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A Network Cloud Queuing Model for Capable Resources Mapping in Cloud Computing Environment

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ABSTRACT

Cloud computing is nowadays being used for on demand storage, processing power and resource pooling. It assigns the resources to improve the locally available computational capacity when necessary. The cloud user accesses shared computing resources as general utilities that can be leased and released. The ubiquitous access to cloud resources easily enables the simultaneous use of different clouds. In the networked cloud computing environment lead to resource mapping problem. To overcome the problem previous researchers formed hierarchical framework. A request partitioning approach based on Iterated Local Search concept facilitates the cost-efficient and online splitting of user requests among eligible cloud service providers within a networked cloud environment. The resource mapping of requested virtual to physical resources is performed and the use of distributed intra cloud resource mapping approach allows for efficient and balanced allocation of cloud resources. Recent researches used linear programming is utilized so that each sub-VN is properly allocated in the selected cloud. Resource utilization is depending on linearly computing resources. In this work extended in the non linear manner to derive utilization based enhanced queuing models a flexible queuing network layered model is proposed to estimate how to allocate resources utilization to each network of an n- network. A queuing system indicates that the inter arrival time of requests is exponentially distributed and task service times are independent and identically distributed random variables that follow a general distribution with mean value. The system consideration contains m servers which render service based on the arrival of task request (FCFS). The capacity of system is m þ r which means the buffer size for incoming request is equal to r. As the population size of a typical cloud center is relatively high while the probability that a given user will request service is relatively small, the arrival process can be modeled as a Markovian process.

Keywords

Index Terms: Cloud Computing, Resource Mapping, Request Partitioning Approach, Iterated Local Search, Queuing System, Markovian Process

1. INTRODUCTION

Cloud computing has become a popular model for distribution, efficient and commercial computation. The main aim is to create the virtual resources across the computers, servers and data centers that enable the user to access the data storage on demand basis. By adding Inter cloud communication or Intra cloud communication resources to the resource mix leads to network cloud computing environment. Mapping of physical resources to virtual network request leads to Virtual network Embedding problem(VNE).Two more challenges are faced in this paper 1)Assigning the requested resources to the physical resources among different clouds 2)Inter cloud communication should available to map the virtual resources to network cloud environment. On demand Request Partitioning is a technique which spilts the user request. Previous work focuses on resource mapping using Iterated local search with linear computing resources. Our contribution is to compute the efficiency using queuing system since queuing system proceeds in non linear computing resources and also evaluating the performance of the iterated local search and queuing system. Efficiency is computed for the above two techniques in order to produce a cost efficient network cloud environment.

2. RELATED WORK

On demand VN Request Partitioning

On demand VN Request Partioning is based on graph portioning problem. NP completeness problem is partioning of vertices of a graph into a given number of disjoint subset.Intercloud resource provisioning cost is computed according to the availability of resources in the cloud. If the resources is not defined in the intra cloud it uses the virtual link inorder to traverse to the other neighbourhood cloud.A request partitioning approach with the use of Iterated Local Search (ILS) proposed adopted for dealing with the intra domain VNE problem. In order to allow for a more realistic and comprehensive formulation of the corresponding resource mapping problem, the associated resource provisioning costs based on the availability of resources, namely the scarcity of the resource and the average utilization over a time window. A linear programming is utilized so that each sub-VN is properly allocated in the selected cloud. Resource utilization is depending on linearly computing resources. To derive utilization based enhanced queuing models a flexible queuing network layered model is proposed to estimate how to allocate resources utilization to each network of an n- network. . A queuing system which indicates that the inter arrival time of requests is exponentially distributed, while task service times are independent and identically distributed random variables that follow a general distribution with mean value.

3. PROBLEM DEFINITION

- Resource mapping problem
- The problem of mapping substrate resources to Virtual Network (VN) requests is known as Virtual Network Embedding (VNE) problem. Inherent complexity and scalability of the problem.
- The request partitioning problem is related to the graph partitioning problem. Graph partitioning or bisection is a common NP-complete problem with a large number of applications.
- MIP commodity flow problem.
- Resource Utilization depends linearly computing resource

