



HYBRID

HYBRID CLOUD

A Pragmatic Approach

A WHITEPAPER

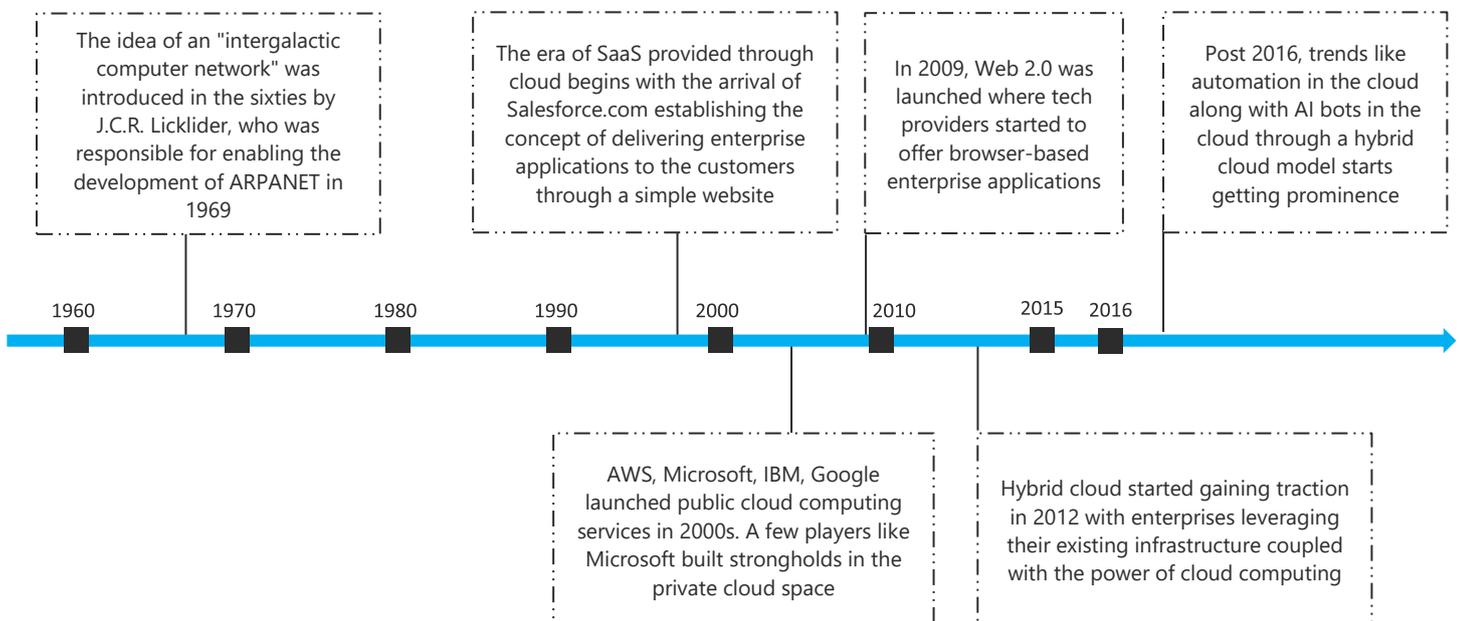
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Introduction

When you log into your favorite social media and update your status - “Feeling Excited” and it automatically projects in your timeline and for the world to see - you might not even know it but you’re using cloud computing. When you have to check your salary and you log into your phone banking application to see your salary details - and you are working with cloud technology. For a normal user, **Cloud computing is omnipresent**. The cloud has quickly become the new normal for IT departments. The recent research from cloud solutions provider **RightScale** shows that **93 percent of businesses use cloud technology in some form or another**.

Evolving Landscape of Cloud Computing



Cloud Computing is an assortment of deployment models mainly distinguished by its proprietorship, size and access. It is categorized into public and private cloud. In case of **Public Cloud**, the cloud services are delivered over an external network to the company and is open for public usage. It is cheaper than a traditional IT infrastructure and has lower capital overheads and operational cost. It does lack the security and control of a private cloud model. **Private Cloud** has a similar structural design to the public cloud but it gives the organisation greater and direct control over their data but it is expensive.

Both concepts owing to their respective suitability has created a necessity of an IT managed bridge between “the cloud” and traditional IT resources giving the emergence to the concept of the hybrid cloud.

But what is hybrid cloud? And how can it benefit customers. In this whitepaper, we will answer some of the burning questions that everybody is asking

Definition of Hybrid Cloud

Hybrid Cloud Defined

Cloud Providers

Microsoft

".. to maintain control over data environments while gaining the flexibility and operational efficiency of a dynamic data infrastructure"

IBM

"secure consumption and integration of services from two or more sources, including private cloud, public cloud or traditional IT"

Advisory/ Consulting Firms

Gartner

"policy-based and coordinated service provisioning, use and management across a mixture of internal and external cloud services."

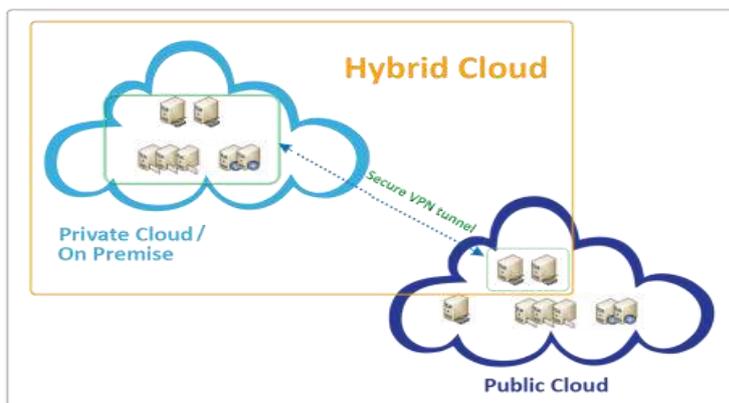
IDC

"unified, orchestrated management framework for different IT cloud deployment models (onsite private cloud, dedicated hosted/offsite private cloud, and/or public cloud)"

Global Standard Body

National Institute of Standards and Technology (NIST)

"composition of two or more distinct cloud infrastructures (private, community, or public) that remain unique entities, but are bound together by standardized or proprietary technology that enables data and application portability."



Hybrid cloud was created to take advantage of the benefits of both the **public cloud** and **private cloud models**. In simple terms, hybrid cloud is an adaptation of two deployment models in which the workloads are exchanged between the private cloud or the traditional IT/ public cloud as per the need and demand.

It provides following feature sets to its user:

- On demand elasticity by leveraging both public & private cloud infrastructure depending on the application needs
- Control on data location and security (like private cloud) for mission critical applications
- Economies of scale for non-critical and mass usage applications
- Highly flexible, self-serve and shared governance model for its customers

Many users think that hybrid cloud is a recent phenomenon, on the contrary this model has been there for the better part of the last decade. The hype surrounding hybrid cloud reached its peak in the 2012. Hybrid cloud has since then taken off and become the most sort after deployment model owing to its duality and the market is estimated to grow from USD 33.28 Billion in 2016 to USD 91.74 Billion by 2021, at a Compound Annual Growth Rate (CAGR) of 22.5% during the forecast period as per a report.

