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A Comparative study on Dynamic Time Warping (DTW) and Arbitrary Selection Load Balancing (ASLB) Approaches to Heterogeneous P2P Networks

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----------ABSTRACT----------

The World Wide Web is a vast network of documents that are linked together a set of protocols defining how the system work and transfer data. The explosion of data traffic on the World Wide Web (WWW), web servers are often experiencing overload from an increasing number of users accessing the servers at the same time. With increased popularity of web, there are a number of problems such as Servers overloaded, Internet Backbone congestion and Slow web services access, etc.,. To address the performance and scalability problems of web servers, more virtual servers and mirror servers were developed with many load balancing approaches. Among the many other approaches for efficient load balancing in distributed heterogeneous P2P networks, Dynamic Time Warping (DTW) approach and Arbitrary Selection Load Balancing (ASLB) approaches plays a vital role. This paper mainly focuses on comparative study of Dynamic Time Warping (DTW) and Arbitrary Selection Load Balancing (ASLB) approaches to Heterogeneous P2P Networks.

Keywords**: Dynamic Time Warping, Heterogeneous, Load Balancing, Peer to Peer Network, World Wide Web,**

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I. Introduction

Peer-to-Peer networking is an emerging technique for next-generation network applications. P2P Networking and Applications disseminates state-of-the-art research and development results to facilitate effective deployment of P2P networking and applications. Peer applications include distributed computing, file sharing, message routing, information search and content delivery. P2P network infrastructures are key building blocks in the design of P2P applications. Most home computer networks today are peer to peer networks. Residential users configure their computers in peer workgroups to allow sharing of files, printers and other resources equally among all of the devices. Although one computer may act as a file server or Fax server at any given time, other home computers often have equivalent capability to handle those responsibilities.

P2P networking has generated tremendous interest worldwide among both Internet surfers and computer networking professionals. P2P software systems like Kazaa and Napster rank amongst the most popular software applications ever. Numerous businesses and Web sites have promoted "peer to peer" technology as the future of Internet networking. Although they have actually existed for many years, P2P technologies promise to radically change the future of networking.

1.1 Navigating a P2P Network

This diagram shows how a P2P network operates. The solid lines indicate physical, hard-wired network cables. The dotted lines indicate that each PC can communicate and share files with every other PC on such a network. A printer attached to one PC can be used by other PCs on the network—if that printer's PC allows such use.

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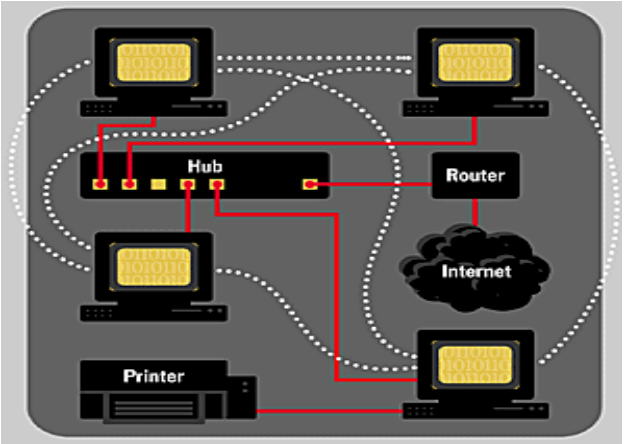

2. Related Work

Load balancing is a key challenge because nodes are often heterogeneous. For the load balancing approach, many algorithms have been proposed early. Suby Maria Jacob, 2103 presented an Efficient Load Balancing in Peer-to-Peer Systems with Partial knowledge of the System. This paper, present a novel load balancing algorithm to minimize both the load imbalance and the amount of load moved. The unique feature of this proposal is that each participating peer estimates and represents the "system state" as the probability distributions for the capacities of nodes and the loads of virtual servers.

Hung-Chang Hsiao, Hao Liao, SSu-Ta and Kuo-Chan Huang, 2011 presented a Load balance with Imperfect Information in structured Peer-to-Peer system. They used reallocation algorithm and distribution algorithm for a heterogeneous peer networks.

