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Dynamic Placement of Autonomic Internet Services

Rakesh R J, Jayasudha J S

Abstract— The placement of services available in an optimal manner determines the capability of a data network to efficiently support user's service demands. The paper includes the optimal placement and the dynamic creation of the services. The algorithm described in the paper specifies the enhanced form of service demand concentrator on the basis of traffic aware centrality metric. The accessing of the services is based on the evaluation of the access points as well as network bandwidth. Broadcast routing is also performed and message as well as file transfer is carried out between the nodes. The storage of the services is also made possible in the cloud network developed in apache cloudstack. The solution applies to a broad range of networking scenarios in network storage and involvement of the end-user in the creation and distribution of lightweight service facilities.

Index Terms— Service, Service Migration, Broadcast routing, Cloud Stack Storage.

I. INTRODUCTION

One of the most significant changes with the network scenario concerns the role of end-user in acquiring the resources. Traditionally the end-user has been almost exclusively the consumer of content and services generated by dedicated providers. Nowadays, Web 2.0 technologies have enabled a paradigm shift towards more user-centric approaches to content generation and provision. Strong evidence is obtained about the abundance of user-generated content in social networking sites, blogs, video distribution sites etc. As a result, recreation of the network architecture is necessary. The generalization of the UGC concept towards services is increasingly viewed as one major future trend [2]. The user-oriented service creation concept aims at engaging end-users in the generation and distribution of service instances [3]. There already exist online applications enabling end-users to compose their own customized combination of web sources through easy to use graphical interfaces. Google App Engine [4] and Yahoo! Pipes [5] are typical examples of web-based mashup tools.

The user requirements are analysed and the specific services are created based on that dynamically. The services are stored in the cloud network based on the node availability. Numerous ISP-owned home gateways can be instrumented through virtualization technologies to host those lightweight peer servers and create a distributed Internet service platform that leverages end-user proximity.

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This shift towards more distributed data storage paradigms is further evidenced in 1) the emerging Information centric networking (ICN) paradigm that uses ''in-network storage'' to contribute actively to the distribution of information objects [8]; 2) the realization of distributed-fashion social networks such as Diaspora [9]. Another application performed is the file sharing and message broadcasting. The file sharing is made possible together with the service transfer or deployment. The message broadcasting is made possible with routing algorithm. The AES is used for the routing with the encapsulation of 8bit to 16bit long encryption standards [6]. A symmetric cipher key encryption method is used with the AES. The file sharing is made with the service publication as well as with the cloud network using the affinity network groups. Normal transfer protocols may be used to perform the sharing and the broadcasting of data nodes.

II. RELATED WORK

A variety of works mainly deals with the placement of services based on adopting facility location approach. More relevant to the service deployment scenario is the former approach that attracts both theoretical and practical interest. The theoretical thread relates to the approximate nature of the facility location problem by distributed approaches. Algorithms are typically executed over a complete bipartite graph where m facilities communicate with 'n' clients in synchronous send-receive rounds. The work in distributed approximation[23] draws on a primal-dual approach earlier devised in facility location and k-median problems[24], to derive a distributed algorithm that trades-off the approximation ratio with the communication overhead assuming O(log n) bits message size. A more recent, alternative distributed algorithm for the metric facility location that runs in k rounds, achieves an O $(m^{2/\sqrt{k}} \cdot n^{3/\sqrt{k}})$[1].

Many works on the basis of content centrality networking with different models is performed. Content-Centric Networking (CCN) uses content chunks as a primitive decoupling location from identity, security and access, and retrieving chunks of content by name. On the course of time CCN achieves scalability, security and performance.CCN also keeps track of availability, security and location dependence [25]. Dynamic decomposition of services was also advised with traversal of activities with the service creation, publication, discovery, composition etc. On the other hand another work traverses through user centric service availability. It defines OPUCE (User Centric Service Creation and Execution) architecture for the evaluation with a user as well as an admin portal, which has functionalities with the user portal to collect information and admin portal to manage and configure the platform.

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Another work which deals with the storage of data with nano data centres which stores on the basis of certain energy consumption constrains.

NaDa use ISP-controlled home gateways to provide computing and storage services and adopts a managed peer-to-peer model to form a distributed data center infrastructure. Centralization trend is not without its limitations. The core part of the nano data canters includes the tiny managed services. These servers serve as a collection of distributed system which provides the data storage for the different media [7]. In order to reduce the heat dissipation problem the data present will be passed through the gateway in a more precise manner based on priority designing algorithm. Efficient placement of the services in an optimal manner is required for enhancing the performance.

