

A COMPLETE GUIDE TO GOOGLE CLOUD PLATFORM

And why Google is winning the Cloud War

AUTHORS

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Prologue

On a day in 2006....

I still remember the day Amazon launched AWS, its cloud platform with the S3 (a storage service). It was a bright sunny day with AWS being the only cloud on the horizon.

Fast forward to now... The cloud wars are on.

It's raining cloud services and there are umpteen number of cloud providers competing as rivals for a bigger pie of the cloud market.

Each day companies add new weapons to their arsenal, hoping one of them would win them the war. Google, Amazon and Microsoft are the main rivals and battles of price, performance, reliability and innovation are fought every day. The price battle seems already won. An independent expert recently benchmarked Google

as the best cloud. Google achieved this feat through its unbeatable pricing. Does this mean Google has won the Cloud war? No! Because price is only one of the variables that enterprises look at while picking the best cloud, there are a host of others and we'll introduce you to some of them here. The current state of the cloud world has been shaped by history among other things. Amazon had the early-mover advantage and used it to capture a significant share of the cloud market. But Google is catching up fast.

While we can't predict who will emerge on the top, we can look at the evolution of cloud computing and understand its current dynamics as well as future prospects. And maybe, just maybe, you'll guess who is winning the cloud war, by the time you turn to the last page.

Contents

Authors

Prologue

1. A Brief history of our time on the Cloud
2. Shifts in Cloud strategies: Rivalry/Evolution?
3. Starting your cloud Journey with the right partner
4. Architecture of a Cloud Platform
5. The 'Compute' in Cloud Computing
6. Don't Grab a Passing Cloud (to Stash your Data)
7. Why networking matters
8. Why DBaaS is in Demand
9. Big Data Analytics - Data Driven Business success
10. The (Machine) Learning Enterprise
11. Why Google Cloud?
12. Planning your enterprise cloud strategy

Conclusion

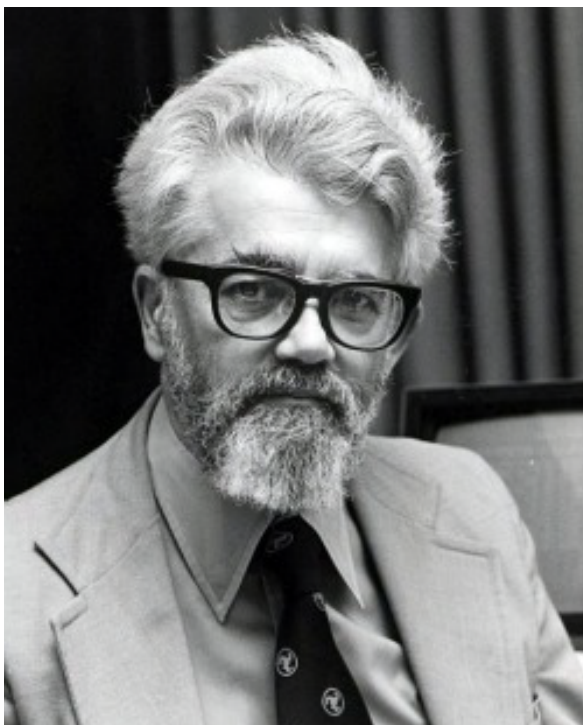
Annexures

Annexure A: Building blocks of AWS and GCP

CHAPTER 1

A BRIEF HISTORY OF OUR TIME ON THE CLOUD

The story of cloud computing so far



John McCarthy
Cloud computing Scientist

When John McCarthy first spoke of computation being delivered as a public utility, it was a distant possibility. But today cloud computing is a reality; we spent a part of our lives on the cloud in our virtual avatars. As more and more services reach us via the cloud, the consumption of cloud services will continue to rise.

A host of developments paved way for the emergence of cloud computing. The advent of enabling technologies like the internet, virtualization tech, SOA architectures and widespread broadband access were crucial to the realization of the cloud computing paradigm.

How it all began

1999 After Salesforce launched enterprise applications as a service, the SaaS wave caught on and many enterprises launched their own apps via internet.