Rapid growth of internet adoption, growth of mobile data and digital transformation are the key reasons for the growth in hybrid cloud.

- India has one of the fastest internet adoption and millions of consumers are getting online on a regular basis. Government initiatives such as Demonetization, GST has accelerated the adoption of technology by businesses and consumers. Most of the internet access is through mobile phones. In fact, the number of mobile developers is estimated to double from the current 300,000 by 2020.
- Increase in high-speed internet connection also is increasing the usage of data by both humans and machines. Petabytes and petabytes of data is created everyday. This data is being utilized by the businesses to better understand their customers and also provide newer services
- Disruptive start-ups especially in areas such as fintech, ecommerce, SAAS are forcing existing large companies to accelerate their internal digital transformation.

Today, Enterprises work with a lot of data present in a whole lot of places. There is thus a need to have extra resources to support their compute as well as storage requirements. Consider an example of a logistic company who has to build a predictive maintenance model for its fleet. The sensors in the fleet capture the required data, which is sent to a public cloud for filtering and processing the huge amounts of data. Some of the data is then sent to private cloud where it is analysed to build the predictive maintenance model which is then deployed back to the gateway device. This type of hybrid setup allows the logistics company to manage the large volume of data it collects.

Adopting a hybrid cloud model by an organization requires transformational change in the way the company interacts with their IT and business. There is a need of enabling employees with competence in contract management, as hybrid cloud deployment models involve interaction with third party cloud providers. The members within the organization need to be skilled to handle any exigency involving the cloud service provider. Another set of training is needed to facilitate employees within the organization to acclimate themselves with the new business processes and governance structures.

To increase hybrid cloud adoption, most enterprises mentioned that network connectivity between their on-prem infrastructure and public cloud as well as unified management across multiple operating systems and public clouds as the key drivers.

The leading hybrid cloud providers in the market, in no order of preference, are Microsoft, VMWare, AWS, Rackspace, EMC, HP, IBM, Cisco and Dell who have a diversified offering suite for their customer. But as we would learn later in this whitepaper, while selecting a provider, the pricing and the configurability are not the only factors that require grilling on.

THE EMERGING NEED FOR HYBRID CLOUD

Digital transformation is a major disruption in enterprises. The convergence of new business models, modern technologies such as AI, Blockchain, IOT and the competition from new start-ups are forcing enterprises to rearchitect themselves to become more agile, digital and global. Most organizations have a legacy infrastructure that is slow to change however they also need the ability to adapt newer technologies and business models. Mobile web applications used by the customers evolve at a faster pace whereas mission critical systems required to run the business evolves at a slower pace.

Hybrid cloud is one of the enablers for organizations to allow modern, agile customer applications sit on legacy systems. Some of the use cases where we see adoption of Hybrid cloud are in:

- **Disaster Recovery and Archiving/ Storage:** Enterprises can mitigate the risk of natural disasters or technical failure by using hybrid clouds to promote high availability and disaster recovery. For example, in a warm disaster recovery scenario, enterprises can deploy a hybrid cloud, keeping its production environment in a private cloud and recovery environment in a public cloud. The organization replicates data across to the public cloud, but all other resources remain non-operational until needed. In the event of a disaster, administrators can quickly start the application in the public cloud, since the data is already present there. When disaster strikes, this configuration results in significant cost savings as well as dramatic improvement in application availability.
- **Development/ QA/ Testing:** Developers need an agile, flexible, dynamic environment for developing and testing software applications. Moving application development and testing to the cloud with seamless interoperability gives the freedom to quickly deploy dev/ test workloads to the cloud
- **Lift & Shift VMs / Cloud bursting:** It refers to a situation where workloads are “spilled over” to a different cloud environment to meet capacity demands. This could be a temporary situation due to seasonal traffic or a news event. A hybrid cloud scenario would see the steady state handled by the fixed private cloud environment and the spike handled by on-demand resources from a public cloud. A prerequisite to this arrangement is the integration of the different type of environments with each other. If an enterprise has Microsoft systems in its internal IT, then it should go with Azure since the integration between both the environments would be seamless. When the two

environments are different, backend integrations are required to make both the setups work properly.

- Migrate Packaged Application:** IT department face rising challenge of adding capacity on-demand to meet business critical requirements or free up resources for higher value projects. Enterprises migrate standard packaged applications such as CRM, SharePoint, Email and collaboration software to a hybrid cloud, freeing up hardware resources on premise.

Hybrid is fast becoming a new standard for delivery of digital transformation. As per a survey, **over 40 percent of enterprises planned to build a hybrid cloud infrastructure or transform their existing IT infrastructure.**

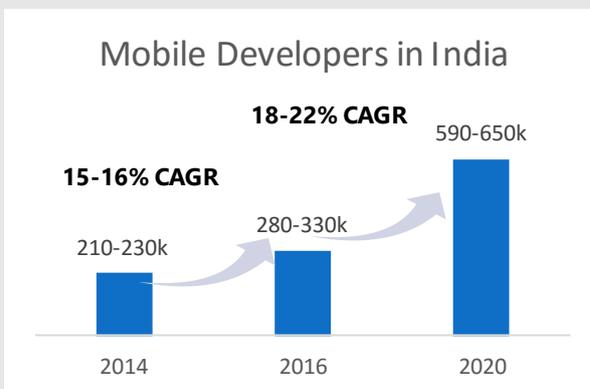
A recent study found that the top reasons executives cite for adopting Hybrid Cloud solutions are: lowering total cost of ownership (**54 percent**), facilitating innovation (**42 percent**), enhancing operational efficiencies (**42 percent**) and enabling them to more readily meet customer expectations (**40 percent**). Seeing the cost as well as organizational benefits, enterprises are increasingly enhancing their reliance on a hybrid cloud setup.



Mobile Apps Development and Hybrid Cloud

The advent of mobile application and its growing popularity have pushed enterprises into native cloud development and hybrid cloud architectures. Modern applications have become sophisticated in their design, with many requiring access to the organization's production databases for their smooth operation. The need to connect the mobile apps' user interface to this production data has laid out the need of hybrid cloud. Moreover, by using the hybrid cloud architecture, enterprises have been able to shorten their application development cycles and have accelerated their entire production process.

The growth in the number of mobile developers, shows that enterprises are increasingly coming out with mobile application to cater to their customer base, which presents the case for the use of hybrid cloud architecture by enterprises in the coming years.



In India, availability of mobile developers has experienced growth of 15-16% in terms of CAGR with an estimated 280-330 thousand such developers present in the country as of 2016. The continued growth pegs the mobile developer economy in India to be around 590-650 thousand by 2020.



