A New Cloud Computing System Optimization Model Based on Neural Network and Random Field Theory

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Abstract. In this paper, we propose a new cloud computing system optimization model based on the neural network and the random field theory. Cloud computing is committed to in a more liberal environment, sharing cloud resources in a wider range of space, for a wider users to provide the more information service and knowledge service, its ultimate purpose is to provide different customers a variety of resource shared service. Cloud computing three-tier architecture reflects the different levels of the main function and its role, is to provide all kinds of targeted cloud resources shared services. To enhance the traditional systematic structure, we combine the neural network and the random field theory for modification that achieves the satisfactory optimization.

Introduction

Cloud computing is a new kind of calculation model, through the Internet to provide various services, therefore, the user can use any device anywhere access to cloud services anytime and anywhere. In addition, users do not need to know how a cloud platform to work, they just need to access the service through the network browser. Due to its convenience and huge capacity, cloud computing is seen as the next generation of computing model. Virtualization in the cloud resource management plays a key role and dynamic configuration, through the virtualization technology can encapsulate the underlying various hardware resources, to the virtual machine as the basic resource units provide service to user.

Google think cloud computing is to allow the user to the data of all the existing online remote data center, just through the Internet when they need to connect to the data center will be able to get these data, and need to calculate the data of time also can through the Internet connection to the data center is calculated. Individual users use what operating system is not important, because as all of the cloud computing applications are carried out through the browser. All the web pages in the W3C standards, the future of all Internet applications will continue to follow this standard, so we met today will not be compatibility problems. As we have today, no matter use what operating system, no matter use what the browser can also enjoy the search engine and E-mail service [1-3].

In the vast platform, cloud computing is huge waste of resources. In a parallel and the distributed computing environment, the allocation of resources deployment are mostly in order to meet basic user needs and reserve resources, and most of the time for the task will not call to reserve the resources, computing resources waste that reflects the listed challenges. (1) Traditional users cannot recognize myself uncontrolled environment can provide better security at the same time, the user's personal computer or the small and medium-sized security server far from cloud computing environment. But everything there are advantages and disadvantages, through both equilibriums the users can find suits own data security solutions. (2) For small and medium enterprises, the cloud service is practicable, but widely used in large enterprises to the cloud service must first overcome the technical, operational and financial obstacles. (3) At present, there is no common ground between the cloud and cloud standards, that is to say, the enterprise users from a hard switching to the another service suppliers to reduce the flexibility of primary service transfer [4].

Random field model generally cannot be used directly in the stochastic finite element analysis, and should be expressed in a finite number of random variables with the airport approximation with the random field to replace, the so-called discrete random field. However, due to limitation of numerical calculation accuracy, the discrete process is likely to damage the correlation coefficient matrix is qualitative. This article through to two common random field model is the qualitative analysis of the correlation coefficient matrix, that is used to increase in the number of random variables cannot be infinite discrete random field, as the growth of the number of basic random variables, the correlation coefficient matrix are qualitative will be destroyed, and the random variable upper limit of the number of estimates is given. In the figure one, we show the application scenarios of the cloud computing.

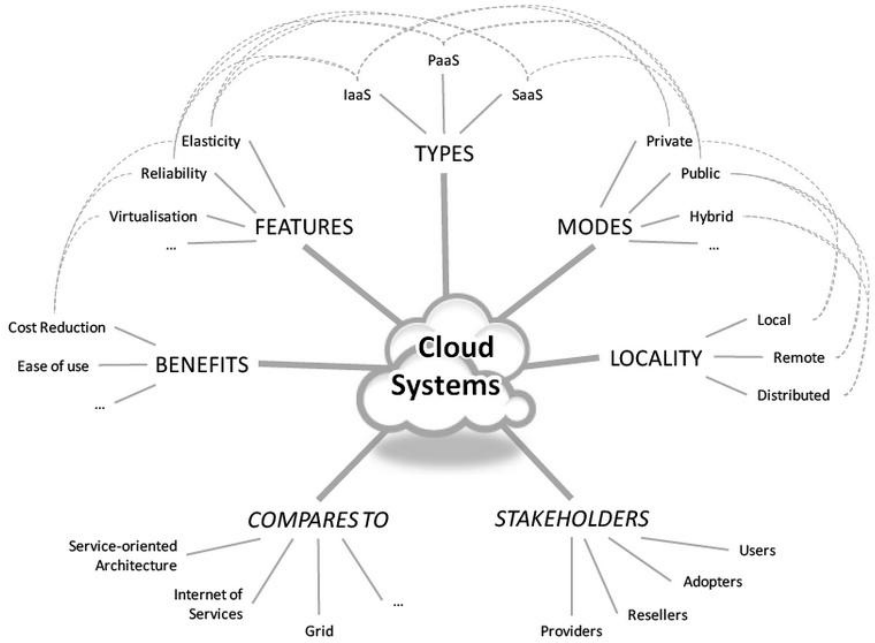

Figure 1. The Application Scenarios of the Cloud Computing System

In this paper, we propose a new cloud computing system optimization model based on the neural network and random field theory. The basic principle of cloud computing is by making the calculation of distribution on a large number of distributed computers, rather than the local computer or remote server, the operation of the enterprise data center will be more similar to the Internet. In the later part we will discuss the issues from the neural network and random field perspectives.