2006 The next development was the arrival of Amazon Web Services (AWS) in 2006. AWS was the first to launch a suite of cloud-based services. AWS allowed enterprises to rent both storage and computing resources through its S3 and EC2 services. Amazon is celebrating 10 years in the cloud in 2016 and is still the market leader among Public cloud service providers.

2008 Google entered the fray with its Google App Engine and is competing with other cloud vendors like AWS and Microsoft Azure in the provision of cloud services.

2009 Launch of browser-based enterprise applications from vendors like Google and Microsoft, Google Apps and Microsoft office web apps provided proof of concept for cloud enabled service delivery by demonstrating that online services were both easy to consume and reliable.

2011 Although Amazon, Microsoft and Google are primarily public cloud providers, enterprise concerns on data security and control, have pushed

these vendors to experiment with other deployment models. This led to newer models like hybrid clouds, which combine the best of both public and private cloud models.

Google is a late entrant but is adding product families and new services to its cloud portfolio faster than others. Even on the price front, the massive price cuts by major cloud vendors are driving down the costs of cloud services quickly. Google is constantly lowering the cost of cloud services as a part of its avowed mission to democratize technology, especially IT.

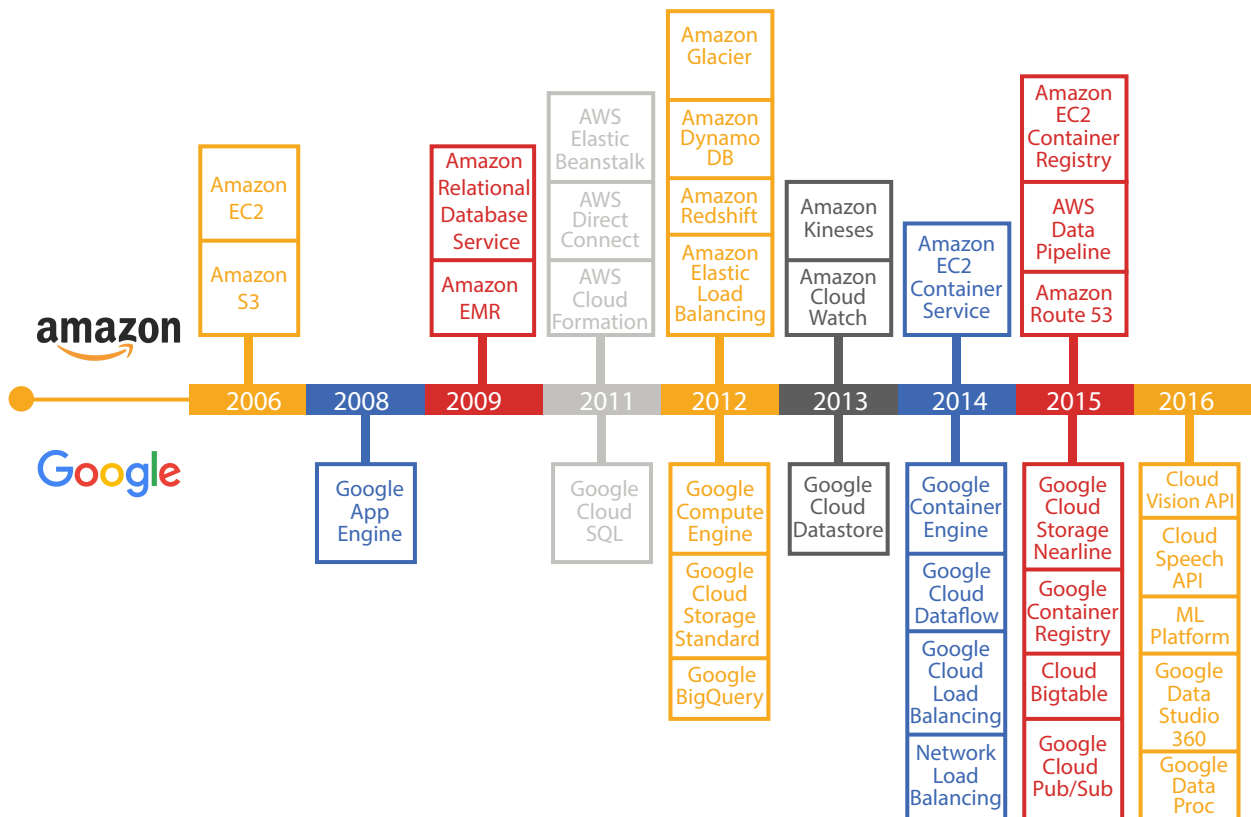
Evolution of Cloud Computing: Competing to Contribute

The massive demand for cloud services is spurring innovation through competition. Cloud providers are dropping prices and launching new products to win new clients.