Disaster Recovery & Archiving/ Storage



Scenario

Mazda, an automobile manufacturer, backed up information like parts ordering, customer service among others from software to disk-based virtual tape, making copies of physical tapes, and sending the tapes offsite for disaster protection

Challenge

In case a production system failed or a data restore was needed, it took up to 24 hours to request, locate, and deliver the appropriate backup tapes and restore the data

Transformation

- Mazda revamped its data protection using a hybrid cloud storage solution
- The company now has real-time data protection and can restore data in minutes
- It has eliminated backup work for engineers and reduced data protection costs by 95 percent



Development/ QA/ Testing



Greenpages, a system integrator and a computer services company, wanted to adopt a hybrid cloud strategy for its testing, development and QA needs

The company assessed solutions that would help it address the infrastructure capacity shortage and Test/Dev/QA environment needs

- The company selected a hybrid infrastructure environment for its production apps
- The solution made possible for Greenpeace to use the computational power of the cloud for testing its application
- The setup enabled Greenpeace to leverage resources off premise while maintaining the option to move that workload back on premise



Lift & Shift VMs/ Cloud bursting



Migrate Packaged Application



Scenario

OMD OM group is a media agency firm. Over the past few years, it was experiencing huge data surges owing to its rich portfolio of customers' ad clips, projects, design suggestions etc. The company's local file storage swelled 1.5 times to 12 Tb in 2015.

Challenge

All of OMDs' files were scattered across data storage devices of various manufacturers. This complicated their IT maintenance and incurred huge expenses.

Transformation

- The company implemented a hybrid storage solution, enabling it to access data depending on need basis
- In the setup, "hot" blocks that were constantly needed were stored on local SSD and HDD disks. As local storage used to fill up, "cold" blocks that were hardly ever accessed, were shifted to the hybrid cloud

Dangote wanted to upgrade its IT infrastructure after its refinery project was given a green light. It was looking for a local service firm that could implement a hybrid cloud infrastructure for the company

It faced a challenge of unpredictable power supply and access to replacement hardware and resources owing to its geographical location. They needed an approach that could virtually end the down time scenario

- The company migrated its email and SharePoint to public cloud
- It shifted the internal ECM system over to the cloud
- The company also used hybrid storage to store its ERP and other mission critical application backups for added resiliency

ADOPTION OF HYBRID CLOUD – WHO ARE THE KEY USERS?

Hybrid cloud is becoming a preferred deployment model across industries. According to a survey, hybrid cloud adoption has increased up from **58 percent in 2015 to 71 percent in 2016** among enterprises.

The industries where the impact of digital transformation is the highest are the ones who are adopting hybrid cloud in an accelerated pace. Telecom, Retail/CPG and non-banking financial industries such as insurance and capital market are the ones that see an active demand for hybrid cloud. The reasons are a bit different for each of the industry.

	Telecom	Retail & CPG	Insurance	Capital Markets	Media & Ent.
Hybrid Cloud Adoption	Telecom industry is going through a change in business model. Call charges are almost free and the data pricing is also becoming cheaper every year. The companies have to come up with newer services and business models to monetize their infrastructure. Hybrid cloud helps them in rapidly testing new models	Retail industry in India has seen a major change in the last few years. Billions of venture funds and global eCommerce players aggressive investments in India is forcing all the existing retail providers to adopt to eCommerce and related technologies	Insurance companies have access to a lot of data from customers. They want to use this data to reduce risk as well as increase personalized services to customers	Capital markets need a secure as well as scalable infrastructure to support trading as well as keep up with the evolving regulator requirements	Media/entertainment is another industry that is rapidly adopting hybrid cloud. Live sporting events increasing the workload on OTT providers and hybrid cloud helps them manage the spikes seamlessly
Disaster Recovery and Archiving/Storage 	Leading Telecom Provider Using hybrid cloud scenario for disaster recovery as well as storage	 With hybrid cloud based on SQL Server and Azure, BHS implemented a disaster recovery solution quickly	 Using Azure to deliver disaster recovery services to its operating companies across the Middle East and North Africa	 Partnered with Azure to store its credit scoring system and data over hybrid cloud	 Used Azure hybrid cloud storage solution for primary storage, back-up, archive and disaster recovery
Development/ QA/ Testing 	 Running telephony & audio core services on own infra and testing and QA environment on Azure	 Using DevOps on cloud for development, deployment and mgmt. of its rating & reporting service	 Migrated its test and development environment for 17 key applications on Azure cloud	S&P 500 Financial Services Company Using public cloud for development and testing and private cloud for production deployment	 Using hybrid environment to innovate & deploy features for its XFINITY X1 product

<p>Lift & Shift VMs / Cloud bursting</p> 	 <p>Daily push of asset metadata & user-consumption data on Cloud</p>	 <p>Migrated 2,500 server images, with supporting database and middleware components to Hybrid Cloud</p>	<p>Leading Insurance Co.</p> <p>Using hybrid cloud scenario for provisioning, de-provisioning and management of servers</p>	 <p>MUFG offloads its daily risk calculations to Azure providing agility and scalability to support risk computations</p>	 <p>When local storage was exhausted, workloads were shifted to cloud</p>
<p>Migrate Packaged Application</p> 	<p>A Global Telecom Player</p> <p>Migrated their Billing system in the cloud</p>	 <p>Migrated SAP to Hyper-V & created a DR environment in Azure</p>	<p>S&P 500 Financi</p> <p>Delivered its enterprise risk management solution in the Azure Cloud</p>	 <p>Moved its customer-developed applications and services in Microsoft datacenters</p>	<p>A large-tier Media Company</p> <p>Storage of block-based applications on hybrid environment</p>

Several other industries are either assessing hybrid cloud deployments or are still running their IT infrastructure on legacy system because of some roadblocks (compliance/regulatory issue, security). For example, in **manufacturing industry** load is still taken care by the legacy IT infrastructure. Since manufacturing companies are primarily operating with a fixed predictable load, moving to a scalable environment is limited today. A few of the companies use hybrid cloud set-up to host non-critical application like HRM, CRM etc. while a few others use hybrid cloud for disaster recovery.

Banking has also been a laggard in its hybrid cloud journey. Core banking workloads, having a lot of confidential user data, have a strict security protocol to host data in their own infrastructure. These enterprises still use cloud for less critical workloads such as for marketing via cloud etc. but mostly the adoption rate is lower in comparison to other prominent industries.

What's interesting is that hybrid cloud opportunities are coming from a lot of new places, **Government is one such example which is expected to go towards the hybrid cloud route.** Government and Federal agencies are associated with functions that need the security of private clouds, but also the flexibility of public clouds. With a push to save tax payers money and a lingering financial crunch, hybrid cloud setup is ideal for them. The realization by the government agencies is that they need to move some application to the cloud in SaaS model and ensure that public data is controlled in a private environment.

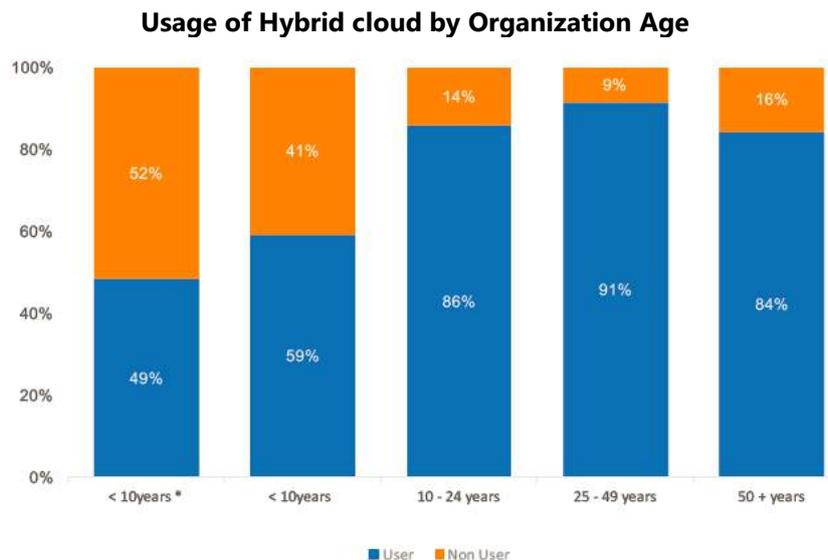
As per a survey[#], enterprises rated following factors behind their organization's last Hybrid Cloud solution deployment.

