Briefing:
An Introduction to Cloud Computing

November, 2013

1. INTRODUCTION TO CLOUD COMPUTING

Welcome to the Introduction to Cloud Computing briefing paper. This paper is provided as a 'pdf' and is a near mirror-copy of the website introduction on www.eamonnkillian.com. If you've downloaded this briefing it is likely you want to know more about what Cloud Computing is. Everywhere you look these days there's another marketing trigger identifying the service as "in-the-Cloud" or "Cloud-like".

The objective of the website www.eamonnkillian.com is to provide material and meaningful assistance for those wishing to become Cloud Service Providers (CSPs). This means providing fundamental insights into all areas of Cloud provision whether the plan is to provide an infrastructure based Cloud or to deliver application services from the Cloud. In order to do this it is worth outlining in detail what specifically is considered a Cloud service and why it has come to be so pervasive in the Information Technology (IT) market.

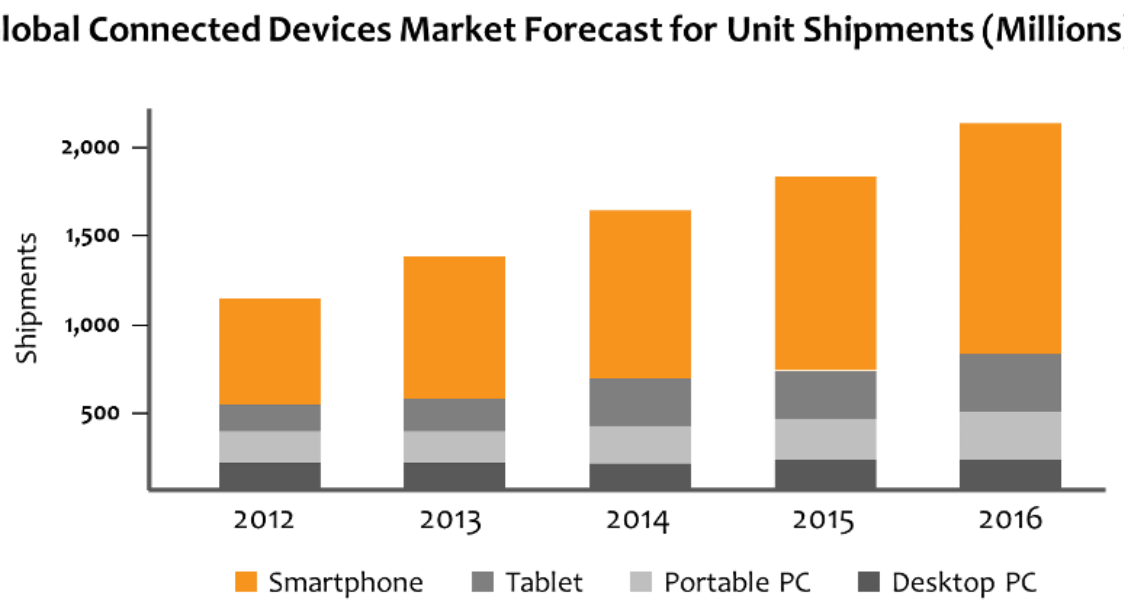
1.1 Pre-Amble

The growth in use of IT has been astounding over the past five decades. From the outset in the 1930s to 1960s it would have been clear to Alan Turing, John Von Newman, John Bardeen, William Shockley, Walter Brattain, John Presper Ekhert, John Mauchly, & Federico Faggin that computers would become vastly complex computational devices capable of helping governments and businesses to streamline operations, develop deeper insights, improve experimental outcomes, etc. In the 1970s a pioneering movement emerged around the creation of the Personal Computer (PC) spearheaded by people such as Paul Allen, Bill Gates, Steve Jobs and latterly the emergence of the home computer with inventors and innovators such as Sir Clive Sinclair, Hermann Hauser, and Christopher Curry. These inventions had an astounding impact on our societies. They were and are being eclipsed though:

- First, by the introduction of the SmartPhone to the market, first in the guise of the Nokia Communicator, Kyocera 6035 and the Blackberry but more importantly was the introduction in June 2007 of the Apple iPhone which opened up possibilities far beyond the mundane email, calendar and messaging; and
- Secondly, by the introduction of the tablet computer in April 2010 – the Apple iPAD which spawned a new era of personal computing and has grown in popularity almost exponentially.