III. ARCHITECTURE

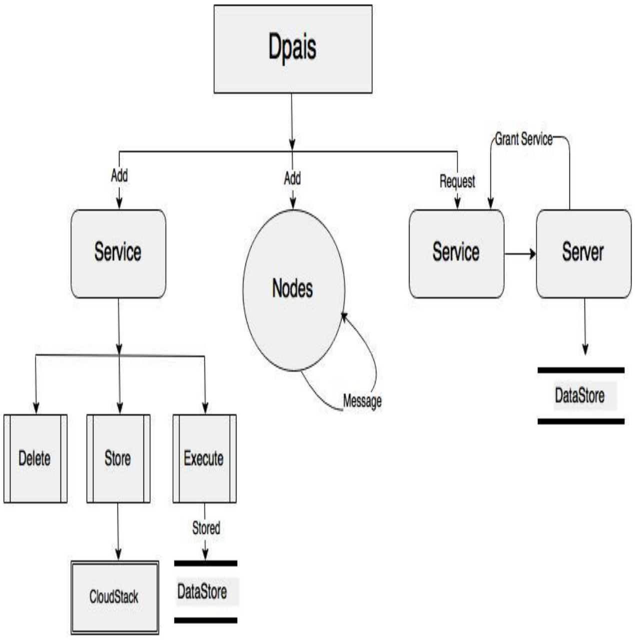

Figure 1. Dpais Architecture

A service is something which can act autonomously for providing an application. With the proposed algorithm the services are placed and accessed based on the requirement of the user [11]. This paper mainly concentrates on quality improvement of placement of services and the dynamic creation of the services. The creation of services dynamically is based on a particular language platform. For providing user centric nature in the accessing application the services are also stored in the cloud network. The cloud network is setup with host only adapter with the usage of virtual box.

A. *Service Placement vs. Service Migration*

The optimal placement of up to k service instances is typically treated as a k-median problem [10]. Input to the problem is the network topology and service demand distribution across the network users. 1-median problem variant that seeks to minimize the access cost of a single service replica since it matches better the forthcoming UGS paradigm. This will enable the generation of service facilities in various network locations from a versatile set of amateur user service providers. Their huge majority will be lightweight services requiring minimum storage resources and addressing relatively few users in the ‘‘proximity’’ of the user service provider, either geographical or social , so that their replication across the network would not be justified[15].

Network topology can be represented as an undirected connected graph G=(V,E). A subset VS $\subseteq$ V of the total network nodes are enabled to act as service host sites and along with the set ES $\subseteq$E of edges linking them, form the, generally disconnected, sub graph G=(V_s, E_s). Each potential service host k $\in$ VS may serve one or more users attached to some network node n $\in$ V and accessing the service with different intensity, generating demand w(n) for it. The goal is to find the service host k that minimizes the aggregate, i.e., access cost of a service facility by all network users.

Cost (k) = ----------- (1)

where the distances or cost d(k,n) may have different context, depending on routing policies and the network dimensioning process[18],[19]. Assume that path costs coincide with path hop counts but the algorithm easily generalizes to more general shortest-path concepts.

B. *Service Identification with per hop behaviour*

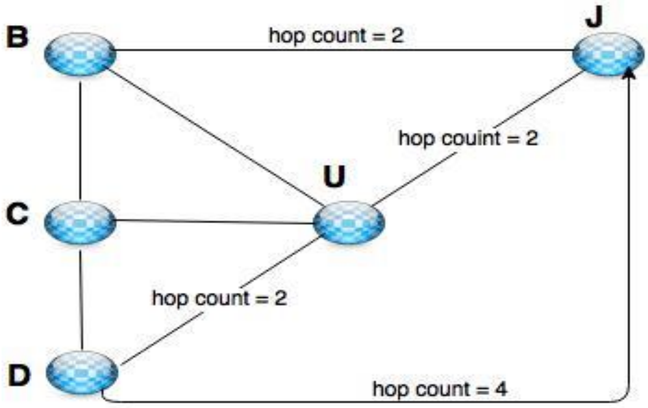

Figure 2. Calculating Hop Count

The per hop behaviour nature is adopted with the algorithm in the neighbouring node identification and the specific nodes are analyzed on the basis of the costs assigned with the same. The node ‘u’ accessing resources from different neighbouring nodes on the basis of hop count in the enhanced algorithm which is represented as cost. The cost is calculated on the basis of access rates and the availability with the nodes[13].