- **Preparation for future IT strategy in the organization:** 46%
- **Business growth (new units, divisions, merger, geos, etc.):** 37%
- **Alignment with business strategy:** 35%
- **Integration of different systems:** 34%
- **New application/ software:** 33%

The top triggers for hybrid cloud projects relate to business growth and the continued evolution of overall IT strategy. IT and business leaders alike view hybrid cloud as part of their business strategy — and it seems to be working, with 92% of those who have deployed a hybrid cloud solution indicated they would do it again.

More established organizations are using Hybrid cloud.

Organizations over 10 years old have already made significant technology investments, and they are extremely likely to be using hybrid cloud. The number drops quite a bit for companies less than 10 years old, especially when filtering out IT services and software companies, which are generally more likely to use hybrid cloud. With that filter about 50 percent of companies less than 10 years old are using hybrid cloud, versus nearly 90 percent for 10-year-old companies.



#Note: An external survey of mid to large organizations, that have either deployed Hybrid Cloud solutions or were planning to do so within 12 months done from December 2016 through January 2017, to determine their understanding and usage of hybrid cloud.

Hybrid Cloud Players Leading the pack

It is becoming more and more important for enterprises to upgrade their IT infrastructure for achieving scalability, risk management, greater control, as well as enhancing organizational agility. Enterprises are looking for solutions that would provide them with the **right migration tools to enable seamless relocation of existing services** between dedicated private cloud and public cloud infrastructures, without lengthy or unplanned disruption to live service. The other factors include economical pricing, rich portfolio of solutions such as a cloud management tool, database apps, new-age tech features such as ML/ AI, and efficient security solutions.

There to fulfil the growing needs of the customers, leading cloud providers are building solutions, enhancing partnership network and jointly going to market with system integrators to provide flexibility through hybrid cloud environments. Very few vendors provide a full end-to-end hybrid cloud solution. However, many offer critical pieces of the full solution that make them powerhouses in hybrid cloud.

The below mentioned tables, give a brief understanding on the top providers and their offerings in the hybrid cloud space

Leading Hybrid Cloud Players	Hybrid Cloud Solutions	Support Services	Integration & Mgmt. Tools	Service Level Agreement
	Operations Management Suite, Azure Stack, Azure ExpressRoute Azure Hybrid Use Benefit StorSimple	Hybrid Identity, Azure Mobile Services, SQL Server, Log Analytics, Azure IoT Hub, Azure Media Services, Azure Site Recovery	Microsoft Azure Files, Compute Intensive Virtual Machines (for heavy computational duties), Azure API Management, Microsoft Azure Site Recovery	99.99%
	vCloud Air, VMware Cloud Foundation, VMware vCloud Air Network	VMware Identity Management, vCloud Air Mobile, vCloud Air SQL, vCloud Connector	VMware vCloud Air Hybrid Cloud Manager	99.99%
AWS Direct Connect 	Direct Connect Service	-	AWS IAM (Identity and Access Management) service	No SLA provided at the time
	Bluemix (Public, Dedicated and Local)	IBM Cloud Identity Service, IBM Mobile Services, IBM Cloudant, IBM Analytics, Watson IoT Platform, IBM Video Solutions, IBM Bluemix Lift	IBM Cloud Orchestrator IBM Cloud Brokerage	100%*

Hybrid Cloud Solutions Offered by the Leading Players

Leading Hybrid Cloud Players	Hybrid Cloud Management	Infrastructure	Database Apps	Networking
Azure	✓	✓	✓	✓
VMware	✓	✓		✓
AWS		✓		✓
IBM	✓	✓	✓	✓

Support Services

Leading Hybrid Cloud Players	Identity & access mgmt.	Mobile Dev Services	Database	Analytics	Internet of Things	Media Services	Migration Services
Azure	✓ Hybrid Identity	✓ Azure Mobile Services	✓ SQL Server	✓ Log Analytics	✓ Azure IoT Hub	✓ Azure Media Services	✓ Azure Site Recovery
VMware	✓ VMware Identity Management	✓ vCloud Air Mobile	✓ vCloud Air SQL	-	-	-	✓ vCloud Connector
AWS	✓ AWS IAM	✓ AWS Mobile	✓ RDS, Aurora, DynamoDB	✓ Amazon EMR	✓ AWS IoT	✓ AWS Digital Media Solution	✓ Cloud Data Migration
IBM	✓ IBM Cloud Identity Service	✓ IBM Mobile Services	✓ IBM Cloudant	✓ IBM Analytics	✓ Watson IoT Platform	✓ IBM Video Solutions	✓ IBM Bluemix Lift

Since India is one of the fastest growing markets for cloud services, most of the leading cloud technology vendors are setting up their cloud datacenters in India. Having local infrastructure to serve local customers could be a game changer for the cloud vendors.

