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Differentiated Services Network with Dynamic Admission Control Algorithm

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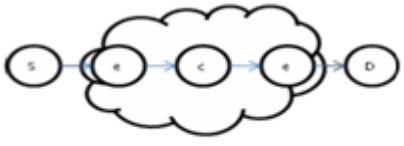
Abstract: ***Differentiated service network is used to provide QoS (Quality of service) in an IP network with the help of Dynamic admission control algorithm. Bandwidth broker, an important part of Diff-serv network, performing all the controlling function of Diff-serv network. Admission control module is an integral part of bandwidth broker. The aim of admission control algorithm is to achieve good quality of service by increasing network bandwidth utilization and efficient resources allocation. NS2 simulator is being used to perform the task of achieving QoS in Differentiated service network with Dynamic admission control algorithm.***

Keywords: Differentiated service network, Bandwidth broker, Dynamic admission control algorithm

1. Introduction

As the internet grows into commercial and global infrastructure, so that it can support many types of application such as network multimedia, VOIP, real time application and on demand media streaming. This application required to be transfer huge amount of data at a time with good quality of service. IP is unreliable protocol and it provides Best efforts delivery services. Because of these reasons IP itself is unable to fulfill the requirement of these applications. For supporting IP, one type of well known model is the Diff-serv Model.

Differentiated Services or DiffServ is networking architecture that specifies a simple and scalable mechanism for classifying, managing network traffic and providing Quality of Service (QoS) guarantees on modern IP networks DiffServ is a class-based mechanism for traffic management**.** Class-based mechanism means that in Diff-serv network incoming data packets are classified into different types of classes. The differential treatment is provided to each type of classes. DiffServ can be used to provide low-latency to critical network traffic such as voice or video while providing simple best-effort traffic guarantees to non-critical services such as web traffic or file transfers. DiffServ uses the 6-bit Differentiated Services Code Point (DSCP) field in the header of IP packets for packet classification purposes. The differentiated services framework enables quality-of- service provisioning within a network domain by applying rules at the edges to create traffic aggregates and coupling each of these with a specific forwarding path treatment in the domain through use of a code point in the IP header. In figure.1 the shaded region shows basic Diff –serv netwok.



S=Source e-edge router
D-Destination C-Core router

Figure.1 Diff –Serv network

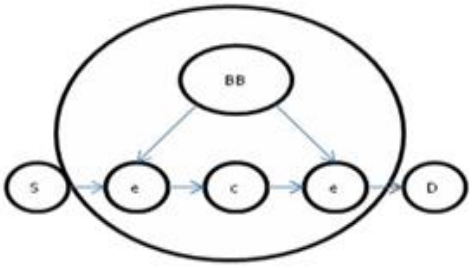
DiffServ has only data plane .Bandwidth broker is needed for performing the task of controlling throughout the network. Bandwidth broker is basically a agent which act as the control plane for the DiffServ. DiffServ itself can't achieve end to end quality of service, so that bandwidth broker is most important part for DiffServ. Only because of that Bandwidth broker proper resource management is possible. Bandwidth broker contain admission control module and in that admission control module admission control algorithm is defined. On the basis of that algorithm Bandwidth broker decides the incoming flow request is admitted or rejected.

2. Bandwidth Broker

Bandwidth Broker is an agent that has some knowledge of an organization's priorities and policies and allocates bandwidth with respect to those policies. In order to achieve an end-to-end allocation of resources across separate domains, the Bandwidth Broker managing a domain will have to communicate with its adjacent peers, which allows end-to-end services to be constructed out of purely bilateral agreements. Bandwidth Brokers can be configured with organizational policies, keep track of the current allocation of marked traffic, and interpret new requests to mark traffic in light of the policies and current allocation.

When a flow request arrives, first it goes to the Bandwidth broker. Bandwidth broker has all the data about resources availability, path availability and link availability throughout the network. Bandwidth broker sent it to the admission control module where the admission control algorithm is defined. Admission control module checks the network stats and takes the decisions. If resources are available then it accepts the flow request otherwise it is rejected. There are two architecture are available for Bandwidth broker, one is the Centralized Bandwidth broker modal and other one is the Distributed Bandwidth broker modal.