1.2 What does this have to do with Cloud Computing?

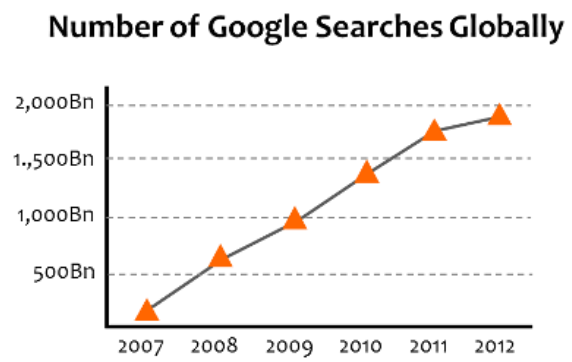
In a nutshell data and processing. The growth in computing includes all type of computers whether large scale systems housed in enterprise data centres or handheld devices. The data speaks for itself in October of 2013 there were 1 million apps available on the Apple App Store and 850 thousand on the Google Play Store. Sales of tablets and SmartPhones vastly outnumber those of PCs and Laptops.

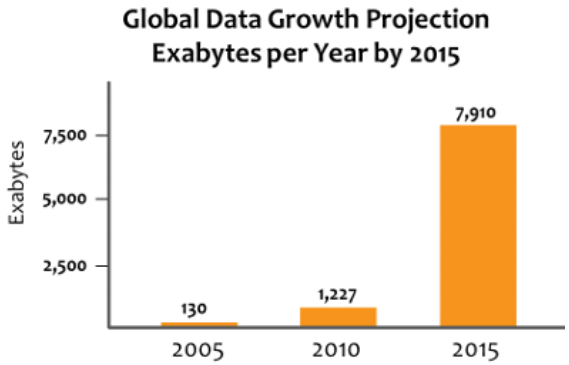


Source: http://blog.geoactivegroup.com/2012/12/dateline-2013-samsung-and-apple-battle.html

Each of these devices is driven by the insatiable desire of users to run apps of all kinds. This in turn drives the need for developers and service providers to emerge to fill this void. For instance, look at the enormous growth in Google searches since 2007!

Many of these emergent service providers realised that there was a growing need in the market for services related to these devices themselves.





Users were taking huge quantities of videos and pictures which they wanted to store in secure areas, others wanted to store documents and spread sheets, others to play online games with saved statuses, etc. This coupled with the emergence in businesses of Machine-to-Machine (M2M) communications, sensors & actuators in almost everything, Building Management Systems (BMS), and many more areas has led to an exponential rise in the amount of computing and storage resources consumed globally. In an EMC study the prediction is for 7.9 Exabytes Per Day by 2015!

This rampant demand requires a new paradigm of computing to be developed which can scale to meet these ceaseless growth challenges. This is where Cloud Computing comes enters.