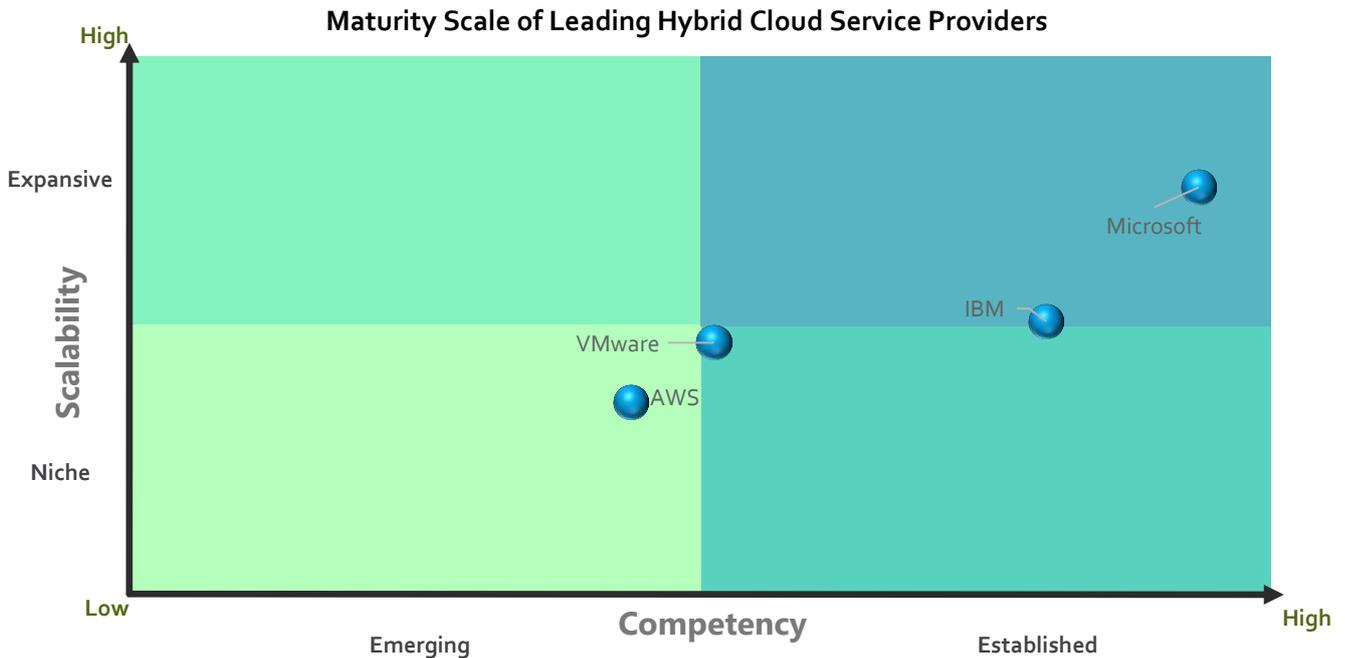
Business

Leading Hybrid CSPs	Partnership Ecosystem	Global Datacentre [#]	India Datacentre [#]
Microsoft	450 +	30 (established) + 8 (new coming)	3 in India (West/ Central/ South India)
VMware	220 +	11	No
AWS	130 +	35 Availability Zones	1 in India (Mumbai)
IBM	220+	31	1 in India (Chennai)

Notes: * Customers are global and hybrid cloud specific

Datacenter considered area ones that support hybrid cloud environments

The following 2x2 matrix is plotted by considering x- axis to depict competencies of the leading cloud providers having parameters such as diversity of hybrid cloud solution, breadth of support services, number of Integration & Management tools and services, and service level agreement provided as a part of the agreement, the y- axis, on the other hand, depicts the scalability of cloud providers based on parameters such as number of hybrid cloud customers, partnership ecosystem, as well as number of global datacenters and Indian datacenters. The rating is devised by assigning weights to each of these parameters by following a scientific approach through a proprietary AHP framework.



For an enterprise that is starting its hybrid cloud journey, they should do a portfolio analysis across the applications in their traditional IT, private cloud and public cloud to decide the right set of applications for transformation. The need for local infrastructure, usage spike requirements, security, mission critical vs non-critical applications as some of the factors to consider before selecting a hybrid cloud solution.

They then have to analyse the environment of their applications. For example: If the applications are majority based on Microsoft environment, it is better to choose a Microsoft solution as it will reduce the amount of background configuration required to make the systems work seamlessly. The major focus should be to have a similar setup in both the environments for a seamless integration.

Microsoft

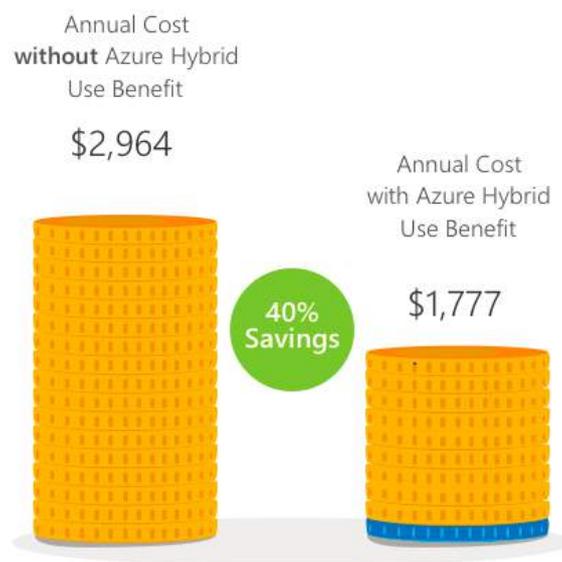
Microsoft is one of the few cloud service providers with a complete hybrid cloud environment. It has solutions encompassing all a customers' needs while deploying a hybrid cloud solution for their organization, **right from networking, infrastructure service to cloud management as well as database applications**. Additionally, it has three of its datacenters in India to support its environment. Recently, Microsoft launched **Azure Stack**, a new hybrid cloud platform product that enables organizations to deliver Azure services from their own datacenter in a way that is consistent with Azure. Below is a list of services provided as a part of Azure Stack

Category	Azure Stack Services
Compute	Virtual Machines (including extensions & availability sets), Service Fabric

Data & Storage	Blobs, Tables, Queues
Networking	Virtual Network, Load Balancer, VPN Gateway
Mgmt. & Security	Microsoft Azure Portal, Key Vault
Web & Mobile	App Service (Web Apps, Logic Apps, Mobile Apps, API Apps)
Developer Services	Azure SDK

Although, Microsoft has opened Azure to Ubuntu Linux (as a part of its Azure Stack platform), enabling open source applications to work well in Azure Stack environments, it still needs to catch up with other open stack platforms.

In terms of pricing, Microsoft offers economical option for Hybrid cloud deployments. The company recently launched **Azure Hybrid Use Benefits** which allows enterprises to use existing Windows Server licenses with Software Assurance feature (*a program that includes rights to new software releases and cost-efficient upgrades*) to run Windows Server virtual machines in Azure at the base compute rate. This enables enterprises to transition to cloud and **save up to 40 percent on Azure instances cost**, depending on usage, instance type, and location.



Sample annual cost comparison of two D2 v2 Promo Windows Server VMs²

Microsoft also provides **Operations Management Suite (OMS)** as a part of its hybrid cloud solution, which is primarily a set of cloud-based services designed to help customers protect, detect and respond to security issues across hybrid cloud environments. OMS provide a dashboard that combines a graphical view of machine data and analytics with status information about system configuration, backup, site recovery and job automation. By bringing security and management together in a single cloud-based offering, OMS provides the tools needed to address threats and remediate issues.

VMware

VMware was one of the early incumbents in the virtualization market and provides performance and reliability through its product portfolio. Its hybrid cloud solution, VMware vCloud Air, is vendor agnostic when it comes to running Microsoft, Linux or other operating systems. This wide base of support treats all vendors the same and provides a consistent platform that is best suited to multiple operating system environments. Though some of the customers view VMware's solutions to be often a collection of products loosely bundled together that can contribute to confusing purchase, installation, and upgrade.

Amazon Web Services (AWS)

AWS is one of the two leading public cloud providers with its major focus on public cloud deployments. The hybrid approach of AWS uses a Direct Connect Service that connects the customer's datacenter with a virtual private cloud (VPC) resource. Partners of AWS (NetApp, F5, Splunk, Trend Micro etc.) provide backup, private storage, data integration, security and configuration management. AWS remains more focused on the public cloud and currently does not offer a complete hybrid cloud management suite.