4. OVERVIEW OF THE PROPOSED SYSTEM

In this work novel hierarchical frameworks inter domain resource mapping in a networked cloud environment is to deal with the inherent complexity and scalability of the problem. A request partitioning approach with the use of Iterated Local Search (ILS) proposed adopted for dealing with the intra domain VNE problem. In order to allow for a more realistic and comprehensive formulation of the corresponding resource mapping problem, the associated resource provisioning costs based on the availability of resources, namely the scarcity of the resource and the average utilization over a time window. Recent researches used linear programming is utilized so that each sub-VN is properly allocated in the selected cloud. Resource utilization is depending on linearly computing resources. In this work extended derive utilization based enhanced queuing models a flexible queuing network layered model is proposed to estimate how to allocate resources utilization to each network of an n-network. A queuing system which indicates that the inter arrival time of requests is exponentially distributed, while task service times are independent and identically distributed random variables that follow a general distribution with mean value. The system under consideration contains m servers which render service in order of task request arrivals (FCFS). The capacity of system is m þ r which means the buffer size for incoming request is equal to r. As the population size of a typical cloud center is relatively high while the probability that a given user will request service is relatively small, the arrival process can be modeled as a Markovian process. The proposed framework a large number of VN requests and networked cloud sizes, with minimum computation time, can be obtained.

5. SYSTEM ARCHITECTURE

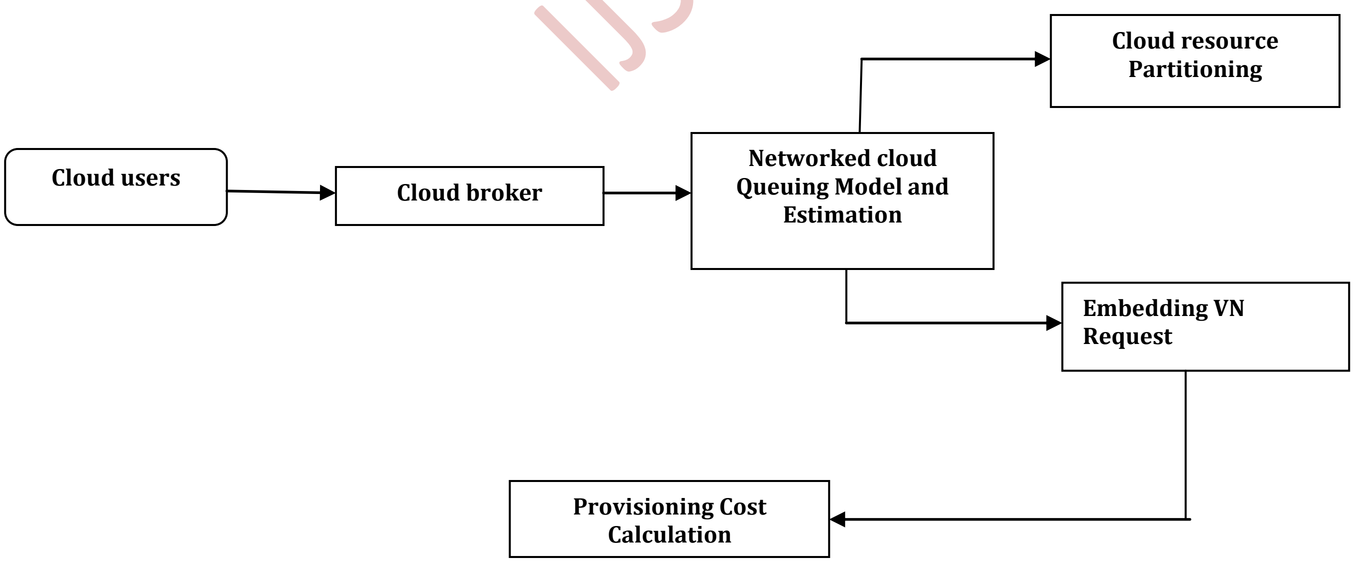

Fig 1: System Architecture

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6. SYSTEM IMPLEMENTATION

6.1 Cloud resource mapping

A user usually interacts directly with a cloud service provider (CP) to request IaaS and users may interact indirectly with CPs and transit network providers that interconnect clouds with virtual links. A cloud Brokerage Service will be responsible for providing cloud IaaS based on user's requirements. In the proposed work hierarchical approach is adopted, where virtual resource mapping on the networked cloud is a two-phase

6.1.1 Demand Partitioning

Every cloud broker that receives an incoming request, groups the requested virtual resources according to their functional attributes and non functional attributes, creating Virtual Resource Sets (VRS) sharing common characteristics. A one-to-many relation is established between the cloud broker and known CPs that is requested to state provisioning costs. CPs match physical resource candidates to the received VRSs and respond to the cloud broker with a resource Provisioning cost per VRS. The cost is related to resource availability in the cloud. In order to perform partitioning in a realistic environment an appropriate heuristic is devised that can provide near optimal results in real time. The cloud broker concludes upon the most cost-effective request partitioning and sends the corresponding partial requests to the selected CPs for further processing.

