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Co-Operative Resource Sharing Platform for an Efficient and Trustworthy Colloborative Cloud Computing

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Abstract*—Cloud computing has significant efficiency and cost advantages, advancements in cloud computing provides a promising future for collaborative cloud computing (ccc).In ccc globally-scattered distributed cloud resources belonging to different organizations or individuals are collectively used in a cooperative manner to provide services. In this paper, we address resource management and reputation management are the two fundamental issues.in ccc harmony platform Cloud will used to integrates res mgt and rept mgt in a harmonious manner. Harmony incorporates three key innovations: integrated multi-faceted resource/reputation management, multi-qos-oriented resource selection, and price-assisted resource/reputation control. The issues of resource management and reputation management must be jointly addressed in order to ensure the successful deployment of ccc. however, these two issues have typically been addressed separately in previous research efforts, and simply combining the two systems generates double .

Keywords*— Distributed systems, Reputation management, Resource management, Distributed hash tables, Cloud computing, Multi-qos resource selection, Price control.

I. INTRODUCTION

Cloud computing has become a popular computing paradigm, in which cloud providers offer scalable resources over the Internet to customers. Currently, many clouds, such as Amazon's EC2, Google's AppEngine, IBM's Blue- Cloud, and Microsoft's Azure, provide various services (e.g., storage and computing). For example, Amazon [1] (cloud provider) provides Dropbox [2] (cloud customer) the simple storage service (S3) (cloud service). Cloud customers are charged by the actual usage of computing resources storage, and bandwidth.

The demand for scalable resources in some applications has been increasing very rapidly. For example, Dropbox currently has five million users, three times the number last year. A single cloud may not be able to provide sufficient resources for an application (especially during a peak time). Also, researchers may need to build a virtual lab environment connecting multiple clouds for petascale supercomputing capabilities or for fully utilizing idle resources. Indeed, most desktop systems are underutilized in most organizations; they are idle around 95 percent of the time [3]. Thus, advancements in cloud computing are inevitably leading to a promising future for collaborative cloud computing (CCC), where globally- scattered distributed cloud resources belonging to different organizations or individuals (i.e., entities) are collectively pooled and used in a cooperative manner to provide services.

As shown in Fig. 1 below, a CCC platform interconnects physical resources to enable resource sharing between clouds, and provides a virtual view of a tremendous amount of resources to customers. This virtual organization is transparent to cloud customers. When a cloud does not have sufficient resources demanded by its customers, it finds and uses the resources in other clouds.

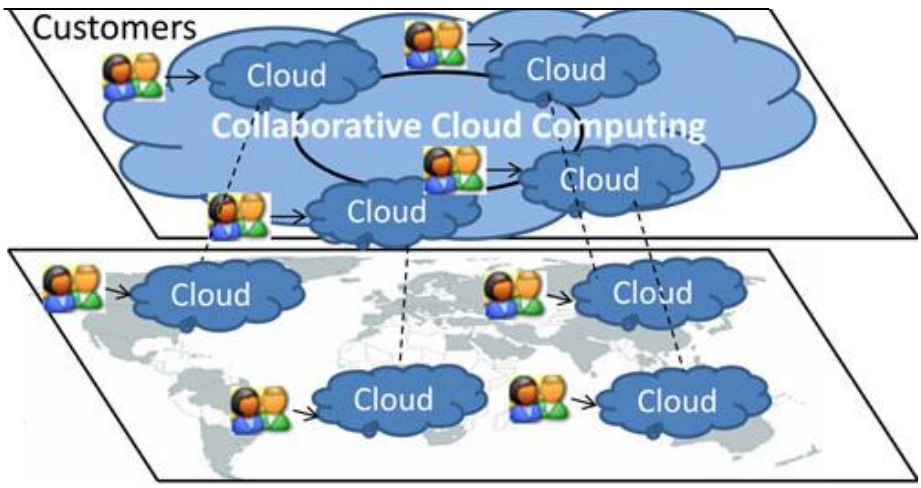


Fig:An example of collaborative cloud computing.

