

Should the Cloud Computing Definition Include a Big Data Perspective?

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INTRODUCTION

Vaquero et al. (2008) list more than twenty existing Cloud Computing definitions in their paper, and conclude by proposing an additional one. At this rate, we will have a confusing number of definitions before long! This is typical of the inflated expectations of a recent technology, as the cycle of hype surrounding it reaches a peak. At this stage, it is important to step back and try to see Cloud Computing for what it really is. This is exactly what the ISO/JTC1/SC38 committee proposes to accomplish in the next few years. Working Group 3 was specifically created to look at normalizing Cloud Computing terminology.

Looking at the original idea of the term *Cloud Computing*, a key question was raised, why so many definitions exist for such simple words. The basic concepts expressed by the term are quite simple. The word *computing* refers to any activity that involves computer processing or storage (Shackelford et al., 2006). A computer manipulates and stores data, which commonly reside on the hard drive of a computer, or in other hardware such as NAS (network-attached storage), commodity hardware (affordable and readily available hardware), the mainframe, etc. The hard drive can store anything, including structured data, unstructured data, software, databases, etc. In Cloud Computing terminology, these capabilities are designed as services, and these services are offered services in a *cloud*, anywhere on earth. In other words, its location does not matter. This term also refers to networked computers, among which processing power is distributed.

Where the confusion begins, and so many different definitions are generated, is if those definitions try to include: 1) different perspectives (i.e. Infrastructure versus Software Engineering); 2) too many technical details; 3) a specific technology point of view. For example some definition includes concepts like billing features, type of access, security issues, ownership of data, and even quality features associated with the technology. Since these concepts vary depending on the technology and can evolve, the definition of Cloud Computing can become broader and fuzzier over time.

One of the leading proposals for an internationally accepted definition of Cloud Computing has been proposed by the National Institute of Standards and Technology (NIST):

“Cloud computing is a model for enabling 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.” This cloud model promotes availability, and is composed of five essential characteristics, three service models, and four deployment models.

This proposal implies that the terminology of those essential characteristics, service models, and deployment models must also be precisely defined. Table 1 shows how these three concepts are defined in the NIST proposal:

The above definition was initially intended to serve as a means for broad comparisons of cloud services and deployment strategies, and to provide a baseline

Table 1. NIST Cloud Computing definition

| | | |
|--|--|---|
| Essential characteristics On-demand self service Broad network access Multi-tenancy Resource pooling Rapid elasticity Measured service | Service models Cloud Software as a Service (SaaS) Cloud Platform as a Service (PaaS) Cloud Infrastructure as a Service (IaaS) | Deployment models Private Cloud Community Cloud Public Cloud Hybrid Cloud |
|--|--|---|

for discussion – from what Cloud Computing is, to how best to use it.

This first serious proposal raises a key issue. Cloud Computing is complex, especially considering the nature of its components. Defining it comprehensively requires that every essential characteristic, service model, and deployment model be well defined and that these elements do not change over time. Since change is likely to happen in this field, a simplified version could be offered and can be expected to withstand the test of time.

To better understand what characteristics should be part of the definition of Cloud Computing, or left out of it, we propose looking at a well known and well defined concept, and see how its definition deals with characteristics that aren't explicitly mentioned, but are implied. This may help us improve the proposed NIST definition.

BACKGROUND

ISO Joint Technical Committee 1, Subcommittee 38 (ISO/JTC/SC38) is focused on Distributed Application Platforms and services (DAPS) including a working group (WG) for each subject:

1. (WG1) Web services
2. (WG2) Service Oriented Architecture
3. (WG3) Cloud Computing

WG3 is responsible for Identify, develop, and maintain JTC 1 deliverables in the field of Cloud Computing and is working with many standards developing organizations (SDO's), such as the National Institute of Standards and Technology (NIST) towards a standard definition of the term Cloud Computing. The first serious draft of Cloud Computing was to use the current definition of the SDO NIST. Currently, these

organizations are facing a major challenge, owing to the existence of multiple industry definitions due to a specific focus of each organization and a lack of consensus concerning the essential/optional characteristics that should be reflected in the definition. The main objective of this article is to consolidate different point of view without creating a new one. To achieve this goal, we will debate on two major points of view: IT infrastructure and Software Engineer rather starting a new definition without a specific focus and use concepts contained in the definition of a familiar object, a car. to keep our focus in essential characteristics when we propose amending the current NIST essential and optional characteristics. This proposal represents a step on the journey towards a clearer definition of the term, and is part of a Canadian contribution to ISO/JTC1/SC38, Working Group 3 on Cloud Computing.

THE CAR ANALOGY

The automobile, which is referred to as a *car* today, is defined by F.G. Fowler and H.W. Fowler (1976) as '*a wheeled motor vehicle used for transporting passengers, which also carries its own engine or motor.*' Most existing definitions agree on the following car characteristic: '*The car is designed to run primarily on roads, to have seating for one to 8 people, and to be constructed principally for the transport of people rather than goods.*'

Analyzing the above definition in connection with the challenge of defining Cloud Computing, we note that the car as described by the Fowlers did not include any options, such as air conditioner, warranty, equipment's features, financing modes, etc. The definition is restricted to the car's essential characteristics, such as wheels, motor, and seats for transporting people, as shown in Figure 1. Could this analogy be extended to simplify the definition of Cloud Computing?

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