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Dynamic resource allocation for distributed file system in Cloud computing

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Abstract – **Distributed computing enables clients to utilize assets in view of the requirements of the relating applications. A standout amongst the most critical strategy in the distributed computing is virtualization method which is utilized for multiplexing of assets, servers, and so on. In spite of the fact that an Inter cloud is an interconnected around the world "surge of fogs" that enables each cloud to exploit asset of various fogs, joint efforts among Inter cloud accomplices are mind boggling in light of the way that Inter cloud assets are scattered and controlled by different fogs. "Administrator based disseminated registering" incorporates the improvement of experts for fortifying disclosure, planning, assurance, association, course of action, arranging, work process, and checking of Inter cloud asset. An authority is a PC system that is fit for settling on decisions self-sufficiently and associating with various administrators through support, coordination, and exchange. Using an administrator based approach, traits related with watchful practices of masters, for instance, conveying socially through interest, coordination, and exchange can be joined with fogs. This paper 1) inspects the vitality and good conditions of using an authority perspective for Inter cloud asset appropriation, 2) overviews designate models of administrator based Inter cloud Resource assignment and gives a relationship among these models, 3) contemplates pro based and non-administrator based procedures for undertaking executions in different fogs, and 4) offers pointers to future headings.**

Key words: Autonomous specialist ,Cloud computing, Load rebalancing, Distributed file system, Inter cloud, Resource management

1. INTRODUCTION

Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources. One of the essential aspects of cloud computing is creating the illusion that “infinite” computing resources are available on demand. However, the resources held by a single cloud are usually limited and it may not be able to deal with a sudden surge in user demands. An Intercloud is an interconnected global “cloud of clouds” that enables cooperation among clouds. In an Intercloud, each cloud can tap into resources of other clouds when it does not have sufficient resources to satisfy consumers’ requests. Interclouds are classified into federated clouds and multi-clouds. In a federated cloud, providers voluntarily interconnect their infrastructures to enable sharing and exchange of resources among themselves.

Cloud computing allows transformational changes with usability, performance, elasticity and security over measurement and characterization for load prediction. But based on the specifications from the cloud users it cannot be modeled accurately based on raw measures which show little variability and less auto-correlation . Virtualization is the one of the most important techniques used in Cloud computing. It supports the cost efficiency while the usage of resources, on demand services and provides resource scalability. The comparison between traditional data center oriented models over the enhanced models and computational services is satisfying the users by providing the quality of service (QoS). Towards to provide the optimum in both computing environment and resources used must give the efficiency, reliability with the co-ordination of the above. This requires the delivery of a set of virtual resources, dynamically allocated to the corresponding server within networked clouds. Pay-per-use infrastructure method is the main advantage of cloud computing. Because it is used to host hundreds of thousands of applications to face the challenges in the resource utilization, resource management, resource pre-reservation [1], [2]. So with the vast positive advantages of Virtualization is becoming most popular technology to frame the infrastructures in the virtualized cloud environment. Among all the Virtual Machine Monitors (VMMs), Xen is defined to be a conspicuous hypervisor based VMM [3]. This VMM is actually used to provide the communication between the Virtual machine (VMs) and Physical Machines (PMs). This communication is hidden from the cloud users. In such cases the each PM must have the sufficient resources which will be requested in the future by the VMs. The mapping between the above two machines is possible means, then the mapping is migrated using the migration list in the VM in order to support green computing by minimizing the number of PMs [4], [5]. Cloud computing allows Transformational changes with usability, performance, elasticity and security over measurement and characterization for load prediction. But based on the specifications from the cloud users it cannot be modeled accurately based on raw measures which show little variability and less auto-correlation [6]

Goals to achieve:
Overload Avoidance:
The capacity of a PM must satisfy the resource needs from all VMs running on it. Or else, the PM is overloaded and leads to provide less performance of its VMs.
Green computing:

The number of PMs used should be optimized as long as they could satisfy the needs of all VMs. And Idle PMs can be turned off to save energy.