IV. ENHANCED SERVICE MIGRATION TECHNIQUES

In the proposed technique specification the service is placed in a particular node and the selection of the node is done with a random procedure. But in the enhanced service migration algorithm the service traversal is done from a chosen node. The node scans for the services and trace out from the neighbouring node with maximum access points. As the nodes are not selected in a random manner it is easy to trace out the node with maximum access points.

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A. *ESM in G(Vs, Es)*

Algorithm: 1 ESM in G(Vs, Es)

1. Initialize request, service, cost.
2. Place SERVICE at a node //Node for placing is chosen by the user
3. Grab user request for the service.
4. For each nodes in G.nodes do

4.1 Calculate cost to another node //Cost is assigned based on routing distance.

- 4.2 Store the cost in cost (k).
- 4.3 Identify the node with lower cost. //Shorter in accessing through the network.
- 4.4 For each node g.nodes
  - 4.4.1 Calculate the number of access nodes.
  - 4.4.2 Choose the node with maximum neighbouring nodes.
  - 4.4.3 Set 'An' as the current access node.
- 4.5 End

5. End
6. Repeat for every nodes added.
7. Move SERVICE to the requested node. //Normally the user
8. Stop.

ESM Description

1. **1.** The Initialization: The algorithm starts with the service s, node n. Specific node is chosen at the initial stage of the execution. Cost is calculated for the nodes.
2. **2.** Service Placement: Service placement is done on the basis of the user request. With the user request the algorithm traverses to the particular service [21].
3. **3.** Service Discovery: Service discovered on the basis of access points rate termed as access rate and it is specified with the number of neighbouring node access points.

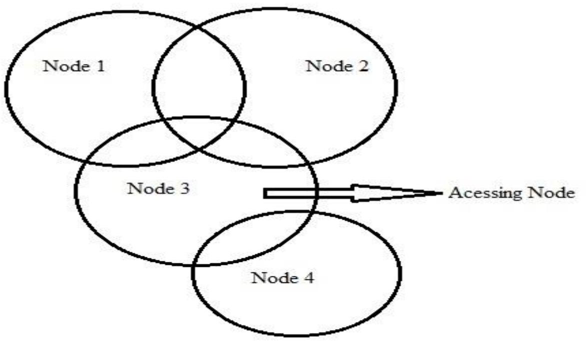

Figure 3. Sample Access Code Analyzer

From the figure 4.1 it is easy to identify how the accessing node is evaluated. The cost will be higher with Node 3. Node 3 is connected with Node 1,2,3.

4. **4.** Service Access: The requested service will be accessed form that particular access point with lower cost.

B. *Broadcasting Algorithm (AES)*

1. Byte by byte substitution during the forward process.16X16 looks up table to find a replacement byte. 2^8 bit scrambling to avoid bit level co-relations.
2. Shifting rows of the state array. The goal of this transformation is to scramble the byte order inside each 128-bit block.
3. Mix Columns for mixing up of the bytes in each column separately.
4. Add Round Key for adding the round key to the output of the previous step.

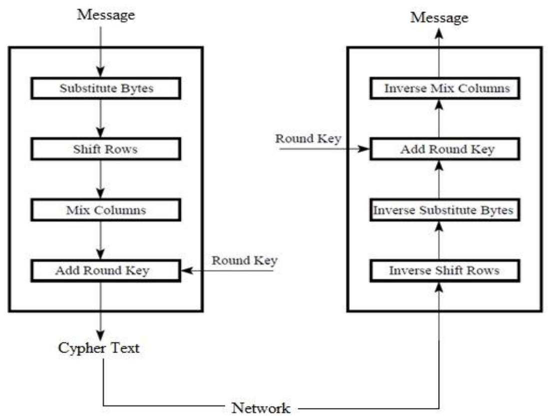

Figure 4. Broadcast Routing

In the broadcast routing for the file sharing the storage is placed with the cloud network. Apache cloudstack is used for the storage [25]. A small scale deployment structure is setup for the cloudstack setup management with the management server which includes the hypervisor as well as the setup environment for the same. The hypervisor provides the central authentication.ssh server provides the encrypted standards for the application to run in the cloud network environment. Console proxy server is also configured to provide the usage of the management server with the application of proxy network. Virtual box is configured with host only adapter to work with the management server. The management server storage with primary and secondary will be in terms with the host machine used for the cloud network [14],[16].

