

Taxonomy and classification of cloud computing services

Research Proposal

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ABSTRACT

This document describes a draft research proposal in the area of cloud computing services. The main research question is: “How can cloud computing services be efficiently classified and organized in a taxonomy?”. To answer this question the current cloud computing services are explored and a taxonomy is generated.

Keywords

Cloud computing services, characteristics, taxonomy

1. MOTIVATION

Cloud computing (CC) is a highly discussed topic not just in the computer science fields but also many businesses are interested what it has to offer [23]. The amount of cloud computing services is increasing fast and many big players of the software industry are joining the development cloud services. [2, 23, 17, 20]

The National Institute of Standards and Technology (NIST) proposed the following definition of cloud computing: “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” [18].

Many companies want to explore the possibilities and benefits of cloud computing. However, there is a lack of standardization [23, 17, 12] and the great amount of different cloud computing services (CCS) it is hard to compare the offers and to find the right service.

This paper will attempt to organize existing cloud computing services by proposing a taxonomy. It will describe a tree-based structure to easily classify cloud computing services. This will make it easier to compare cloud services and to identify areas suitable for standardization.

2. RESEARCH QUESTIONS

The main research question is: How can cloud computing services be efficiently classified and organized in a taxonomy?

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13th Twente Student Conference on IT June 21st, 2010, Enschede, The Netherlands.

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In order to answer this question the research is broken down into subtasks. First it needs to be researched what cloud computing services are currently available. The NIST already differentiates types of cloud services in their definition and standardization efforts, so these categories should be considered when researching available services. These categories will be the first characteristic used in the taxonomy. Next for each category it needs to be researched which further characteristics differentiate the found services. Then the most significant characteristics will be examined to develop the taxonomy. Finally, the taxonomy will be explained, and it will be shown with an example, how it can be used to classify and compare cloud computing services. Other tasks include reading and making notes about the found references, writing the answers for each sub-question and working out the introduction and conclusion. Final tasks are formatting and proof reading.

The research tasks described lead to four sub-question that will help to gather the information to answer the main question. The sub-questions are listed below. Beneath each sub-question is a list of references to be used to answer the question, together with a brief description of the relevance.

2.1 What cloud computing services are currently available?

The following references can be used to answer this question:

- General information on cloud computing services: [2, 30, 3, 25, 31, 15]
- Official websites of major cloud computing services: [1, 11, 26, 16, 27, 19, 22, 10, 13, 21, 24, 9, 8]
- Information on Google’s App Engine: [11, 14]
- Information on cloud computing standards and definitions: [5, 4, 6, 18]
- Open-source based cloud computing services: [32, 9, 8, 13]
- General information on new cloud computing services, such as gaming: [7]

2.2 What are the main characteristics that differentiate them?

The following references can be used to answer this question:

- Mentions or describes characteristics of cloud computing services:

[2, 30, 3, 17, 25, 12, 15]

- General information on the security of major cloud services: [28]
- Gives comparisons of cloud computing services: [3, 29, 25]
- Describes open-source based cloud services: [32]

2.3 How Could the CCS Characteristics Be Used to Generate the CCS Taxonomy?

The following references can be used to answer this question:

- Proposes a simple classification: [30]
- Proposes an ontology of cloud computing: [33]
- Proposes a taxonomy: [25]

2.4 How can current CCS be categorized in this Taxonomy?

The resources listed above can be used for this question.

3. RESEARCH APPROACH

This research will mainly be based on literature study, an analysis and comparisons of existing cloud computing services and the generation of a taxonomy. Question one and two will provide the information to design the taxonomy. Question three will examine the features suitable for the taxonomy and propose a framework for the classification. The last question will illustrate how cloud computing services can be compared using the taxonomy.

4. ROUGH PLANNING

In Table 1 a tentative planning for the different tasks during this research is given. Important dates are in bold typeface, representing fixed deadlines or important decisions. The main research question is split into four sub-question. For each of them a week is taken into account in the scheduling. Some questions may take more time, while others take less. Afterwards there is still time left to check the coherency of the paper, work out the introduction conclusion and to finalize the paper.

5. STATE OF THE ART

Cloud computing is currently one of the biggest buzzwords, however, it is not a completely new concept [28]. It uses many existing technologies and approaches, such as centralizing computing power, utility computing, distributed computing and even software as a service [31]. Already in the 1990s Sun tried to promote the use of thin clients [28] and many companies have been offering hosting services for websites, online storage and computing power for years [30]. The new idea is that cloud computing combines all of the above concepts and everything has to be accessible through the network around the clock [31]. Cloud services are expected to offer rapid elasticity and on-demand self-service, meaning that customers can request more resources whenever needed without requiring human interaction [18]. Further, the customers do not need to have any technical expertise in the underlying technology and the control and maintenance is done by the service provider.

Currently three service models are being differentiated - Software as a Service (SaaS), i.e. online applications, such as web-based email, Platform as a Service (PaaS), which allows customers to deploy their own applications, and Infrastructure as a Service (IaaS), which provides, for example, processing power or storage [18]. However, beyond

Table 1. Planning

Week	Date	Activity
6-10	8 Feb-11 March	Collect literature
10	Th 11 March	Deadline proposal for peer review
10-11	11-15 March	Peer reviews
11	Mo 15 March	TPC meeting to discuss peer review
11-12	15-25 March	Revise proposal
12	Fr 26 March	Deadline proposal final version
12-14	26-4 April	Start writing paper (read literature, make notes)
13	29-2 April	Receive GO/NO-GO decision
14	5-11 April	Answer sub-question 1
15	12-18 April	Answer sub-question 2
16	19-25 April	Answer sub-question 3
17	16-2 May	Answer sub-question 4
18	3-9 May	Work on introduction and conclusion, check coherency
19	10-16 May	Finalize paper
20	Mo 17 May	Deadline draft paper for peer review
20-21	17-25 May	Peer reviews
21	Tu 25 May	TPC meeting to discuss peer review
21-22	25-1 June	Revise paper
22	Tu 1 June	Deadline paper
22-23	1-8 June	Format paper
22-23	2-7 June	Receive acceptance/ rejection notification
23	Tu 8 June	Deadline camera-ready paper
23-24	8-18 June	Prepare slides for conference
25	Mo 21 June	Conference

these categories no further differences are made in current definition. Though, differences for further classification can be found, for example, whether SLA or certain security mechanisms are used [28] or whether the service is compatible with other providers' services.

There are several organizations [6, 18, 4, 5] attempting to create standards and trying to ensure interoperability between cloud services. Standards are necessary to enable applications to be ported easily from one cloud to another and it will also make it possible to work with multiple providers [12]. Though, most of the efforts are aimed at IaaS [23].

A taxonomy for cloud computing services has been proposed [25]. However, the paper supplies a completed table, that lists different cloud computing services. Rather than providing a method to compare existing and future cloud computing services, it aims to find the strengths, weaknesses and challenges in current cloud systems.

In this paper a new, tree-structure based taxonomy is developed, which helps to easily and quickly compare existing and future cloud computing services. The classification can also help researchers identify areas that could be standardized.

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