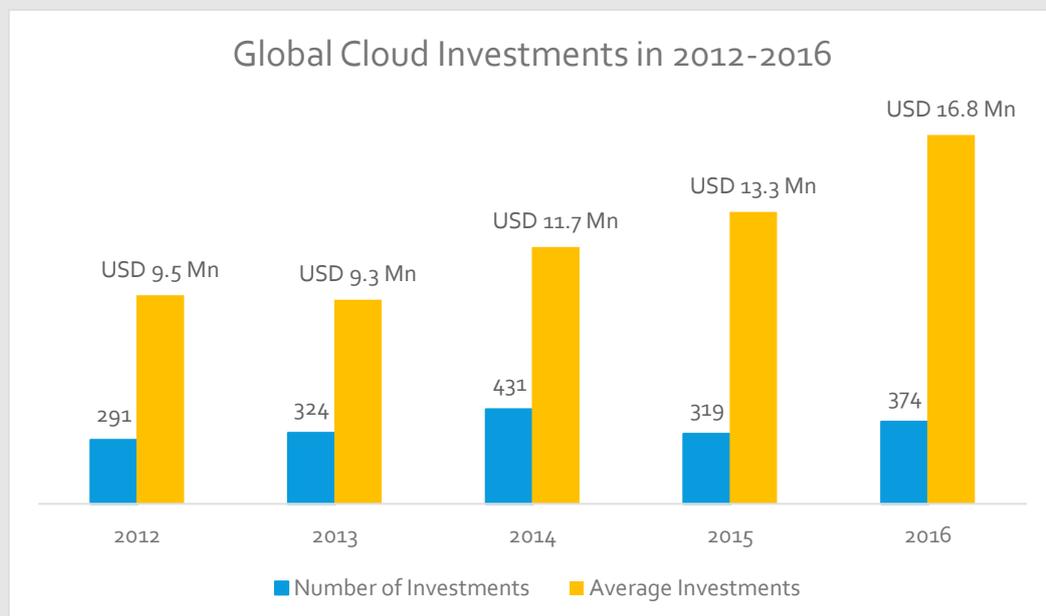
IBM

IBM's Bluemix hybrid cloud has an open architecture, focused on developers and operations access, and offers catalogue of tools through the public cloud. IBM is focusing its resources on providing management control and visibility into both traditional datacenter, private and public cloud services through its management tools. Watson based cognitive services, integrated DevOps, range of mobile backend services, database & analytics services makes IBM Bluemix a very rich platform. There are over 150+ services (IBM and third party) on the Bluemix platform. IBM is also focusing in providing hybrid cloud management solutions to their customers. They have recently unveiled **Cloud Automation Manager**, a cloud-agnostic, multi-cloud management platform which rapidly automates provisioning of cloud applications and resources on any cloud.



New age ISVs/Startups brewing up the Hybrid Cloud Landscape

The rapid growth of hybrid cloud deployments as well as the continuing interest from the enterprises have propelled the new age ISVs and the startups to build their competencies in hybrid cloud. Funding and investments in cloud tech startups have increased exponentially, with the industry showing confidence in the growth of the cloud market. In 2016, the cloud market has seen about 370+ deals being signed, 30% of them going through early stage funding rounds. The average investments have grown at a CAGR of 15% spread over five years (2012-2016).



Hybrid cloud deals accounted for 45-50% of the total cloud deals that happened from 2012 to 2016. Most of the hybrid cloud deals have been focused on storage, automation as well as hybrid cloud management solutions.

Companies like **Velostrata**, having a hybrid cloud solution that enables decoupling of storage from the compute resources, raised USD 14 Mn funding in August 2015.

Another such example is **CloudVelox** which develops hybrid cloud automation platform. CloudVelox's software based on its patent-pending One Hybrid Cloud platform, aims to extend the enterprise data center to the public cloud by enabling multi-tier applications to run without modification in the cloud and access services that reside in the enterprise data center.

Hybrid Cloud Channel Partners

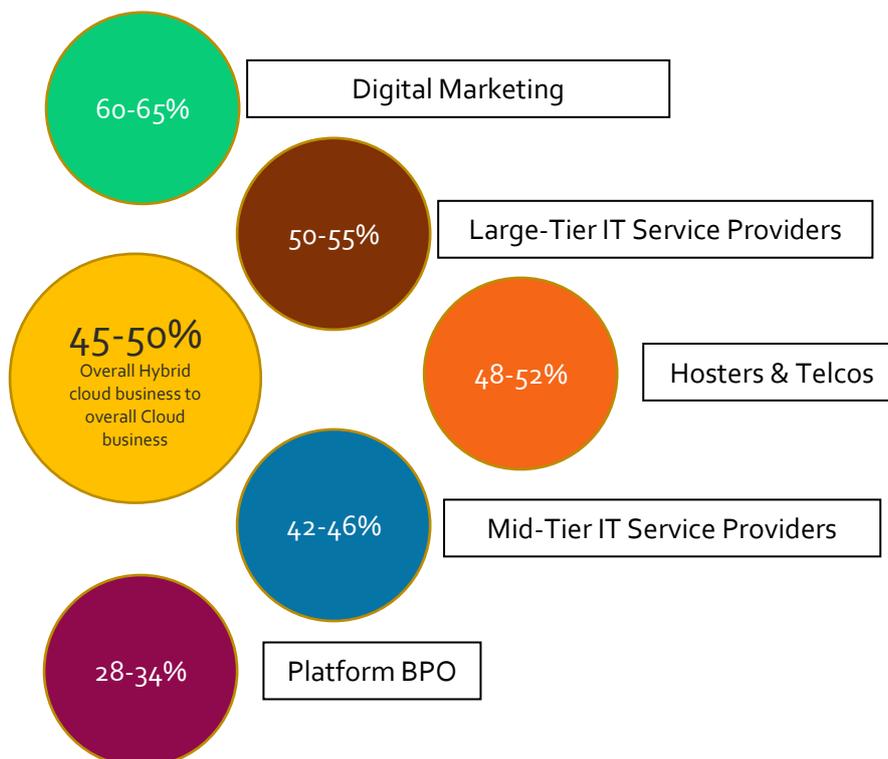
Collaboration with channel partners is the key to sales productivity. The leading cloud solution providers are engaging with channel partners to reach potential clients and drive cloud business. Partners can be technology providers, managed service and consulting providers or resellers with each having its own benefits.

The channel partners go through a rigorous process of enrolment before they become the official partner for any of the cloud technology providers. Most of the cloud technology providers filter out the prospective channel partners' basis their geographic reach, their technological competency, scalability, focus on providing dedicated services to the CSP, as well as their partnership expectations. In case of Hybrid Cloud Solutions, it needs to have the technical know-how and the expertise of deploying a hybrid cloud environment.

Zinnov assessed 50 leading channel partners (SI/SP) across large tier IT service providers, Mid-tier IT service providers, Hosters and Telcos, Digital marketing firms as well as Platform BPOs in the cloud computing ecosystem and found that Hybrid Cloud deployments constitutes 45-50% of their overall Cloud business.

Digital marketing lead the hybrid cloud revenue mix with 60-65% of their overall cloud business coming from hybrid followed by Large-tier IT service providers, Hosters and Telcos, Mid-tier IT service providers and Platform BPO providers.