1.3 So What is Cloud Computing?

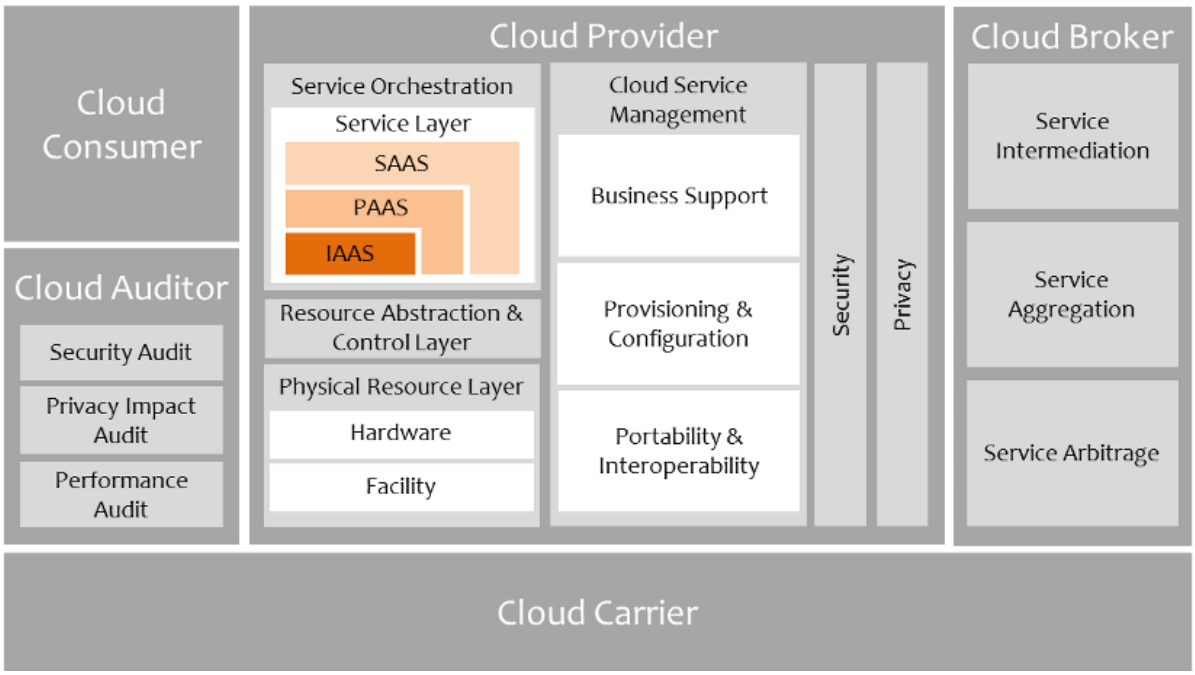
The United States National Institute of Standards and Technology (NIST) has kindly provided a definition for Cloud Computing which outlines the specific traits and characteristics an IT provision should exhibit to be classed as Cloud Computing.

It is worth noting that in "marketing" terms, and to be fair given the nascent state of Cloud Computing today, many provisions offered in the IT market today do not precisely conform to these standards but are nevertheless advertised as Cloud Computing. They identify a Cloud Computing as *"a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."*

There are five Essential Characteristics:

- On-Demand Self Service: A consumer can unilaterally provision computing capabilities , such as server time and network storage, as needed automatically without requiring human interaction with each service provider;
- Broad Network Access: Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms (e.g., mobile phones, tablets, laptops, and workstations);
- Resource Pooling: The provider's computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand. There is a sense of location independence in that the customer generally has no control or knowledge over the exact location of the provided resources but may be able to specify location at a higher level of abstraction (e.g., country, state, or datacenter). Examples of resources include storage, processing, memory, and network bandwidth;
- Rapid elasticity: Capabilities can be elastically provisioned and released, in some cases automatically, to scale rapidly outward and inward commensurate with demand. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be appropriated in any quantity at any time; and
- Measured service: Cloud systems automatically control and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service (e.g., storage, processing, bandwidth, and active user accounts). Resource usage can be monitored, controlled, and reported, providing transparency for both the provider and consumer of the utilized service.

Because of the importance of Cloud Computing NIST have also developed a "reference architecture" based on the NIST definition that can be used to help develop and build a Cloud Computing capability.



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1.4 Service Models: IaaS, PaaS & SaaS

The Cloud Computing market is estimated to be worth about $35 Billion in 2013 which is substantial for any emergent technology - not least for a market which only came into being in the past four years.