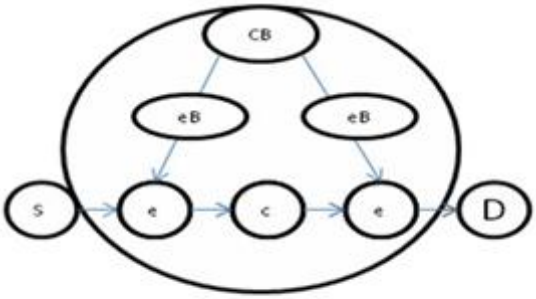
In Centralized Bandwidth broker modal only single one Bandwidth broker is used for a particular network domain. In Centralized Bandwidth broker modal, each resource reservation and provisioning and also admission control decisions are taken by single one Bandwidth broker. This single one Bandwidth broker is responsible for each and every decision making. Figure.2 shows Diff-serv network with Centralized Bandwidth Broker



BB-Bandwidth Broker

Figure.2 Centralized Bandwidth Broker

In the hierarchical Distributed Bandwidth broker modal two types of bandwidth broker are used, one is the central bandwidth broker, other one is the edge bandwidth broker. In which responsibilities are divided into two groups for two type of bandwidth broker. When a flow request arrives first it goes to the edge router then it forwards it to the edge bandwidth broker. Edge bandwidth broker made admiddetability test and it checks network stats for availability of bandwidth and resources. If the bandwidth required by flow request is the available then it response to the flow request. If the bandwidth required by flow request is greater than the available bandwidth, then it request the chunk of bandwidth from Central bandwidth broker. If required chunk of bandwidth is unused or free on other path, then Central bandwidth broker provide it to the flow request otherwise request is denied. Figure.3. shows Diff-serv network with Distributed Bandwidth Broker.



CB- Central Bandwidth Broker
eB- Edge Bandwidth Broker

Figure.3 Distributed Bandwidth Broker

3. Admission Control

Admission control is basically a criteria or set of rules by which we can decide the flow request is to be accepted or rejected. There are two types of admission control are possible, one is the static and another one is dynamic. In case of Static admission control, bandwidth allocation for each path and links are predefined in the static manner. When the bandwidth required by flow request is more than available at the path, but in this case bandwidth allocation is not changes even if there is unused bandwidth is available at some other path. In case of static admission control waste of bandwidth occur. There are two types of static admission control are algorithms are explained.

PBAC (Parameter based admission control)-In this PBAC method, all the admission decisions for any incoming data stream are taken on the basis of parameters of the network. This is based on only certain traffic behavior assumption. If the incoming user request is not one that is taken into assumption, then it will not work properly.

MBAC (Measurement based admission control) - In this MBAC method, all the admission decisions and resource reservation and provisioning are based on the real time measurement of traffic. In which before taking any type decision first current situation of traffic is measured and on the basis of that decisions are taken. Bandwidth broker periodically measured link lode and bandwidth reservation is done on the basis of that periodically measured link load. If link load is below some specified threshold value, then user request is accepted otherwise it will be rejected. There are many drawback of static algorithm such as waste of bandwidth and resources. To overcome this disadvantages we are using Dynamic admission control algorithm.

4. Dynamic Admission Control

Dynamic admission control algorithm uses the concept of Resource sharing pool. In this Resource sharing pool concept, when user request arrive then bandwidth broker not only checks the free or remaining available bandwidth and resources on the network but also checks the reserve bandwidth and resources on the network. If reserve bandwidth and resources are not use at peak level, some bandwidth and resources are unused, then bandwidth broker also taken into account these unused resources and bandwidth with the remaining available bandwidth and resources on the network for fulfill the requirement of newly arrive user request. Dynamic admission control mechanism is a two phase mechanism, path level admission control and link level admission control. Path level admission control is performed by bandwidth broker. Bandwidth broker perform path level admission control at the edge router. Bandwidth broker simply calculates bandwidth and provide it to the edge router. Edge router itself performs path level admission control. If the bandwidth required by user request is within the bandwidth of that path, then request is accepted. If the bandwidth required by user request is greater than the bandwidth of that path, then edge router can't take any decision .At that time link level admission control is required. Link level admission control is performed on the basis of Dynamic admission control algorithm. If the path bandwidth is insufficient for user request then we perform link level admission control. In which case we takes the decision dynamically that means we checks the unused bandwidth on other path ,if available ,then it provide it to requested path to complete user request. After that network stats are updated .

5. Simulation and Discussion

The simulation of Diff-serv network is performed by using NS2 simulator. Experimental topology for IP network is shown in figure.4 in which n1,n2 and n3 are intermediate node between source and destination . At the intermediate node data is simply passes through node, there is no differential treatment is provided to the incoming flow request. In this sinerio we are taken the simulation time is 100s , packet size of 1500 and link delay is 10ms . The bandwidth between S1-n1, n1-n2 ,and n3-D is 10 Mb and between n2-n3 is 5 Mb Experimental topology for Diff –serv network is shown in figure.5 in which e1,e2 andC are Edge

and Core routers between source and destination . At these routers differential treatment is provided to the incoming flow request. In this sinerio we are taken the simulation time is 100s , packet size of 1500 and link delay is 10ms .The policer type is Token bucket and for this policer type the value of CIR(committed information rate) is 1000000 and CBS(Committed burst size) is 10000 The bandwidth between S1-e1, e1-C ,and e2-D is 10 Mb and between C-e2 is 5 Mb.