Hybrid Cloud Revenue Mix for Leading System Integrators



ECONOMIC VIABILITY OF HYBRID CLOUD

Hybrid cloud enables enterprises to develop a joint public and private infrastructure strategy and launch services rapidly & efficiently. A detailed analysis of several enterprise workload scenarios further suggests that hybrid cloud also makes a strong economic sense for enterprises from a total cost savings perspective.

Aggregate Cost Savings against Private Datacentre over 4 Year Period*



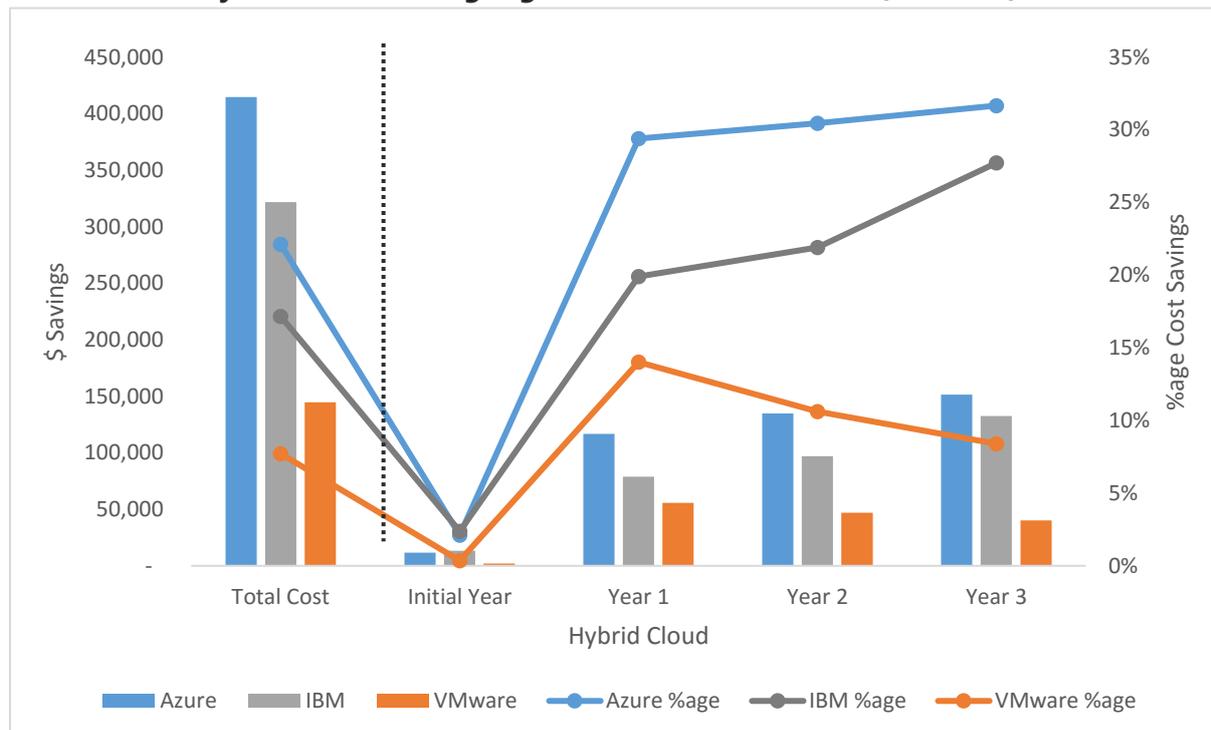
Based on a theoretical cost modeller comparing cost between a complete private cloud datacentre and hybrid cloud deployments, it is concluded that hybrid deployments could result into cost savings of anywhere between 5% and 30% at steady state (depending on the growth of virtual machines in an enterprise’s datacentre and a proportion of workloads moving from private datacentre to public cloud infrastructure). The cost savings amount to about 8-20% at an aggregate level over a 4-year period, including the initial capex costs in both scenarios.

The hybrid solution offered by Microsoft Azure comes out to be the most economical, followed by IBM, and VMware. Pricing is a crucial factor but companies do consider maturity of the hybrid cloud offerings as a critical parameter while evaluating a hybrid cloud player.

Note: *Cost factors include only server (hardware & software), storage, data transfer and system management software costs. Assuming VM growth in the considered enterprise is 5% and storage growth is of 8%. Percentage of workloads moving from private datacentre to public infrastructure is assumed to increase from 5% in initial year to 35% in year 3. The models consider Microsoft infrastructure (including Windows server 2016 with software assurance and System centre 2016 software deployments) for both public & private cloud scenarios. Pricing as of May 14, 2017

Considering a hypothetical enterprise with 500 VMs in the datacentre and industry standard configurations (of server & storage systems, outbound data and infrastructure software), the model suggests that the enterprise could essentially save approximately \$700 per year per VM (average) hosted on public cloud infrastructure. At an aggregate level, this results into ~\$360,000 savings over a 4-year period against an otherwise total investment of ~\$1 million in private datacentre

Hybrid Cloud Savings against Private Datacentre (500 VMs)*



Note: *Cost factors include only server (hardware & software), storage, data transfer and system management software costs. Assuming VM growth in the considered enterprise is 5% and storage growth is of 8%. Percentage of workloads moving from private datacentre to public infrastructure is assumed to increase from 5% in initial year to 35% in year 3. The models consider Microsoft infrastructure (including Windows server 2016 with software assurance and System centre 2016 software deployments) for both public & private cloud scenarios. Pricing as of May 14, 2017

The model suggests that the savings for a hybrid cloud solution grows over time compared to a purely private cloud datacentre. When moving the VMs from own datacentre to public infrastructure, companies do consider the criticality and data sensitivity of the workloads being moved and decide on a public cloud to private cloud ratio. Accordingly, the cost savings may vary from those shown in the graph depending on the rates and configurations considered. In general, the cost savings are better when a relatively higher number of VMs are moved on to the public cloud infrastructure.

In case, enterprises are using common management framework to manage on premise and cloud applications (i.e. common application development, management and identity across private and public cloud environments), the total cost of ownership (TCO) over a 4-year period could be as low as 2 to 3 times compared to

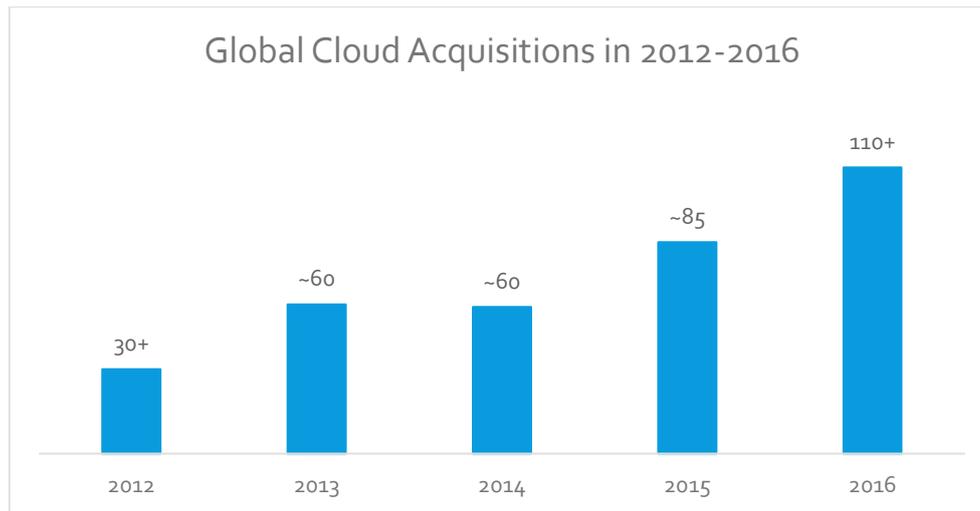
heterogeneous management of infrastructure between public and private infrastructure.