The silver lining

The fierce rivalry between Amazon and Google in the cloud space, has resulted in cutting edge tech getting mainstreamed to the masses quickly. Let's look at a timeline of services launched by Google and Amazon to see how they are contributing to cloud evolution.

Cloud Services Launched by Google & Amazon



Google entered the cloud game late, but the Alphabet Inc is not one to be left behind! Google is launching new products at a rapid pace to power the next wave of cloud evolution.

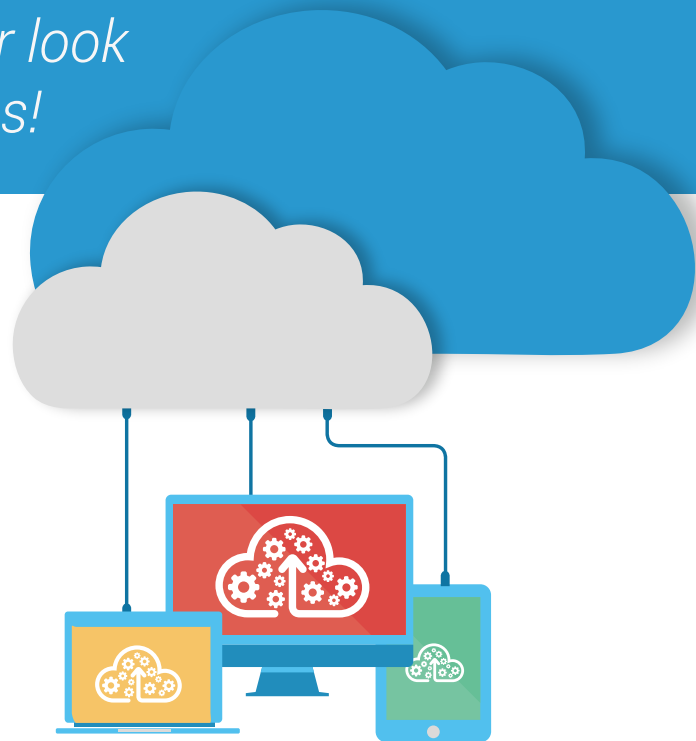
CHAPTER 2

SHIFTS IN CLOUD STRATEGIES: RIVALRY / EVOLUTION?

*Why it's time to take a closer look
at enterprise cloud strategies!*

The Cloud race is getting hotter; the New Year began with major cloud vendors like Amazon and Microsoft announcing price cuts. Google responded to these price changes by announcing that its platform was still the most economical option through a company blog. So is the cloud rivalry all about pricing? Definitely not! So what shapes an enterprise cloud strategy if not pricing? The past few months saw some high-profile enterprises make changes in their cloud strategy. They tell the story of how the cloud space is evolving and how enterprises are getting over their fears of storing restricted data on somebody else's servers, as the cloud keeps getting more secure.

Let's take Amazon, it not only pioneered cloud computing but has spent the last decade popularizing the concept in the enterprise world.



Amazon Web Services (AWS) has a product release schedule that's enviable! It rolls out new features and services to millions of its users every year. News of high profile AWS users like Spotify and Apple shifting to Google has generated a lot of debate in the recent months.

From a Trickle to a Roar

When Spotify announced its plans to migrate to Google Cloud Platform, it left everyone baffled. The company had often been cited as a reference customer for Amazon services. What was dismissed as a one-off instance by supporters of Amazon, soon turned into a headache when reports of Apple following Spotify to Google Cloud surfaced.

So, are AWS users really looking for a better host?

Not really, unless you believe the overexcited folks on Twitter who see this as the beginning of an end to Amazon's dominance over the cloud market.

Let's take a reality check

1. Dropbox reduced its use of Amazon's storage service (S3) as it was pursuing an on-premise cloud strategy, which would require most of its users' data to be stored in in-house data centers.