As identified at the outset the objective of this portion of this website is to provide material and meaningful assistance those wishing to become Managed or Cloud Service Providers (CSPs). There is one final component of background information to relay before diving deeper into the MSP/CSP pages - that of Cloud type or as NIST define it "Service Model". This Service Model denotes the type of Cloud vendor (you could be many) you wish to be and provides a meaningful reference point for prospective customers in the market to understand what it is that you provide. In order to understand the Service Model we need to abstract the actors involved when consuming Cloud Computing:

This icon is used to denote the physical server hardware used to process Cloud Computing workloads.

This icon denotes the physical storage hardware used to process Cloud Computing workloads.

This icon denotes application software either common off-the-shelf (COTS) or bespoke packages deployed within the Cloud Computing service.

This icon is used to denote the processes, procedures and resources employed to measure and report on the Cloud Computing workloads.

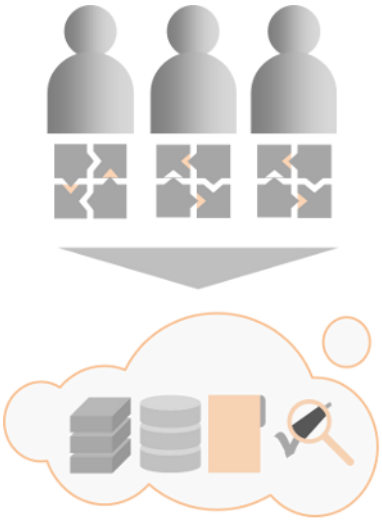
This icon denotes the processes, procedures and resources employed to manage (provision, orchestrate, & configure) the Cloud Computing workloads.

This icon denotes the Cloud service end users or Cloud Consumers.

This icon is used to denote the development resources used to programme applications delivered as part of the Cloud Computing service.

This icon is used to encase a Test or User Acceptance Test process employed within the Cloud Computing service.

Service Model #1: Infrastructure-as-a-Service(IaaS)

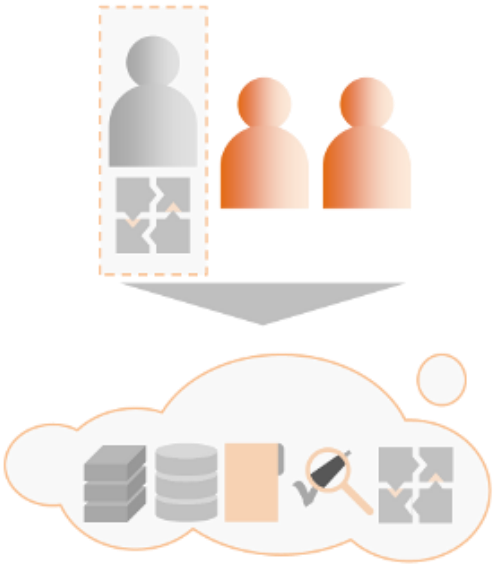


The capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, and deployed applications; and possibly limited control of select networking components (e.g., host firewalls). Often marketed or advertised as Storage-as-a-Service, Compute-as-a-Service, Backup-as-a-Service, etc.

Providers:

- Amazon Web Services
- Datapipe
- Joyent
- SoftLayer

Service Model #2: Platform-as-a-Service(PaaS)



The capability provided to the consumer is to deploy onto cloud infrastructure consumer-created or acquired applications created using programming languages, libraries, services and tools supported by the provider. The consumer does not manage or control the underlying Cloud infrastructure including network, servers, operating systems or storage, but has control over the deployed applications and possibly configuration settings for the application hosting environment.

Examples:

- AppScale
- Google apps
- Force.com
- Microsoft Windows Azure

Service Model #3: Software-as-a-Service(PaaS)

The capability provided to the consumer is to use the provider's applications running on a cloud infrastructure. The applications are accessible from various client devices through either a thin client interface, such as a web browser (e.g.,web-based email) or a program interface. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings.

Examples:

- Salesforce.com
- Netsuite
- ServiceNow
- MediData

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