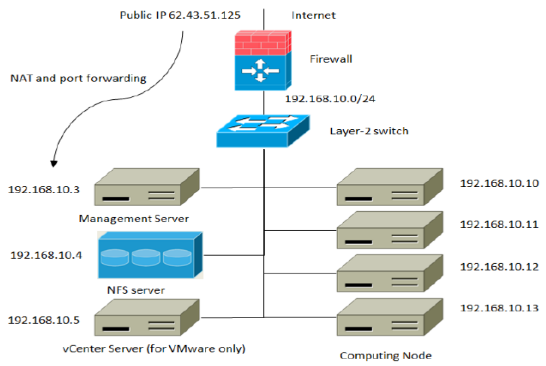

Figure 5. Small Scale Cloud Deployments Model

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V. Performance Analysis

The performance analysis for the dynamic placement of the services is performed after creating a number of distributed networks with different number of nodes. The raw data produced by profiles, counters, or traces are rarely in the form required to answer performance questions. Hence, data transformations are applied, often with the goal of reducing total data volume. Transformations can be used to determine mean values or other higher-order statistics or to extract profile and counter data from traces. For example, a profile recording the time spent in each subroutine on each processor might be transformed to determine the mean time spent in each subroutine on each processor, and the standard deviation from this mean. Similarly, a trace can be processed to produce a histogram giving the distribution of message sizes. The figure shows how the increase in number of nodes in the sub graph influences the access rate [23].

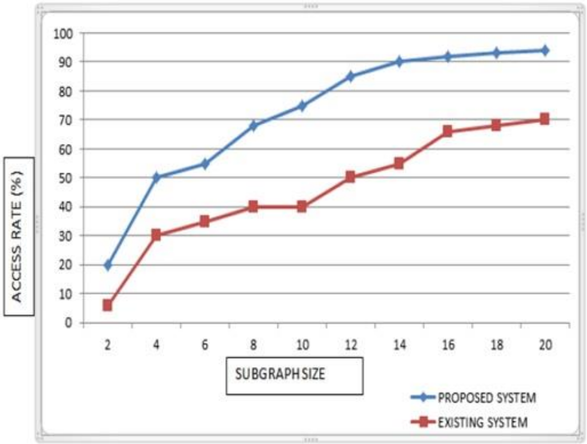

Figure 6 (a). Access rate: Existing vs. Proposed

The sub graph evaluation with the access rate specifies the marginal increase in the access rate, because of the usage of enhanced service migration algorithm. The consistency with the access rate is achieved in a faster manner with the application of the existing algorithm [22].

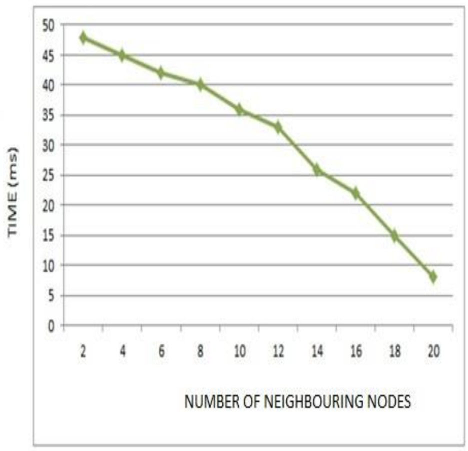

Figure 6 (b). Time vs. Number of Neighbouring nodes

The figure 6(b) shows another analysis rate which points out the reduction in time with the increase of the neighbouring nodes. With the application of the routing algorithm the nodes with maximum access point will give cent percentage surety for the service to deliver as per the requirement of the user. The increased access rate also come into action with the usage of node with maximum neighbour nodes which cause the node with maximum access rate.

VI. Conclusion And Future Works

The paper traverses through the network issues of accessing resources through the existing network in a faster manner. It is better to keep a structure in service creation, allocation, distribution and placement of it. Algorithm relies on centrality insights to iteratively migrate service facilities towards near optimal locations under various demand dynamics achieving very good accuracy and fast convergence. It lends to realistic implementations that preserve its advantages regardless the employed routing policies and exhibit excellent scalability properties. The review starts from network naming to the data centres and placement of the storage techniques. The review suggests an algorithm for avoiding the anomalies due to network issues both in the services as well as the traffic. Last but not the least the thing to be kept in mind is in the case of practical implementing scenario and scaling. The future enhancement can be driven through the development of network services with service platforms irrespective of the platform, that is the language you are dealing with. The optimal nature in the service availability and the dynamicity of service publication is achieved. The work actually creates the dynamicity in the publication of services with a single language platform. The processing of big data can be also enhanced with the cloud network. Map reducing tasks with the application of hadoop can also be incorporated with the work. Practical implementation of such huge networks can also be taken under consideration in future.

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