2. Apple may have shifted some of its workloads to Google Cloud Platform but it still continues to use AWS too. Apple also runs some of its operations on Microsoft Azure cloud. In Apple's case, it's simply following a multi-provider cloud strategy.

What is driving the shift in Cloud strategies?

The proponents of cloud computing marketed the paradigm as a solution to all, if not most enterprise IT challenges. Moving operations off-premise was not only going to bring significant cost and time savings but would also free enterprises from vendor lock-in. Adoption of cloud services would imply enterprises could shift all or part of their workloads to rival vendors if they were delivering better value on cost, performance and security aspects. This was the promise of Cloud computing. Enterprises are now seeing this promise delivered.

Why you need a fluid cloud strategy?

Cloud technology is only a decade old and is still evolving. Different vendors in cloud space are accumulating advantages in niche segments. For example, Google is leveraging its strengths in data processing to establish its dominance in big data segment. A small enterprise might do better with a vendor that's having an edge in a particular segment. While large enterprises may use different vendors for different product/service lines for the same reasons. Shifts in consumer preferences, data laws and disruptive tech innovations are all capable of

engineering a change in an enterprise cloud strategy and are unrelated to vendor-side dynamics. Most companies are still experimenting with their supplier and product strategy to figure the best vendor mix for their product/service matrix. Therefore it's pointless to discuss enterprise cloud strategies in absolute terms. All of the enterprise IT workloads may not operate on the cloud, only some of them might be. Similarly, an enterprise may have multiple cloud vendors servicing its different product or service lines. The reality is, firms are keeping their cloud strategy fluid to respond to changes in vendor and business environments. A fluid strategy also has a positive impact on the cloud ecosystem as it pushes providers to innovate.

But one thing is certain, as prices of cloud services continue to drop and providers add more functionality and features to their cloud platforms we will see greater adoption of cloud services in the future.

CHAPTER 3

Starting Your Cloud Journey With The Right Partner

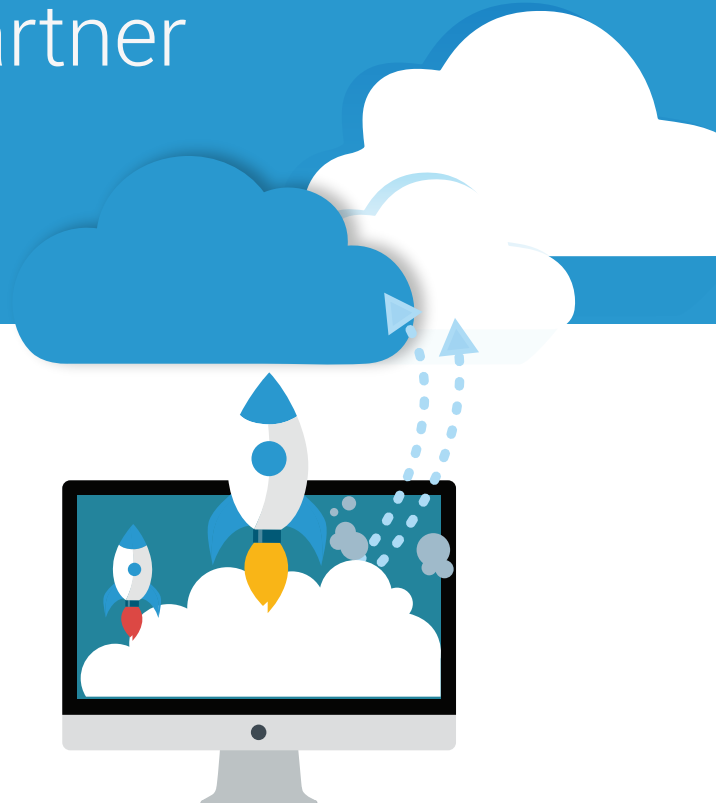
Why startups must adopt a Cloud-First Strategy!

The cloud computing space is evolving. Vendors are finding their niche segments and owning them. But, why should all of this brouhaha about cloud migration matter to you? Is the 'Anytime, Anywhere, Any Device' computing model for everyone?

Is there a compelling business case for universal cloud adoption?

Find Out!