The Proposed Algorithm

The Principles of the Cloud Computing. Cloud computing is a commercial calculation model based on the Internet. Using high-speed Internet transmission capacity, the data processing from the PC or server to the Internet server in the cluster, the server is managed by a large data processing center, data center according to the customers' needs to allocate computing resources, to achieve the same effect with the super computer. Cloud computing is emerging business computing model using high-speed Internet transmission capacity, the data processing from the PC or the server to the Internet computer cluster. These computers are very common industry standard servers, by a large data processing center management, data center computing resources, according to the customer requirements to achieve the same effect with the super computer and this is described in the former do not need to be a powerful personal terminal can enjoy cloud computing brings a lot of convenience [5-6].

Cloud computing is a service provided by the system, with the basic implementation of the service mechanism is transparent to users, users need to know the detailed mechanism of cloud computing, we can gain needed services which could be separated into the listed aspects.

(1) IaaS. To rent out a large number of infrastructures as a service, cloud computing through the virtual technology to abstract and encapsulate the basic infrastructure for a huge resource pool provides service to the user.
(2) PaaS. Plus on IaaS a particular custom software stack, can be described as a complete virtual platform: it includes the primary operating system and necessary services around a particular application. It can provide users a development environment or applications environment.
(3) SaaS. Based on the primary application of the Internet provide software service pattern, is the development trend of general management software, and cloud computing deployment of best practice, because of the SaaS based on object for the software and the Internet, so it's about cloud computing itself and performance of network performance has the very big dependence.
(4) Cloud computing architecture is based on programmable infrastructure, based on the operation of the unified management platform, as required for the allocation of resources the network architecture. The whole cloud computing system on logic is often divided into front-end and back-end two main parts and the front is the part of users can directly see back-end is cloud system, two parts through the network general and the primary interconnection.

The Neural Network. Nonlinear network error of surface is much more complicated than the error of the linear network side the problem is the multilayer network with multiple local optimal solution in the nonlinear transfer function. Optimization of the process and the selection of the initial point relationship is very big, if initial point closer to the local optimal point, rather than the global optimal point, won't get the right results, it is also a multi-layer network couldn't be one of the reasons that the optimal solution. Using the same or the different learning algorithm to learn mutually disjoint subsets respectively and the study results are combined, the method of both improves the speed of the to deal with large data sets and can ensure the accuracy of learning results [7].

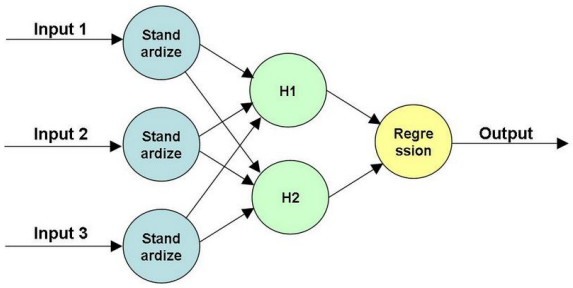

Figure 2. The Demonstration of the Neural Network Architecture

Two important characteristics of neural network as a distributed and parallel, the description refers to a distribution in multiple processing nodes; Parallel refers to computing in distributed processing nodes in parallel way. Even though each individual neural network in parallel processing data but let the distribution of the multiple neural networks processing a task is a difficult point. Because of the neural network learning process requires to submit all sample data for neural network training until its stability after circuit training for once or several times as formula one.

$$e_{general} = \frac{1}{2}\sum_{o=1}^{q}\left(d_0(k) - y_0(k)\right)^2 \tag{1}$$

Weight vector of the neural network represents the knowledge points as these two characteristics ensure the even on behalf of the training samples of a kind of knowledge is divided into many subsets can be preserved when learning the distribution and concentration was extracted after learning.

$$E_{enhanced} = \frac{1}{2m}\sum_{k=1}^{m}\sum_{o=1}^{q}\left(d_0(k) - y_0(k)\right)^2 \tag{2}$$

Required to determine whether a network error. When the error reaches the preset accuracy or learning set number is greater than the maximum times is the end of the algorithm. Otherwise, select

the next learning samples and corresponding expected output, returned to the third step, into the next round of learning. Study first determines whether the end, if no, then calculate the similarity values, and the function to calculate the competition winning neurons; If less than or equal to the similarity of the winning neuron similarity threshold method, fixed neuron weights depending on the learning algorithm, or add new neurons and add new neurons of weight value vector for time to submit sample.