There is an in depth trade off between the two goals in the face of changing resource needs from all VMs. To avoid the overload, should keep the utilization of PMs low to reduce the possibility of overload in case the resource needs of VMs increase later. For green computing, should keep the utilization of PMs reasonably high to make efficiency in energy.

Federated clouds are classified into centralized (resource allocation performed by a central entity) and peer-to-peer (no central authority) modes. Clouds interconnected at the same layer (e.g., between two or more IaaS providers) is called a horizontal federation and clouds interconnected at different layers (e.g., between a PaaS provider and an IaaS provider) is called a vertical federation. In a multi-cloud, cloud providers do not necessarily volunteer to interconnect and share their infrastructures, and consumers are responsible for managing resources across multiple clouds.

In a broker aggregated service multi-cloud, cloud brokers provide resource selection and aggregation services. An specialist is a computer system that is capable of making decisions independently, carrying out actions autonomously, and interacting with other specialist through cooperation (working together and drawing on each other's knowledge and capabilities), coordination (achieving the state in which their actions fit in well with others), and negotiation (trying to reach agreements on some matters).

Adopting an specialist paradigm enables clouds to maintain their autonomy and interact more intelligently and more efficiently through social interactions, and allows specialist-based Intercloud resource allocation systems to be designed with desirable properties specified and proven using game theory.

1) Modeling an Intercloud as a multispecialist system (MAS) enables individual clouds to operate as autonomous components within a larger interconnected system. Using specialist to automate the interactions among clouds allows each cloud to have more control over its own resources by having more flexibility to implement its own scheduling policies (e.g., scheduling its own tasks at some preferred time slots) while committing to execute the tasks of others. In an MAS, conflicting schedules may be resolved through automated negotiation among specialist.

2) By modeling an Intercloud as a multispecialist system, "intelligent" characteristics can be built into clouds. "Cloud intelligence" refers to the characteristics of cloud specialist that are associated with intelligent behaviors of specialist. In ABCC, specialist are designed to automatically establish service contracts through negotiation, integrate multiple resources from different clouds into a unified service through cooperation, and manage concurrent workflow and schedule parallel execution of tasks in multiple clouds through coordination. The ability to interact socially through cooperation, coordination, and negotiation is considered as an intelligent characteristic of specialist.

3) Since specialist' interactions can be analyzed using game theory, by modeling an Intercloud as a multispecialist system, the interaction protocols and strategies (specifications of what to do in every alternative during an interaction) of cloud specialist can be designed based on well-known solution concepts from game theory.

2. SPECIALIST-BASED INTERCLOUD MODELS

This section reviews representative models on specialist-based approaches for the discovery and matching, selection and composition, monitoring, negotiation, and scheduling and workflow of Intercloud resources.

Discovery and Matching
This sub-section reviews two approaches for finding appropriate resources that comply with service requests.
1) Matching Requests to Services using Multiple Brokers: Kang and Sim developed an specialist-based multi-cloud

testbed for service discovery consisting of consumer specialist (CAs), broker specialist (BAs), and provider specialist (PAs). Each CA (respectively, PA) sends its requests (respectively, advertisements) to a BA. Using similarity reasoning, each BA attempts to match requests to advertisements (similar to allocation by brokers in supplemental material). Similarity reasoning determines the degree of similarity between concepts by counting their common properties.

In matching prices and time slots of PAs and CAs, a BA attempts to match CAs with PAs that 1) can accommodate the time slots specified by CAs and 2) have acceptable prices that do not deviate too much from those of CAs. Multiple BAs are used in the testbed. To enhance the chance of finding a good match, each BA can transfer unmatched requests from CAs or unmatched advertisements from PAs to other BAs for further matching. Even though empirical results in suggest that this approach can match requests to advertisements with reasonably high success rates, the disadvantage is that an additional set of special specialist (BAs) is needed to manage the matching process by centralizing the requests and advertisements. 2) Specialist-based Cross-cloud Federation: Celesti et al. developed an specialist-based testbed for horizontal Intercloud federation.