Y. Zhu, 2009 presented a Load Balancing in Structured P2P Networks. This paper address the issues of load imbalance, three main solutions are described: Virtual server-based approach, Power of two choices, and address-space and item balancing. While different in their designs, they all aim to improve balance on the address space and data item distribution. This paper also discusses a virtual server-based load balancing algorithm that strives to ensure fair load distribution among nodes and minimize load balancing cost in bandwidth.

Quang Hieu Vu, Member, IEEE, Beng Chin Ooi, Martin Rinard and Kian-Lee Tan , 2009 presented a Histogram – Based Global Load Balancing in Structured Peer-to-Peer Systems. In this paper, we present a general framework, HiGLOB, for global load balancing in structured P2P systems. Each node in HiGLOB has two key components: 1) a histogram manager maintains a histogram that reflects a global view of the distribution of the load in the system, and 2) a load-balancing manager that redistributes the load whenever the node becomes overloaded or under loaded.

Min Yang and Yuanyuan Yang, 2008 presented an Efficient Hybrid Peer-to-Peer System for Distributed Data Sharing. In this paper, P2P networks can be divided into two categories: structured peer-to-peer networks in which peers are connected by a regular topology, and unstructured peer-to-peer networks in which the topology is arbitrary. Unstructured peer-to-peer networks organize peers into an arbitrary network topology, and use flooding or random walks to look up data items. Each peer receiving the flooding packets or random walk packets checks its own database for the data item queried.

3. A Comparison study of Dynamic Time Warping (DTW) and Arbitrary Selection Load Balancing (ASLB) Approaches

3.1 Dynamic Time Warping (DTW) Approach

For efficient Load Balancing in Distributed peer networks, we plan to build an approach called Time Variant – Peer Node Heterogeneous Data Processing Scheme. We don't know how long the peer node will be in that Peer - to - Peer network. It is necessary to denote the time of the peer node i.e. Liveliness of the peer node in the network. To monitor the time of the peer node in the heterogeneous P2P network, the Dynamic Time Warping approach used and also used to evaluate the dynamic time variant capacity of peer node to evaluate the magnitude of load – demand balance factors of peer servers.

The DTW approaches will efficiently identify the liveliness of the peer node in the network which may vary in time or speed. So the peer node, before share its virtual servers with other node, it will check first the DT (Dynamic Time) of the neighbor peer node using DTW approach in the heterogeneous P2P network. After analyzing it, the virtual servers are shared for maintaining the packet data to equalize the load imbalance factor

3.2 Arbitrary Selection Load Balancing (ASLB) Approach

ASLB approach eliminates the network traffic with minimal cost of P2P. Performance of the ASLB is measured using peer failure probability, execution time and traffic control efficiency. The ASLB approach in the heterogeneous P2P network consists of three different levels. The first level is to identify and analyze the peer node server cycle requirements using Duty Cycle Data appropriate Technique (DCDA) with the load demand balance factor outcome. The second level is to employ the node selection strategy for enhancing the load diversions factor if load imbalance occurs. The third level is to utilize the tremendous store model for analyzing balancing workload in a particular distributed environment.

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The Dynamic Time Warping (DTW) approach and Arbitrary Selection Load Balancing (ASLB) approach are measured in terms of

- Execution Time
- Performance Rate
- Traffic Control Efficiency
- Load Imbalance Factor
- Movement Cost

The following experimental evaluation shows that, the comparison of ASLB approach with DTW approach in terms of execution time.

3.3. Experimental Evaluation

The experimental evaluation was conducted to implement the Dynamic Time Warping (DTW) approach and Arbitrary Selection Load Balancing (ASLB) approach in the NS2 simulator. The experiment was conducted with USC / ISI dataset and network traffic dataset with different set of nodes. The simulations result shows that, ASLB approach gives added advantages than DTW approach. When compared to a DTW approach, ASLB gives well in execution time.

Execution Time: It is defined as the time taken to perform the execution process in the heterogeneous peer - to - peer network. It is measured in seconds (sec). The below Table – I describe the execution time based on the nodes in the network route used to transform the data from source to the destination with above mentioned dataset.

