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General Architecture of Cloud

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Abstract

An important element of current systems' sustainability is to increase efficiency gains in every part of the system. Because of this, not only those systems are based on information and communication technology that exist only in cyberspace, but also those that have material manifestation. Cloud computing is one of the building blocks of information technology. Therefore the cloud computing has an impact on all industries. This is the reason why the result of cloud computing examination is important. The purpose of this paper is to synthesize the general architecture of cloud systems to standardize further studies of structure and technological aspects. This method is based on philosophical foundations and represents a new perspective in information technology.

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Keywords: cloud; general; architecture; structure; layer.

1. Introduction

The history of the application of cloud computing is rather short. This technology appeared in 2008. Solutions used in building clouds are documented separately in accordance with the manufacturer's platforms used. However, documentations for the entire cloud system are missing because the manufacturing companies of construction components create only some parts of the cloud and have no interest in the standardization. The manufacturing companies are profit-driven and they strive for a monopoly situation. Therefore it is not in their interest to compare their technology to other manufacturer's technology. Because of this the structure of clouds is only documented on

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the manufacturer's own platforms. The purpose of this paper is to synthesize the general architecture of information and communication technology cloud systems. Producing the general architecture makes the study and the comparison of clouds simpler and more unified. This also applies to the safety aspect. The general architecture is the basis so that the security survey of cloud systems may be performed on a unified platform. This unified platform facilitates the negotiation of a possible vulnerability assessment and the establishment of the criteria of the risk assessment.

The study should start by laying down the general principles of cloud architecture synthesis. Detection of the components required for operation is based on examination of solutions of component-manufacturers. For example: Cisco, Computer Associates, Dell, EMC, Fujitsu-Siemens, Hewlett-Packard, Hitachi, IBM, Microsoft, Oracle, VM-Ware. These companies do not produce all part of cloud, but their products' functionality overlaps. Because of this, synthesizing the complementary elements and generalizing the equivalent elements of the solutions are needed to create the general structure. To produce a universal structure the study is based on philosophical foundations. This method is a unique way in information technologies and it creates a new aspect system.

The bases of the study are the human thinking method (nature, abstraction, modeling, revision) and the philosophical abstract categories (thing, property, relation). These elements produce a matrix structure. According to the human thinking should address the vertical layers. These layers are analogous to information technology layers (natural resources, artificial resources, virtualization, operation, management). The horizontal aspect system should be analogous to the base elements of the philosophical abstract categories. The extension of the horizontal aspect system with primary and secondary system change (control, organic change) generates a dynamic system model.

2. Study of structure

The change in the demands of IT systems created the requirement system of the cloud. Technologies that meet the requirements determine cloud behavior. The international definition of the cloud is based on this behavior: "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" [1]. In order to examine the structure of the cloud one should study those components that define the behavior specified by the cloud definition. Additionally, it is useful to determine the indispensability of each component.

2.1. Vertical structure

Based on the definition of the cloud, its main features can be grouped around the following topics: availability, structure, capacity, flexibility and measurability [2]. The structure of traditional systems was the following: network, hardware, operating system, database layer and application layer. In this approach the operating system has shared the resources provided by the hardware. The model changed after the virtualization came out. Virtualization has appeared as a new layer between hardware and operating system [3,4,5]. This technology makes it possible to resize the hardware resources flexibly. The processing points get only those resources that they need [6]. In addition, this layer affects availability [4,6], capacity [7], and measurability [8]. Because of this the study should start by examining this layer.

When using virtualization, physical IT resources, such as data storage [9], processing capacity [10], and communication elements can be flexibly arranged into logical resource groups. Then these logical resources can be assigned to virtual processing points. In this way the physically used IT resources are separated from the logically necessary IT resources [3,11,12]. Furthermore the logical resource groups are the base of the measuring [8].

The operating system specified by the traditional model is above the virtual layer. In order to make a unified statement, the operating system, the database components, the application components and the data link components should be compressed into a single layer: the operation layer. The platform for this layer is the operating system and the layer's task is to implement business processes. The top management layer above this operation layer is complemented with cloud management components [7,13].