6.1.2 Embedding Phase

Embedding is not a one size fits all process and must be tailored to the needs of the request, taking into consideration resource constraints and requested services, where the actual mapping takes place, upon receiving a partial request, the CP embeds it to its substrate resources using an appropriate intra domain VNE algorithm. In this sense, virtual nodes are mapped to substrate nodes in a way that facilitates the mapping of virtual links to physical paths in the subsequent phase. The problem is extended and formulated for an arbitrary pool of heterogeneous shared resources, while minimizing the overall number of hops for every virtual link mapped on the substrate.

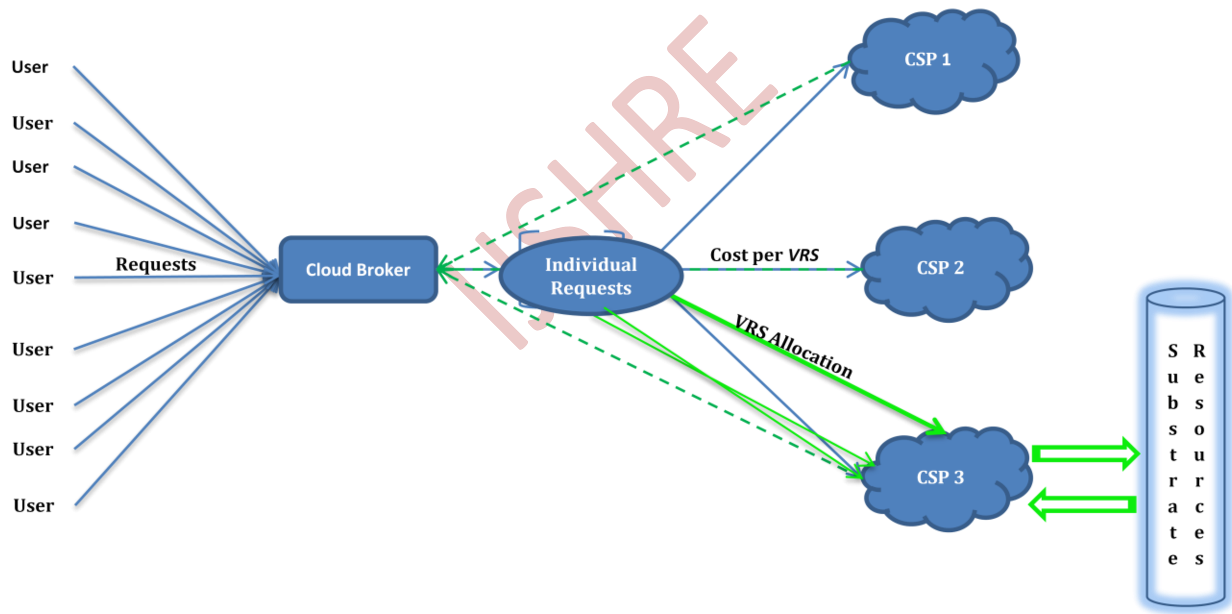

Fig 2: Block Diagram for Demand Partitioning and Embedding Phase

6.2 Queuing network cloud layered model

A queuing system which indicates that the inter arrival time of requests is exponentially distributed, while task service times are independent and identically distributed random variables that follow a general distribution with mean value. The system under consideration contains m servers which render service in order of task request arrivals (FCFS). The capacity of system is m þ r which means the buffer size for incoming request is equal to r. As the population size of a typical cloud center is relatively high while the probability that a given user will request service is relatively small, the arrival process can be modeled as a Markovian process. The proposed framework a large number of VN requests and networked cloud sizes, with minimum computation time, can be obtained.

6.3 Resource provisioning costs calculation

In the framework emphasis is placed on efficient

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resource mapping, we define the resource provisioning costs based on the availability of resources. Relevant costs are associated with the scarcity of the resource and the average utilization over a time window of the mapping candidates. The cost of an inter cloud virtual link is a function of the number of transit providers it traverses, satisfying the constraint that it exceeds the cost of corresponding intra domain links of the two endpoint CPs.