Table – I Number of Nodes Vs. Execution Time (Sec)

No. of Nodes	Execution Time (Secs)	
	ASLB approach	DTW approach
20	35	50
40	39	62
60	42	73
80	44	87
100	45	96
120	47	112

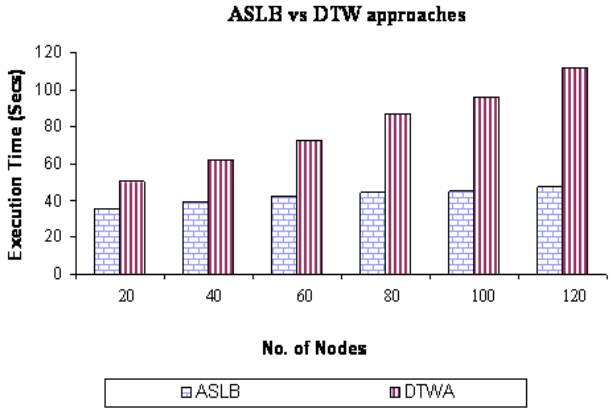

Figure – I Number of Nodes Vs Execution Time (Sec)

The above Fig – I describe the execution time based on the number of nodes. The ASLB approach uses the efficient process to fetch the result quickly with the short span of time. The lesser time taken consumes a lesser cost in the peer to peer network to transfer the data from the source to destination. Compared to a DTW approach, the ASLB consumes the lesser time to execute the process. Arbitrary Selection Load Balancing (ASLB) approach, balance the load without traffic occurrence and with minimal cost.

4. Conclusion

In this paper, we have compared the two approaches, Dynamic Time Warping (DTW) approach and Arbitrary Selection Load Balancing (ASLB) approach in terms of execution time. The simulation results shows that, performance of the Arbitrary Selection Load Balancing (ASLB) approach reduces the network traffic routes with minimal cost in contrast with the peer heterogeneous P2P network using Dynamic Time Warping algorithm approach.

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Volume: 05, Issue: 02, Pages:1904-1907 (2013) ISSN : 0975-0290

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Authors Profile

Mr. P. Murugesan was born in Athani, Tamil Nadu, India in 1976. He received his Bachelor of Science Degree from Gobi Arts College in 1996, Master of Computer Applications Degree from Cheran Arts and Science College, Kangayam in 2000 and Master of Philosophy in computer science from Bharathidasasn University, Trichy in 2005. He worked as a Lecturer in Gobi Arts College and Cheran Arts and Science College. Now he is working as a Assistant Professor (Senior Grade) in Computer Applications Department, Bannari Amman Institute of Technology, Sathyamangalam.

Dr. P. Shanmugam was born in Karur, Tamil Nadu, India in 1948. He received his Bachelor of Engineering Degree from PSG College of Technology in 1972, Coimbatore Master of Engineering Degree from the College of Engineering, Guindy, Chennai in 1978 and Doctor of Philosophy in Electrical and Electronics Engineering from Bharathiar University, Coimbatore in 1994. From 1972–76, he worked as Testing Engineer in Testing and Development Centre, Chennai. He joined Annamalai University as a Lecturer in 1978 and worked for one year. Then he joined PSG College of Technology, Coimbatore in 1979 and served in various capacities. He was the Professor and Head of Electronics and Communication Engineering Department at the time of relieving (April 2004). He is currently the Principal, Bannari Amman Institute of Technology, Sathyamangalam. His Professional activities include, Guided Sixteen Ph.Ds and guiding Sixteen Ph.Ds in the field of Computer Communication Networks. Published and presented more than 120 Papers in International and National Journals. Awarded five times, "Best Project Guide Award" from Tamil Nadu State Government. He has to his credit about 36 years of experience in Teaching, R&D, Project Consultancy and Course organization etc. His Teaching and Research interests are in Wire and Wireless Networks, Fiber Optic Communication and Cellular & Mobile Communication Systems