The testbed consists of: home clouds (HCs) and foreign clouds (FCs). HCs are clouds that require additional storage or computing capacities from other clouds. FCs lease part of their computing and storage capacities to HCs. A cloud provider can simultaneously assume both the roles of an HC and an FC.

In each cloud has a cross-cloud federation manager (CCFM) that interacts with other CCFMs in a three-phase process (discovery, match-making, and authentication) using three types of specialist: discovery specialist, match-making specialist and authentication specialist.

Discovery specialist (DS): The Intercloud discovery process in is managed by DSs. DSs communicate among themselves using the publish-subscribe messaging pattern where senders of messages are called publishers and receivers are called subscribers. Each (publisher) DS publishes information about the states and service capabilities of the resources of the cloud that it represents at a centralized location (which is an intermediary message broker or event bus). A set of authorized (subscriber) DSs representing other clouds can access the information in the centralized location. In the publish-subscribe messaging pattern, published messages are characterized into classes, without knowledge of the subscribers. Similarly, by subscribing to one or more message classes, subscribers only receive messages that are of interest without knowledge of the publishers. During the discovery process, the DS of each HC can compile a list of potential FCs by retrieving the information about their service capabilities and availability from the centralized location.

The authentication process is based on the concept of single sign-on (SSO) authentication, where an HC can gain access to the resources provided by the FCs without further identity checks if both the HC and FCs already established a trust context that allows cross-cloud resource provisioning. The MA of each HC authenticates itself with the FCs using a digital identity that is issued by a trusted IdP. Since the selection of resources in is based only on 1) the matching features between resource specifications and 2) trusted IdPs, there is no economic mechanism for pricing resources and optimizing resource utilization in a cloud federation. This issue was investigated in.

3. SPECIALIST-BASED CLOUD NEGOTIATION MODELS

This sub-section compares the negotiation patterns, concession-making strategies, and interactions and market structures of specialist-based cloud negotiation models in. 1) Negotiation patterns: Adopting the one-shot negotiation pattern, specialist in generally do not have a chance to modify their proposals in the hope of reaching an agreement. Adopting the alternating negotiation pattern, specialist in are allowed to make a series of proposals.

As such, they can revise their proposals by making concessions in the hope of improving their chance of reaching an agreement. Whereas specialist in both and adopt the alternating offers protocol, specialist in adopt a two-phase protocol, first exploring proposals that are of mutual interest in the “warm-up” phase, then finding more appropriate proposals in the “countdown” phase. Designed for concurrent negotiation of cloud resource co-allocation, specialist in adopt a complex but flexible negotiation protocol with an alternating revocable negotiation pattern in which each specialist can be freed from a contract by paying a penalty fee.

In cloud resource co-allocation, there are two advantages for allowing specialist to be freed from contracts. First, if a BA fails to acquire all its required resources before its deadline, it can release those resources acquired so that PAs can re-assign them to other BAs. Second, a BA that has already reached an intermediate contract for a resource can continue to search for better deals before the entire concurrent negotiation terminates.

Concession-making strategies: Although specialist were designed for many-to-many negotiations, they adopt the time-dependent (T-D) strategy with fixed concession rates and do not consider market-oriented issues such as market rivalry (competition) and outside options (opportunity).

Adopting the BPE strategy, specialists were specially designed to respond to different market conditions by making adjustable amounts of concession. Empirical studies were carried out in comparing the performance of the BPE and T-D strategies under different market conditions. Empirical results show that specialist adopting the BPE strategy achieved significantly higher utilities (i.e., better negotiation outcomes) than specialist adopting the T-D strategy.

