migration to public cloud	$750,000
q = k x o / 12	Value lost from conversion & migration to cloud with application freeze	$9,000,000
Cost of Migration to Hybrid Cloud		
o	Set-up & 3-year License costs for hybrid cloud	$1,596,000
p	Number of months to implement hybrid cloud	4
q	Value lost from migration of development to cloud	$0
Additional Business Value Created from Improved Development (Applicable to Public & Hybrid Cloud)		
r	Improved time and cost to value from development on public cloud	40%
s = l x (1 - r)	Percentage of application development dedicated to application maintenance	48%
t =((1 - s) x f x m)-n	Additional value created by application development/year	$7,680,000
Source: © Wikibon 2015		

Table 1: Comparative Strategic Business Case for Conversion to Public Cloud and Hybrid Cloud
Source: © Wikibon 2015

The cost of setting up a hybrid cloud is mainly from the services for implementing and integrating the current IT workflows into a hybrid framework. The Federation Enterprise Hybrid Cloud was the example in this case study. This figure is estimated as $300,000, which includes the implementation of orchestration and automation.

The second part of the set-up costs is the increase in software costs, and some upgrades in VMware management software. This license cost is estimated as $900,000, with a 22% maintenance cost in years two and three.

The elapsed time for accomplishing this project is estimated as four months. One of the key assumptions in the hybrid cloud case is that the cost and productivity of the private cloud

component (after automation and orchestration) will be competitive with the public cloud. Wikibon conducted specific hands-on work to test this assumption (detailed in the "Hybrid Cloud/Public Cloud Time-to-deploy Comparison" section below) and found that there is no significant productivity or functionality difference between best of breed use of a public cloud and a best of breed use of hybrid clouds. Of course, for different organizations there will be specific applications that will run better in the public cloud, and some in the private cloud, but we believe our test represented a fair general comparison.

The cost of conversion of applications from one operating system to another or from one platform to another requires testing the converted code, and setting and testing new processes and procedures for managing the applications. There are two ways of managing a conversion project; the first is to freeze the applications and procedures until after the conversion is complete, and the second is to continue to update applications both in the source and target systems. The second approach works initially, but is extremely difficult to manage in the later part of any conversion project, and can significantly extend the project. This case study assumes a best practice approach of freezing the applications until after the conversion is complete. The major disadvantage of this is the business dissatisfaction with not allowing change, and the decreased functionality of the applications over time. The cost of the conversion effort is estimated at $0.75 million, with an elapsed time of 9 months. The application value lost is estimated at $1 million for each of the nine months, as discussed above.

The case study assumes that application development elapsed time and effort will be reduced by 40% by moving to a public cloud. This benefit is achieved in both our hybrid and publci cloud scenarios. As a result of this improvement in productivity for maintenance, the amount of AD resource dedicated to maintenance will decrease from 80% to 48%. This releases additional AD resources for new application development. The estimated additional application value is calculated as $7.7 million per year.

The 3-year business case for the two alternatives are shown in Table 2 below.

Financial Metrics for 3-year Business Cases		
Conversion to Public Cloud		**3-year Total**
	Conversion Cost to Public Cloud	-$750,000
	IT Business Value lost during Conversion to Public Cloud	-$9,000,000
	Business Value from Improved AD Productivity	$17,280,000
	Net Value from Conversion to Public Cloud	$7,530,000
	Net Present Value of Conversion to Public Cloud (5%)	$6,162,298
	Annual ROI	59%
	IRR (Internal Rate of Return)	41%
	Breakeven (months)	25
Migration to Hybrid Cloud		**3-year Total**
	Migration Cost to Public Cloud	-$300,000
	License Cost of Hybrid Cloud	-$1,296,000
	IT Business Value lost during Migration to Hybrid Cloud	$0
	Business Value from Improved AD Productivity	$20,480,000
	Net Value from Migration to Hybrid Cloud	$18,884,000
	Net Present Value of Migration to Hybrid Cloud (5%)	$17,269,535
	Annual ROI	2276%
	IRR (Internal Rate of Return)	330%
	Breakeven (months)	6
Source: © Wikibon 2015. See Table 1 for Assumptions		

Table 2: Financial Metrics for 3-year Business Cases for Conversion to a Public Cloud and Migration to a Hybrid Cloud.
Source: © Wikibon 2015. See Table 1 for Assumptions.

The net present value of a public cloud conversion project, given the assumptions in Table 1, is shown to be $6.2 million over 3-years, with a breakeven of 24 months and an IRR of 41%. The net present value of a hybrid cloud migration is shown to be three time higher at $17.3 million, with a breakeven of 6 months and an IRR of over 300%.