Moving to the cloud is not just about adopting newer tech but there is a compelling business case to make the shift.



Business Drivers for Cloud Adoption

1) The Cost Argument

Cloud computing is an efficient and cost-effective way to deploy IT. Large cloud providers leverage economies of scale to deliver low-cost computing resources to cloud users. If you are operating on a cloud platform, you pay for the exact amount of resources you

consume. For SMBs and startups working on a lean model, avoiding expenditure on installation, maintenance, upgrades and support costs can make a lot of difference.

2) Investment

Startups and SMBs are often constrained by tight budgets and using the cloud to deliver services will imply costs are incurred as operational expenditure instead of capital expenditure. Operating on the cloud will also mean they don't have to worry about infrastructure provisioning. The cloud provider would take over the responsibility of upgrading infrastructure and maintaining it, letting the enterprise focus on application development.

3) Scalability

Easy scalability is another advantage of cloud adoption. Cloud providers offer automatic scaling whenever computing needs peak. If not for the cloud, firms would have to create the infrastructure to meet peak traffic demands and keep it idle for most of the year. Being able to avoid over-provisioning is a significant advantage of moving to the cloud.

4) Enterprise mobility

Cloud adoption furthers enterprise mobility by allowing users to work from anywhere, at any time, and from any device. Cloud-based business

collaboration tools are efficient and easy-to-use. Cloud-delivered enterprise mobility management systems allow companies to implement Bring-Your-Own-Device (BYOD) policies without worrying too much about data security.

5) Speed

Virtual computing resources can be commissioned in a few hours whereas traditional mode of setting up IT infrastructure takes weeks, if not months. For startups with ideas that need to be out in the market yesterday, adopting a cloud-first strategy is the only means to speed up product development.

Finally, each enterprise will differ in why it embraces cloud computing. Irrespective of why you migrate to the cloud, the approach to cloud adoption must be properly planned and executed. It begins with choosing the right vendor for your firm.

So, how to find your cloud match?

What you must look for in a cloud vendor

1) Performance & Uptime

For high-speed delivery of applications, network performance is crucial. Check if your cloud provider has a low uptime.

Not all cloud providers are made equal. Apart from the above attributes, it's also important to check which cloud vendor matches your business objectives and your enterprise philosophy best.

2) Service Level Agreements and Reliability

Some cloud providers offer higher levels of service and customer support to differentiate themselves from their competitors.

3) Costs

Some cloud providers charge you for the actual number of servers you use, whereas others charge you for the amount of time you keep them online. Few vendors compute costs per hour whereas others compute costs by the minute.

4) Technology Stack

Cloud providers have services that work on particular software stacks. If your app is built on a particular software stack, you can simplify your cloud migration by choosing a provider that supports the same software stack.

5) APIs and Vendor lock-in

It is better to choose APIs backed by multiple providers and vendors as it reduces chances of vendor lock-in. This makes cloud migration from one provider to another easier.

6) Security and compliance

Data security concerns weigh heavily on the minds of enterprises wanting to migrate to the cloud. Make sure that your cloud platform provider is compliant with security standards and data

safety regulations.

7) Deployment models

For most large enterprises uprooting their entire on-premise cloud workloads and migrating them to a public cloud maybe challenging and unnecessary. Enterprises may choose to migrate only some of their workloads to the cloud and work with a hybrid cloud strategy. It's important to check if your cloud provider supports hybrid cloud configurations.

8) Regional support

If business requirements or data safety laws mandate data localization in a particular country or region, then it is necessary to check for regional availability of your cloud provider.

9) Autoscaling

Autoscaling is important for applications that are likely to experience demand peaks and troughs. Bringing more servers online for handling higher workloads and taking them offline when not necessary ensures you pay-as-you-use.

10) Network connectivity

Evaluating your cloud provider's network connectivity is crucial, particularly so if you are running latency-sensitive applications on the cloud.