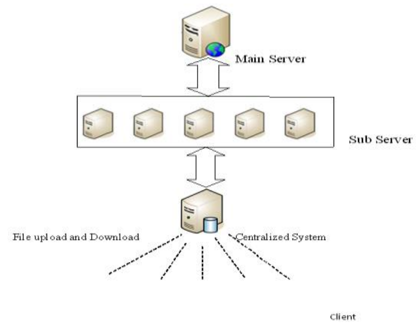
THE SKEWNESS ALGORITHM

We introduce the concept of *skewness* toquantify the unevenness in the utilization of multiple resources on aserver. Let *n* be the number of resources we consider and *ri* be the utilization of the *i*-th resource. We define the resource skewness of a server *p as*

$$skewness(p) = \sqrt{\sum_{i=1}^{n} (\frac{r_i}{\overline{r}} - 1)^2}$$

where $\overline{r}$ is the average utilization of all resources for server *p*. In practice, not all types of resources are performance critical and hence we only need to consider bottleneck resources in the above calculation. By minimizing the *skewness*, we can combine different types of workloads nicely and improve the overall utilization of server resources.

SYSTEM ARCHITECTURE



4. CONCLUSION AND FUTURE DIRECTIONS

In this survey paper, an exposition of specialist-based problem-solving approaches for intelligent Intercloud resource allocation is provided. The contributions of this paper are manifold.

1) It defines specialist-based cloud computing and cloud intelligence. It describes the motivation, advantages, and significance of adopting an specialist paradigm for intelligent Intercloud resource allocation.

2) It provides a comprehensive overview of the state-of-the-art research on adopting an specialist-based paradigm for Intercloud resource allocation by reviewing representative specialist-based Intercloud resource allocation models.

3) It provides a comparison and critique of the state-of-the-art specialist-based Intercloud resource allocation models. Summarizing and comparing the features of existing specialist-based Intercloud resource allocation models provide designers with pointers to and guidelines on some of the essential design considerations for developing new specialist-based techniques for Intercloud resource allocation.

4) It provides a comparison between specialist-based and non-specialist-based approaches for cloud BoT execution.

5) It provides pointers to futuredirections whereas the IEEE Cloud Computing Initiative aims to create the IEEE Intercloud testbed to tie all clouds together and the IEEE P2302 standard for specifying Intercloud interoperability, it is anticipated that will play a significant role in another important aspect ─ shaping the "intelligent Intercloud" vision.

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Some future directions of specialist-based may include:
1) Performing complexity and overhead analyses of specialist-based cloud computing models reviewed,
2) Devising a communication protocol for cloud specialist in active resource monitoring,
3) Empirically comparing active and passive resource monitoring,
4) Devising approaches for constructing and maintaining SCTs,
5) Building learning cloud specialist,
6) Designing a multi-layer Intercloud workflow Petri net, which are described as follows.

As noted in even though active monitoring is preferred over passive monitoring, a communication protocol for cloud specialist in active resource monitoring is yet to be devised. Additionally, empirical studies comparing the performance of both active and passive resource monitoring are yet to be carried out. To date, approaches for constructing and maintaining SCTs to bolster cloud service composition are yet to be devised. Since cloud specialist operate in a dynamically changing environment (e.g., changing user demands), it seems prudent to design learning cloud specialist that gather information (e.g., for predicting supply-and-demand patterns for resources) to assist cloud providers in making better resource management decisions.

Another new direction by Bendoukha et al. may inspire researchers to design Petri nets for modeling Intercloud workflow at three layers: 1) user application layer, 2) middle layer, and 3) resource layer. In the big data era, situations where applications require huge amounts of computing resources that can only be supplied by a federation of clouds will become increasingly common. The author hopes that this survey will raise the awareness of the advantages of ABCC among researchers and inspire them to take up future challenges of developing new specialist-based techniques for bolstering intelligent Intercloud resource allocation in this big data era.

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