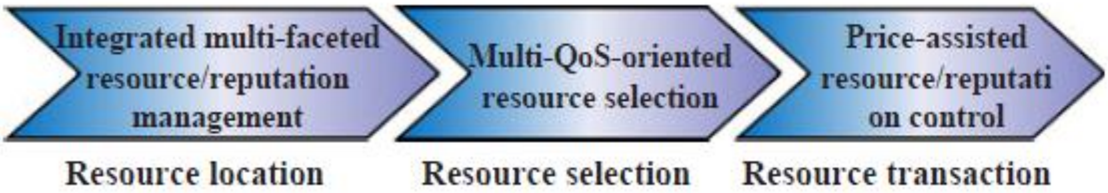
Uses of Resource and Reputation Management:

A node may provide low QoS because of system problems (e.g., machines break down due to insufficient cooling) or because it is not willing to provide high QoS in order to save costs. Also, nodes may be attacked by viruses and Trojan horse programs. This weakness is revealed in all the cloud platforms built by Google, IBM, and Amazon [7], and security has been recognized as an important factor in grids (the predecessor of clouds) [8]. Thus, resMgt needs reputation management (repMgt) to measure resource provision QoS for guiding resource provider selection [4], [7]. As in eBay and Amazon, a repMgt system computes each node's reputation value based on evaluations from others about its will exhibit contradictory behaviors and significantly affect the effectiveness of both, finally leading to degraded overall performance. The results of the single-QoS-demand assumption and contradictory behaviors pose two challenges. First, in task (2), how can we jointly consider multiple\ QoS demands such as reputation, efficiency, and available resources in resource selection? Second, in task (3), how can we enable each node to actively control its reputation and resource supply so that it avoids being over overloaded while gaining high reputation and profit?

To ensure the successful deployment of CCC, the issues of resMgt and repMgt must be jointly addressed for both efficient and trustworthy resource sharing in three tasks:

1. Efficiently locating required trustworthy resources.
2. Choosing resources from the located options.
3. Fully utilizing the resources in the system while avoiding overloading any node.

Harmony components in resource market stages:



Integrated multi-faceted resource/reputation management:

Relying on a distributed hash table overlay (DHT), Harmony offers multi-faceted reputation evaluation across multiple resources by indexing the resource information and the reputation of each type of resource to the same directory node. In this way, it enables nodes to simultaneously access the information and reputation of available individual resources.

Multi-QoS-oriented resource selection:

Unlike previous resMgt approaches that assume a single QoS demand of users, Harmony enables a client to perform resource selection with joint consideration of diverse QoS requirements, such as reputation, efficiency,distance, and price, with different priorities.

Price-assisted resource/reputation control.:

In a resource transaction, a resource requester pays a resource provider (in the form of virtual credits) for its resource.The transactions are conducted in a distributed manner in Harmony. Harmony employs a trading model for resource transactions in resource sharing and leverages the resource price to control each node's resource use and reputation. It enables each node to adaptively adjust its resource price to maximize its profit and maintain a high reputation while avoiding being overloaded, in order to fully and fairly utilize resources in the system.