It is the main advantage of BP neural network has strong nonlinear mapping ability. Second, the BP neural network has remarkably unresponsive to external stimuli and the ability to enter information for associative memory. Again, the BP neural network to outside input samples has a strong ability of recognition and classification. Because it has strong nonlinear processing ability, can better nonlinear classification, solves the nonlinear classification problem in the history of the development of neural network. In addition, the BP neural network optimization computation ability. BP neural network is essentially a nonlinear optimization problem, it can be known constraints, looking for a set of general parameters combination and make the combination of basic certain objective function is minimum, the local minimum problem, however, optimization calculation, and must be improved. The formula 3~4 demonstrates the enhanced objective function [8].

$$f\left(x\right)=\sum_{i=1}^{N} w_{fi}\psi_i\left(x,c_{(i)},\delta_{(i)}\right) \tag{3}$$

$$g\left(x\right)=\sum_{i=1}^{N} w_{gi}\psi_i\left(x,c_{(i)},\delta_{(i)}\right) \tag{4}$$

The Random Field Theory. In the Boltzmann machine in the network, the state of each neuron is binary, but in practice, people often multi-valued problems, such as images of each pixels, gray has multiple possible values, when dealing with such of problems, binary Boltzmann machine needs to be improved and promoted. Based on Markov random field model, this paper discusses this kind of basic model and the Boltzmann machine model, by using the binary Boltzmann machine was put forward multivalued Boltzmann machine with a model of the evolution.

In the tree in the undirected graph G, the biggest group c as consisting of a node and its parent node to. In G, any two brother node is not in the same biggest group, they were independent of condition. But the real problem, they are often influence each other and have to take into account, such as in the syntax tree, nodes before the nouns are likely to be the nodes and can't be adverbs adjectives. So we assume that, between the adjacent two brother nodes linked by edge, adjacent nodes and their parent two brothers of a group of biggest that could be reflected from the figure three.

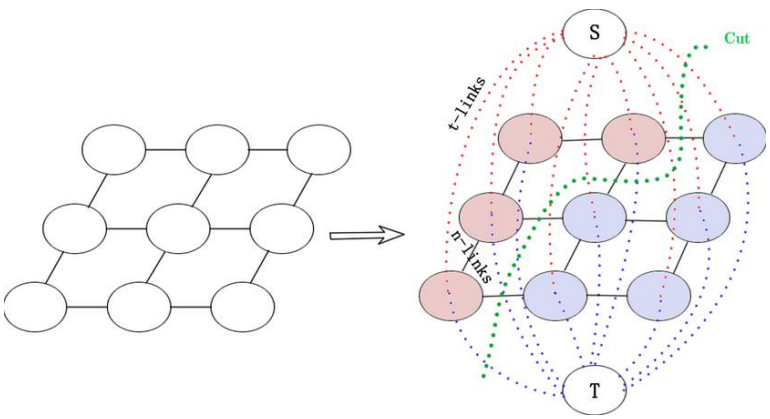

Figure 3. The Visualized Demonstration of the Random Field Theory

Markov random field is proposed in this paper the line, its primitive is not pixel gray level, but has certain directional line element and the spatial relationship is compatibility relation between the line element and in practice, line element can represent boundary element, so the line element of Markov random field object boundary detection has potential application prospect.

The Cloud System Optimization. Highly efficient simulation of complex system mainly comes from two types of user requirements, and one kind is high-end complex systems modeling simulation requirements, another kind is to establish a highly efficient cloud simulation center, provide vast users on demand "cloud simulation service" requirements. Cloud simulation is the author proposed a new network based on the concept of cloud computing model, the modeling and simulation is through the network simulation platform, cloud, basic on-demand online simulation resources and capabilities, to provide users with all kinds of simulation of service a new simulation model [9].

In cloud computing system composed of heterogeneous server, because the same task in different time and server running on the server execution power is different, in different execution on the server on the same task computing performance and energy consumption will be different. The execution of the energy consumption and server when performing a task of dynamic power and is closely related to the execution time of tasks on the server.

In the cloud computing model, it was assumed that at the beginning of the environment, resource consumers and providers do not exist, however, when there is an resource providers, and the system automatically quantitative and virtualization operation, if the consumer request "consumption", also perform quantitative operation, established to determine its utility function and consumer preference. Among them, the utility function refers to the utility gained by the consumer in the consumer and the commodity consumption by the combination of the quantity relationship between the function.

Although cloud data management is considered to be a kind of green management pattern, but it does not provide a mature basic solution to assess and reduce the energy consumption and energy consumption optimization method is still needed to effectively implement "basic green computing". Studies of cloud data management system to optimize energy consumption, the first is to define the measurement model of energy consumption and benchmarking method, primary analysis of energy consumption characteristics of various kinds of cloud data management system.

Summary

In this paper, we propose new basic cloud computing system optimization model based on the neural network and random field theory. With the coming of the era of big data, how to efficiently calculate and basic store data becomes the key issue in the future network computing needs to solve. Cloud computing is in parallel processing, distributed computing, grid computing is developed based on the fusion technology such as the general network computing technology. Cloud computing technology is economical and practical, high scalability, high reliability, convenient and on-demand service, etc. In recent years, cloud computing technology application is more and more widely, the cloud computing is applied to mobile communication system of the baseband cloud can effectively solve the problem of frequent switching high-speed mobile terminal. Our research combines the neural network and random field to enhance the traditional method that is effective.

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