Basis our evaluation of the cloud providers from a pricing stand point, we found out Microsoft to be economical than its peers as it offers **Azure Hybrid Use benefit** (HUB). Through Azure HUB, savings on Azure can further increase by upto 40 percent on their instances, depending on usage, instance type, and location.

But as we learned before, pricing is not the only factor that enterprises should assess when choosing what type of providers, they want to go with. What is more important is to understand what type of applications ones' internal environment works on. If an enterprise has Microsoft systems in its internal IT, then it should go with Azure since the integration between both the environments would be seamless. When the two environments are different, backend integrations are required to make both the setups work properly.

Building Capabilities through Mergers & Acquisitions

Leading cloud providers as well as system integrators (SIs) have been acquiring cloud companies since 2012 to grow their cloud business and become a leader. In 2016, there have been 115 cloud specific acquisitions with the likes of CenturyLink shelling USD 34 Bn for Level 3 Communication, a provider of Data Center Connectivity and Cloud. Between 2012-2016, there has been a 35% growth in terms of CAGR for cloud specific acquisitions with an average investment jump of 81.25%.



Out of the total cloud acquisitions that happened between 2012-2016, 40-45% of the acquired companies had a significant hybrid cloud play.

Enhancing cloud competencies, entering new markets, and better servicing of existing customers were some of the prominent reasons for acquisition of cloud players. **IBM**, for example, acquired **Sanovi Technologies** incorporating its hybrid cloud recovery, cloud migration and business continuity software for enterprise data centers and cloud infrastructure to strengthen its hybrid cloud offering. In 2014, **EMC** acquired **Cloudscaling**, which helped the company build OpenStack private clouds. It also picked up cloud filer gateway startup **Maginatics** and cloud-to-cloud backup pioneer **Spanning**, with the aim of bridging the public and private clouds.

Cloud Decision Makers

Cloud is becoming critical for organizations ranging from large enterprises to SMBs. However, this poses the question, who's making the decisions on what cloud services they should buy and use?

When cloud implementation is not done in a holistic manner, an enterprise can become a victim of cloud sprawling. Cloud sprawl is the uncontrolled proliferation of an organization's cloud instances, services or providers and typically occurs when an organization lacks visibility into or control over its cloud computing resources. Aside from loss of control, this also presents potential business risks such as unauthorized system access, data integrity and protection. CIOs still have most influence on the collaborative cloud purchasing process, followed by CTOs and CSOs. Historically, in the world of IT, the CIO was employed to evaluate and choose the right technologies, innovations, and solutions for their business. If it was a major capital expenditure or infrastructure purchase, then the CEO or CFO may have been involved towards the end of the process for final approval.

Now, cloud services and digital innovation evaluations are increasingly taking place around the boardroom table, and the respective heads of marketing, sales, HR, and operations will play a big part in these discussions. What's more, it's likely that each of them will have knowledge of the 'latest and greatest' cloud disruptive services available on the market. The adage 'a little knowledge is a dangerous thing' has never been truer than in the cloud world, and the CIO is no longer the keeper of all IT knowledge. The organization may even employ a **Chief Digital Officer**, who must understand the innovations the organization needs to compete and thrive in the new digital economy.

Brewing up the future

Hybrid cloud as a deployment model provides all the benefits of a regular cloud environment such as **scale, cost benefit, management and security, but it is applied to a partially internal environment**. We expect two key trends to play out in the next few years:

- a. The future will see enterprises offloading as much of their technology stack as possible to the cloud, which will be driven by the freedom to choose among multiple vendors on their own terms while keeping critical applications on premise
- b. The **future will see more industry verticals adopt hybrid cloud**
 - i. **Government** could adopt hybrid cloud in scenarios where they need the security of private clouds, but also the flexibility of public clouds.
 - ii. Concepts like **connected cars** will further propel industries like **automotive** to adopt hybrid cloud. Applications used for controlling different features of a connected car like in-car entertainment unit, in-dash system could be deployed in a hybrid cloud model.

Automotive companies have already started investing in the concept of connected cars with Qoros creating its own hybrid cloud platform named Yiyun that provides telematics services to customers.

Conclusion

Hybrid Cloud has quickly become a cloud of all needs, enterprises have been more open to adopt hybrid cloud as a part of their IT strategy as they see advantages like reduction in total cost, enhanced performance, greater availability and resiliency, and increased flexibility among others. Having said that, a lot of industries have still been iffy to go towards a hybrid route, partly because most of them still see “cloud” to be a risky bet. Industries like telecom, retail (majorly e-tail but traditional retailers will also adopt hybrid cloud, to provide their customer with a more personalized shopping experience) have seen high adoption, whereas industries like manufacturing and core banking still have a long way to go. We see that analytics, internet of things and artificial intelligence will further propel the adoption of hybrid cloud in the future and help enterprises improve customer centricity and experience through the same. The supply side is also becoming increasingly competitive, with incumbents like VMware, Microsoft, IBM as well as AWS upping their game by providing a complete and a true hybrid cloud solution. AWS and VMware have also partnered to bring hybrid cloud capabilities to customers. This partnership helps customers to run and manage workloads in the cloud, seamlessly from existing VMware tools. Local Hosters like Netmagic have also come out with their own hybrid cloud solution (in addition of providing colocation and managed services) brewing up the market and making it excessively competitive. Another trend that we are seeing is of the incumbents, taking a cue from the local Hosters, are setting up their data centers in India to better service the geography, AWS, IBM and Microsoft have already set up datacenters in India, with Oracle to follow suit.

Hybrid cloud though being a preferred model of cloud deployment for enterprises, brings to the table a lot of questions at the time of its assessment. Deciding on a hybrid cloud provider has additional challenges over a public or a private cloud offering. When you are looking at a private or public cloud you compare features and functionality based on one environment. However, with a hybrid cloud you should look at the solution provided in both your internal environment and what is external to your environment. There is, thus, a need of choosing a cloud strategy for one’s organization that best works for oneself. Today, there are a handful of options that enterprises can evaluate.

Microsoft Azure is one of the options providing best in class hybrid cloud environment for every need. What distinguishes Azure is the cloud management as well as support services it provides to its customer in conjugation of its hybrid cloud environment. With a strategy of providing customers with a seamless cloud experience, Microsoft has launched its **Azure Stack platform**, a new hybrid cloud platform product, that enables organizations to deliver Azure services from their own datacenter in a way that is consistent with Azure making it easier for the organization to migrate to the cloud. With Microsoft Azure Stack, organizations can stop asking

how their applications and datacenters can move to the cloud and start thinking about how they can also bring the cloud to their datacenter.

Thank You

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