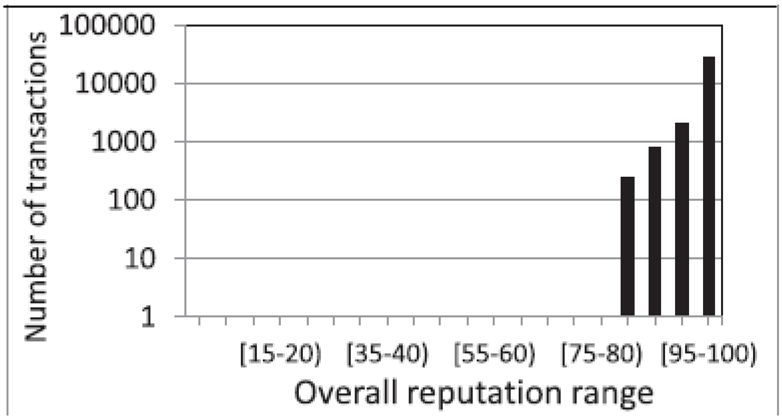


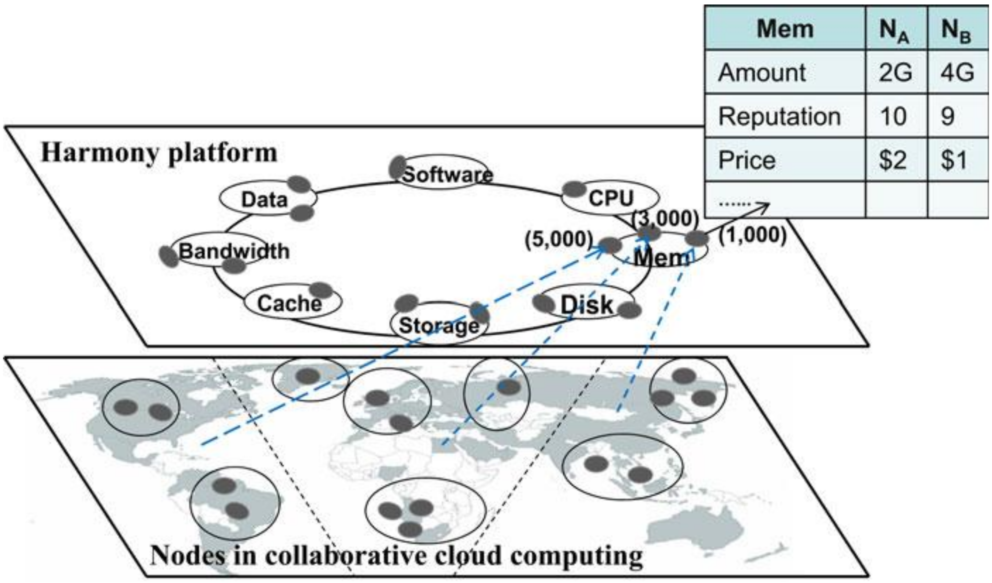
Fig:Transactions

Above fig shows the number of transactions versus the seller's overall reputation from this entire trace data set. The figure shows that clients tend to choose higher-reputed nodes for transactions. Thus, if the resource a node possesses is limited, the highest-reputed nodes can easily become overloaded. In order to cluster the transactions by different types of merchandise, we identified all transactions by 60 merchandise keywords, and found 140,720 transactions of 50 sellers.

The 60 merchandise are the first 60 merchandise of different brands in the Electronics category such as "Samsung mobile phone" and "Lenovo laptop". For these transactions, the transactions of the same type of merchandise of a seller are classified into a group. The average of the five ratings of each transaction is calculated as the seller's QoS for this transaction. Then, the average QoS of each group is calculated as the reputation of the seller for this type of merchandise (named as individual reputation). Finally, the individual reputation on each merchandise type of each seller is derived. The results show that the lowest overall reputation of these sellers is 89, which means that these sellers are relatively highly reputed.

Simply combining multi-resMgt and repMgt will lead to a few problems. First, resMgt and repMgt always have their own infrastructures Maintaining two infrastructures generates high maintenance overhead. Second, most resMgt approaches are driven by either efficiency or security through choosing the highest-reputed or highest-capacity node. Hence, a direct combination will lead to contradictory behaviors. Third, since a node refers to the overall reputation in selecting individual resources, it may receive incorrect guidance because a high-overall-reputed node may provide low QoS for individual resources.

THE DESIGN OF HARMONY:



In the above fig the Ir of the memory resource of physically close nodes is forwarded to the same node in the"Mem" cluster. As the REQUEST procedure in figure shows, to query multiple resources, node i sends out Lookup ðHi;HrÞ requests along with its desired amount, time period, reputation, price, and so on, with one request for one resource type. Based on the Cycloid routing algorithm, the request is forwarded to the owner node of ðHi;HrÞ (i.e., the requested resource's directory node), which stores the information of the requested resource that is physically close to the requester. As the PROCESS procedure in Algorithm shows, if the directory node has no Ir satisfying the requests (i.e., the amount and reputation are no less than the requested values and the price is no higher than the requested value), it probes its neighbor nodes in its cluster. After the directory node finds Ir satisfying the request, it uses the multi-QoS-oriented resource selection algorithm (Section 3.2) to select the best server(s) for the client, and then replies to the client with the results. Since all Ir of the requested resource in the system is in the cluster, if there's no Ir satisfying the request in the cluster, then there is no satisfying resource in the system. The directory node then sends a search failure response to the requester.

CONCLUSION

In this paper, we propose an integrated resource/reputation management platform, called Harmony, for collaborative cloud computing. Recognizing the interdependencies between resource management and reputation management, Harmony incorporates three innovative components to enhance their mutual interactions for efficient and trustworthy resource sharing among clouds. The integrated resource/reputation management component efficiently and effectively collects and provides information about available resources and reputations of providers for providing the types of resources. The multi-QoS-oriented resource selection component helps requesters choose resource providers that offer the highest QoS measured by the requesters' priority consideration of multiple QoS attributes. The price-assisted resource/reputation control component provides incentives for nodes to offer high QoS in providing resources. Also, it helps providers keep their high reputations and avoid being overloaded while maximizing incomes. The components collaborate to enhance the efficiency and reliability of sharing globally-scattered distributed resources in CCC. Simulations and trace-driven experiments on Planet Lab verify the effectiveness of the different Harmony components and the superior performance of Harmony in comparison to previous resource and reputation management systems. The experimental results also show that Harmony achieves high scalability, balanced load distribution, locality-awareness, and dynamism-resilience in the large-scale and dynamic CCC environment. In our future work, we will investigate the optimal time period for neural network training and load factor calculation. We will investigate the challenges of deploying the Harmony system for the real-world applications which involve cooperation between cloud providers.

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