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Performance of Jails versus Virtualization for Cloud Computing Solutions

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Abstract

The existence of a virtualization layer within the cloud affects the resources optimization and the reduction of requirements of its implementation. In this publication the focus will be the use of jail environments, provided by the FreeBSD Operating System, which present a relevant set of features that can enhance the increase of performance. A set of data collection tests that allows measuring the degree of optimization obtainable in current models of cloud computing, based on the use of hypervisors tests, are presented. These tests proved that the increase in performance and optimization of resources is possible, bringing up the need to adapt the current models of cloud computing for the use of such solutions. However, this increase in performance, leads to a loss of flexibility of the usage of independent operating systems, which is not relevant to the model of cloud computing business.

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1. Introduction

Currently the vast majority of information systems are based on cloud computing, where applications and data are stored remotely. Resource consumption and performance in the execution of applications are matter of extreme importance with regard to computational systems and high availability solutions in particular. When referring about cloud solutions these attributes have an important and significant role in the nature of its business model [1].

Major part of the existent cloud computing solutions is based in virtualization. Which is a method to emulate the presence of a specific set of hardware [2], providing platform independent installation environments. Where each virtualization solution implements different ways of optimizing data access, either through mapped shares or via network protocols [3].

The requirements for implementation of any high performance solution are a major obstacle to its use, and indulging in cloud solutions, the investment required is huge. For this reason it is necessary to conduct studies and tests in order to increase the performance of the solutions and reduction of hardware [4-10].

Several solutions have been presented [4, 9], and in particular, container-based solutions, has undergone a constant reference to the future of the cloud, but the lack of measurements, combined with difficulty of presenting comparative amounts in real solutions has hampered the use of this types of solutions.

There is thus a clear need to adapt the current models used in the cloud, since the features of containers, and in particular of jail environments are not available in virtualized environments currently used in cloud computing solutions [9].

1.1. Jail environments

The jail environments are environments based on trapping processes, best known as containers and are essentially based on three features of the system: kernel, file structure and network address [2].

It may resemble the virtualized systems, however, it does not require any type of virtualization, and the access to resources is made concurrently by all running instances running, although, they are limited to their specific system files and are inflexible environments, because they are dependent on the type of base operating system [2].

The operating system should be the point of greatest gain in jails based systems, since the trapped systems are based on the sharing of the running kernel by the base system, thus eliminating the need for additional resources related to the implementation of a new system instance operating. Thus there is a significant saving of resources such as storage space, memory and processing.

Another pertinent point is required by the file structure of a jail, which is relatively lower than any actual operating system installation files space, being a simplified copy of the basic structure of a base FreeBSD system, requiring fewer storage resources.

The jail environments are based on optimizing the use of the base system, and focused mainly on two aspects, one related to the sharing of software among environments and the ability to map distributed areas [9].

The aim of this study is to measure the performance of data access, using up to 3 different protocols, which allows a comprehensive view of the behavior of the performed tests. This is a simple way of starting to research and to collect data for possible optimizations using open source software, since it requires less hardware resources.

2. Methodology

Aiming at the need of obtaining measurable values for preparation of a comparative analysis between virtualized and imprisoned environments at the level of performance and consumption, we begin with an analysis of high-level requirements.

Is shown in Table 1, a comparative analysis and summary of the requirements required by the solutions of implementing virtual environments.

From Table 1 it can be assumed that the use of trapped ambient will allow a considerable reduction in the level of requirements to implement this type of solution, and the resources consumed by the computer system will be much lower.

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