The key to understanding the benefit of the hybrid approach is that the effort required to establish the hybrid cloud is short, because it is reflecting the current workflows and management procedures. Then only the pieces that will get a significant return by being in the public cloud are migrated to the public cloud. That cloud may be an infrastructure cloud (IaaS), a platform cloud (PaaS) or an application cloud (SaaS). Good hybrid clouds will allow multiple public clouds to be enabled, and for ease of migration between different public clouds.

Hybrid Cloud/Public Cloud Time-to-deploy Comparison

Objectives and Metrics

Wikibon developed and tested a sample scenario for an enterprise looking to leverage their pre-existing software develop life cycle (SDLC) process on public cloud (we chose AWS EC2) infrastructure.

The scope of the test was to determine the level of effort and time required to deploy a development environment for enterprise application based on a typical scenario given in the scenario sub-heading of this document. The test was limited to the effort to deploy the environment and did not directly test the performance of the application or reliability of the infrastructure.

The objectives and metrics we chose were:

1. Identify the level of effort required by infrastructure admins
2. Identify the level of effort required by developers
3. Identify time required to deploy infrastructure
4. Identify time required to deploy cloud applications
5. Identify key performance indications for .NET applications, Linux, Apache, MySQL and Python (LAMP) application

Tasks Included

The tasks for the process included:

One Time Tasks	
Task	Description
Establish VPN	Establish site to site VPN with AWS VPC for instance connectivity
Create Accounts	Create test accounts for accessing AWS control panel and environment
Create S3 storage buckets	Create storage repository for storage enterprise images to be converted to AMI's

Infrastructure Tasks	
Deploy Enterprise Images	Upload and convert enterprise OS images to AMI's
Create CloudFormation Template	Create CloudFormation template based on application requirements

Table 3: One Time and Infrastructure Task to Created Public Cloud Environment
Source: Wikibon 2015

Comparison Scenario

In order to provide a context for the benchmark, Wikibon posited the following reference scenario for the comparison.

- A regulated company is looking to enable rapid application development for highly availability applications based on Microsoft .NET and the LAMP stack.
- The organization has an infrastructure group responsible for security and operating system (OS) management.
- This infrastructure group is also responsible for creating and maintaining the service catalog for the developers.

The target enterprise IT operations had the below high level requirements.

Requirement	Description
Private network access	The target application environment was only available via the internal network or VPN
Standard enterprise OS images	The OS images were based on the companies standard OS Build
Highly Availability	The application environment must be able to recover from hardware failure without manual intervention
Service Catalog	The application environment must be deployed via a service catalog
Segregation of duties	The development team should not have access to modify the base OS images or repository.

Table 4: Overall Management Requirements for Application to be Deployed
Source: Wikibon 2015

Hybrid Cloud Software and Tools Used

The hybrid cloud chosen was the VMware-based Federation Enterprise Hybrid Cloud (EHC), which represents a low migration point for many IT installations with VMware management tools. Wikibon's scenario starting point was an enterprise using VMware Workstation 10.0 to develop standard OS images. Common developer tools and application binaries were deployed within the OS image.

Public Cloud (Amazon) Tools and Services Used

The Amazon Import/Export command line tool was used for the import and export of volumes for creation of AMIs. Amazon's Databases Services were used for application environments needing highly available databases. Amazon's CloudFormation service was used to orchestrate and automate the deployment of services for individual application environments within a VPC.

Comparison Results

See the *Appendix* at the end of this report for a summary of tasks and results.

Bursting or Balancing

Vendors are constantly talking about the value of **bursting** to a public cloud. There are some unicorn cases, but for most practical applications the data has to be near the processing. Data is heavy, expensive and time-consuming to move to a public cloud for all but the smallest of applications. And moving data back out again from a public cloud is even more expensive.

There maybe some ability to **balance** workloads within hybrid clouds by migrating the application and data. This is much easier if a mega datacenter strategy is utilized, where the private cloud is co-located in the same data center as the public cloud, and where fast low-latency within building communications are available. For example, both Equinix and SuperNAP offer co-location and very fast communication to public clouds. Microsoft is making significant investments in this area with Azure.

The migration of traditional storage with 10 millisecond IO times to flash-only storage with 1 millisecond will make movement of data even more difficult and expensive. Wikibon continues to recommend that enterprises move away from major internal data centers in favor of the use of mega datacenters.