CHAPTER 4

ARCHITECTURE OF A CLOUD PLATFORM

Piecing the Cloud Puzzle together

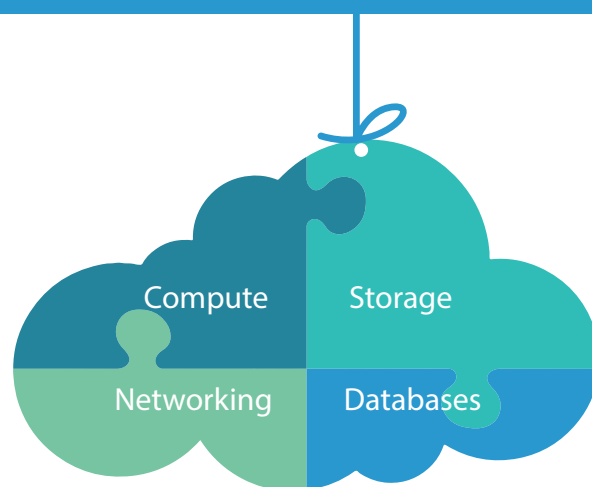
What is a Cloud Platform?

A Cloud is a comprehensive platform providing services that support application development and hosting. The services offered by a cloud platform may be categorised into fundamental services and higher level services. The higher level services are built on top of the fundamental layer.

Let's explore the essentials and add-ons of a cloud services suite:

A. Building-block services

Any self-respecting cloud provider will have these fundamental services in his arsenal.



The fundamental services offered by Amazon and Google Cloud platforms are:

- **Compute**
- **Storage**
- **Networking**
- **Databases**

B. Higher-level services

Both vendors also offer higher level Services built on top the core stack of services. The services provided are diverse and mostly meant to make working on cloud easy by offering an additional layer of abstraction or easier management of deployments.

- **Application services**

Function: To optimise applications using the cloud.

Examples: AWS SNS and Google Cloud Pub/Sub.

- **Data services**

Function: To enable processing of Big Data.

Examples: Amazon Kinesis and Google Cloud Dataflow

- **Management services**

Function: To track performance of applications running on the cloud

Examples: Amazon CloudWatch and Google Cloud Monitoring

Both Amazon and Google cloud platforms are backed by a robust set of basic services. But that's not all! Both are constantly innovating to strengthen core architecture further and add higher level services. Both Amazon and Google recently launched machine learning services as a new product family. Machine Learning is expected to power the next wave of enterprise IT products. Offering such cutting edge tech as a cloud service is the fastest way to mainstream its benefits, as developers everywhere can now build apps that harness its potential.

Google entered the cloud game late, but the Alphabet Inc is not one to be left behind! Google is launching new products at a rapid pace to power the next wave of cloud evolution.

CHAPTER 5

The 'Compute'

In Cloud Computing

Cloud computing, as the name suggests, refers to the provision of computing power over the internet. Let's compare what our favorite vendors Amazon and Google offer in the IaaS-PaaS segment.



Amazon's IaaS is called Elastic Compute Cloud (EC2) and Google's IaaS is known as Google Compute Engine (GCE)

Both IaaS services are robust and offer similar features under different names.

Feature	Amazon Elastic Compute Cloud	Google Compute Engine
Virtual Machines VMs	Instances	Virtual Machines, Instances
VM template	Amazon Machine Image	Image
Temporary VMs	Spot Instances	Preemptible VMs
Firewall	Security Groups	Google Compute Engine Firewall Rules
Scale-out	Auto Scaling	Autoscaler
Local attached disk	Ephemeral disk	Local SSD

Virtual machines (VMs)

Both EC2 and GCE let you launch and terminate VMs/instances as required. Users have complete control over the instance. Both platforms support several instance types.

Instance types

Both EC2 and GCE provide some standard instance types each of which has defined amounts of CPU, RAM and network assigned to it. GCE also allows customised instances that you can configure to fit your particular workload.

Let's look at the common instance types offered by both services:

Machine Type
Shared Core VMs for tasks that don't require too many resources but have to stay online for longer durations.
Standard VMs which provide a fine balance of compute, network and memory resources
High Memory VMs for tasks that need more memory relative to CPU resources
High CPU VMs for tasks that require more virtual CPUs relative to memory
GPU VMs that come with discrete GPU's. Google doesn't have this machine type.
SSD Storage VMs that come with SSD local storage
Dense Storage VMs that support greater amounts local HDD storage. Not Available in Google

GCE and AWS support many of the same families of instance types but Google doesn't offer two specialised families: GPUs and Large magnetic storage.

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