6.4 Demand partitioning via iterated local search

The adaptation of the ILS for the purposes of request partitioning. The history dependence is removed in the adopted ILS approach and therefore ILS results in a random walk in the space of local optimal. ILS implementation, three least cost nodes mapping, single CP mapping and random initial solution. No considerable improvement was noticed, both in terms of computing time and provisioning cost, therefore a random initial solution was selected. In terms of perturbation, different strengths have been tested, where perturbation is accomplished by randomly remapping nodes within the set of interconnected clouds. In order to select an appropriate memory less acceptance criterion two different choices were only better solutions are accepted and a simulated annealing type acceptance criterion is considered. The first approach proved to be the most suitable. This choice of the acceptance criterion has the advantage that it implements a randomized descent in the space of locally optimal solutions. An iterated descent algorithm for Local Search was applied employing a first improvement pivoting rule. A simple type of move is used to define a neighborhood at each iteration a node is remapped to the various remaining CPs. A maximum number of iterations are used as a stopping criterion.

6.5 Networked cloud mapping

Networked Cloud Mapping is based on node mapping phase and the link mapping phase. The physical network graph is improved by introducing one pseudo node for each virtual node and connecting these pseudo nodes to the physical ones. In the augmented substrate, each virtual link with bandwidth constraints is treated as a commodity having as source and destination, a pair of pseudo nodes. The problem is formulated as a MIP commodity flow problem. Solving the flow allocation problem, taking into consideration virtual demands, results in substrate node mapping. Specifically, the optimal fractional solution is computed for the problem's Linear Programming relaxation. The relaxed problem can be solved by any suitable linear programming method, in polynomial time. A rounding technique is applied to obtain the integer solution of the MIP problem. Then, the substrate node is selected, taking also into consideration virtual link demands. The link mapping phase once the node mapping procedure has been successfully completed, link mapping is achieved by solving the flow allocation problem allowing traffic bifurcation multi commodity flow problem. Alternatively, a shortest path algorithm can be applied in order to restrict each flow to a single path.

6.6 Performance evaluation

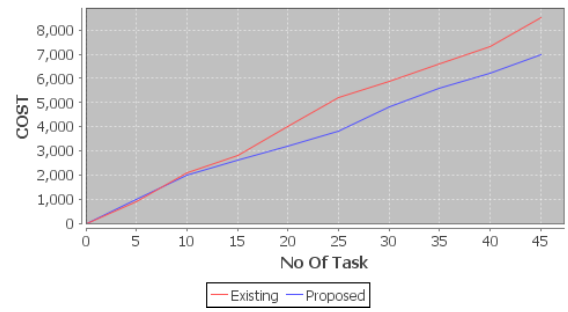

Fig 3: Performance evaluation based on cost

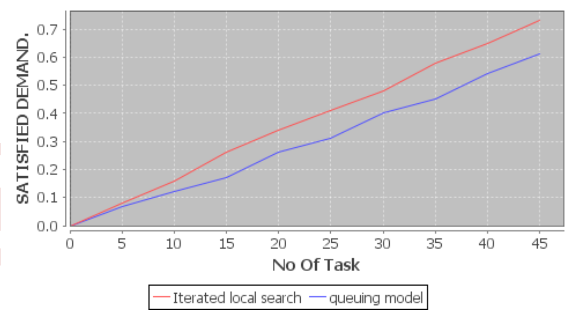

Fig 4: Performance evaluation based on demand

Finally we are evaluating the proposed approach with the existing approach for the Resource Mapping problem. Here we analyze and compare the performance offered by different configurations of the computing cluster. And we present the evaluation comparison by the parameter metrics such as the viability, from the point of view of scalability, execution time, performance, and cost. Based on the comparison and the results from the experiment show the proposed approach works better than the other existing systems.

7. CONCLUSION

In this work extended in the non linear manner to derive utilization based enhanced queuing models a flexible queuing network layered model is proposed to estimate how to allocate resources utilization to each network of an n- network. A queuing system which indicates that the inter arrival time of requests is exponentially distributed, while task service times are independent and identically distributed random variables that follow a general distribution with mean value. The system under consideration contains m servers which render service in order of task request arrivals (FCFS). The capacity of system is m þ r which means the buffer size for incoming request is equal to r. As the population size of a typical cloud center is relatively high while the probability that a given user will request service is relatively small, the arrival process can be modeled as a Markovian process.

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