Conclusions and Recommendations

This study shows that wholesale conversion of a working infrastructure to the public cloud is unlikely to be an optimal strategy. There will be some organizations were a wholesale migration to a public cloud is justified, including greenfield start-ups and very small organizations, or those organizations with very highly skewed processing for all its mission critical applications. For most enterprise customers, Wikibon recommends that taking a hybrid cloud approach will allow them to maintain their current workflow, and within this strategy strategically choose specific applications or functions to move to a public cloud best suited to run it.

Action Item

As always, Wikibon recommends conversions be avoided like the plague. For most organizations implementing a hybrid cloud strategy using existing workflows will be the

preferred strategic choice. The workflows should be upgraded with good automation and orchestration to optimize ease-of-use and ease-to-deploy. Workloads that should be in a public infrastructure cloud, including SaaS and PaaS options, should be migrated within the control of the hybrid cloud. Where possible, Wikibon recommends co-locating the private cloud in the same mega datacenter where there are many options for public cloud services.

Appendix

AWS Pre-Work		
Task	Level of effort	Notes
Establish VPN	Same level of effort as establishing a VPN with any partner network.	Optional based on architecture of application. I.e. public facing resources or sitting behind firewall
Create Developer Account	Simple task about 5 clicks	
Create S3 Storage Bucket for images	Simple task about 5 clicks	

Table 5: AWS Public Cloud Pre-work required
Source: Wikibon 2015

Windows .NET AWS			
Infrastructure Admin			
Action	Total Clicks	Wait Time	Notes
Remove VMware Tools	--	N/A	
Import OVA to AWS	N/A	~1 Hour	Command line script. Speed of upload based on connection speed as well as image size.6GB image file took 36 minutes to upload over consumer broadband connection (Comcast)
Convert VM to AMI	4	N/A	Wait time varies on the size of VM.
Create Cloud Formation template	JSON Script		Template is created that specifies AWS resources. This is a learning curve for those unfamiliar with JSON and AWS services. Trial and error required in configuration.
Developer			
Action	Total Clicks	Wait Time	Notes
Create Stack	**6**	**8mins**	

Table 6: Infrastructure & Developer Work required to Deploy an AWS Windows.NET Environment
Source: Wikibon 2015

Linux LAMP Stack EHC			
Infrastructure Admin			
Action	Total Clicks	Wait Time	Notes
Installation of VMware Tools	2	N/A	Linux install in script based. From the command line a minimum of two commands were issued.
Import VM into OVA into vSphere (x3)	13	~3 min	Number of clicks dependent on directory structure
Convert VM into template (x3)	4	N/A	Wait time varies on the size of VM. Average time was ~5 min
Refresh EHC inventory	5	~1 min	Updates EHC with vCenter information
Create server blueprint (x3)	8	N/A	3 configuration screens
Create application blueprint	7	N/A	2 configuration screens
Publish blueprint	2	N/A	
Assign published application to resource group	5	N/A	Groups were pre-defined as part of EMC engagement.
Developer			
Action	Total Clicks	Wait Time	Notes
Deploy	11	~70 sec.	Begins at ~42:00 in video # of Click dependent on number of options defined as part of customization during EMC professional services engagement. Minimum number of clicks is 3. In this configuration where a backup profile is required for each server 11 clicks are required for this use case.

Table 7: EMC Hybrid Public Cloud Pre-work required by Administration and Developers
Source: Wikibon 2015

Microsoft .NET Stack EHC			
Infrastructure Admin			
Action	Total Clicks	Wait Time	Notes
Installation of VMware Tools	6	N/A	Install of VMware Tools
Import VM into OVA into vSphere (x2)	13	~9 min for largest VM (120GB SQL image)	Number of clicks dependent on directory structure. Wait time is dependent on speed of infrastructure and size of image
Convert VM into template (x2)	4	N/A	Dependent on the size of the VM. The largest VM was a 120GB SQL image which took ~9 minutes
Refresh EHC inventory	5	~1 min	Updates EHC with vCenter information
Create server blueprint (x2)	8	N/A	3 configuration screens
Create application blueprint	7	N/A	2 configuration screens
Publish blueprint	2	N/A	
Assign published application to resource group	5	N/A	
Developer			
Action	Total Clicks	Wait Time	Notes
Deploy	8	~70 sec.	Begins at ~42:00 in video # of Click dependent on number of options defined as part of customization during EMC professional services engagement. Minimum number of clicks is 3. In this configuration where a backup profile is required for each server.

Table 8: Infrastructure & Developer Work required to Deploy an EMC Hybrid Cloud Windows.NET Environment
Source: Wikibon 2015