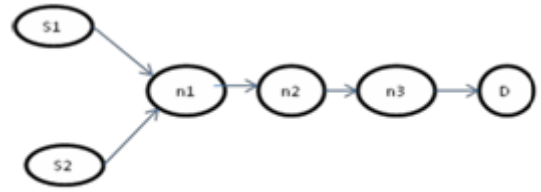


Figure .4 Simulation topology for IP network

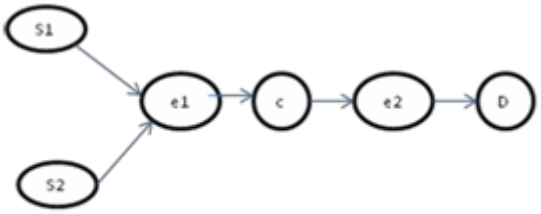


Figure.5 Simulation topology for Diff-serv network

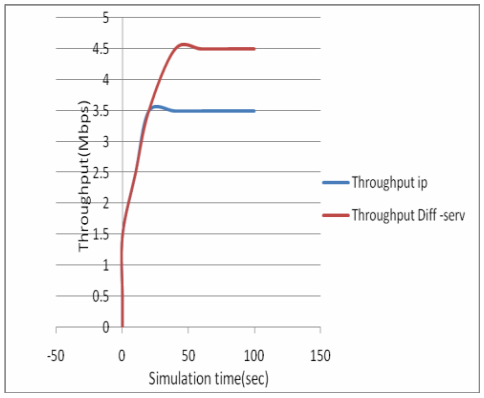
6. Experimental Results

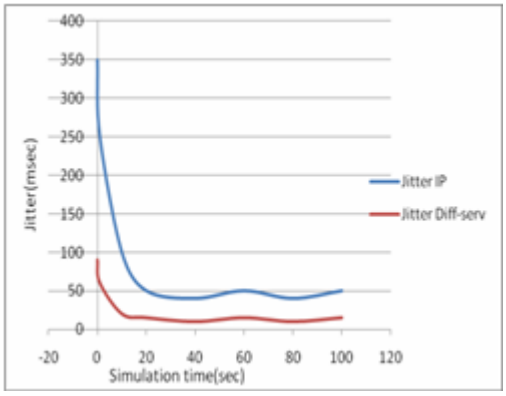
This paper simulates IP network without Diffserv network and IP network with Diffserv network by NS2 software . Table I shows the PHB table for the Diff-serv network.

Table 1: Experimental results of Diffserv network

DSCP	TotPkts	TxtPkts	Ldrops	Edrops
All	29991	22585	5886	1567
10	7457	7436	21	0
11	7402	3788	2844	770
20	7503	7466	37	0
21	7629	3848	2984	797

The graph shows the comparative analysis of IP network without Diff-serv and IP network with Diff-serv for three parameters are as Throughput, Delay and Jitter.





7. Conclusion and Future Work

The graphs shows that Throughput, Delay and Jitter values are improved when we are using the Diff-serv network with the IP network .But when we are see the PHB table for Diff-serv network we can analyze that value of packet loss rate is higher because Diff-serv network itself can't achieve end to end QoS for IP network. When we include a effective admission control algorithm with Diff- serv network, then Packet loss rate, Delay. Jitter and Throughput values are improved.

References

[1] S. Blake, D. Black, M. Carlson, E. Davies, Z. Wang, and W. Weiss, *AnArchitecture for Differentiated Service*, IETF RFC2475, 2009.
[2] Z. Zhang, Z. Duan, L. Gao, and Y. Hou, "Decoupling QoS Control From Core Router: a Novel Bandwidth Broker Architecture for Scalable Support of Guaranteed Service," in *Proceeding of ACM SIGCOMM'00*, Stockholm, Sweden, 2008.
[3] S. H. Jeong, H. Owen, J. Copeland, and J. Sokol, "QoS Support for UDP/TCP based Networks," *Computer Communications*, vol. 24, pp.64–77, 2001.
[4] J. Qiu and E. W. Knightly, "Measurement-based admission control with aggregate traffic envelopes," *IEEE/ACM Transactions on Networking*,vol. 9, 2001.
[5] S. Chen and K. Nahrstedt, "An Overview of Quality of Service Routingfor Next-Generation High-Speed Networks: Problems and Solutions,"*IEEE Networks*, vol. Nov/Dec, pp. 64–79, 2007.
[6] C. Bouras and K. Stamos. "An Adaptive Admission Control Algorithm for Bandwidth Broker". Cambridge: 3rd IEEE International Symposium on Network Computing and Applications (NCA04), pp. 243-250, 2004.
[7] Chimento, P.F., et al., QBONE Signalling Design Team: Final Report http://qos.internet2.edu/wg/documents-informational/20020709-chimento-etalqbone-signaling/, 2001.
[8] Cruz, R. L., A Calculus for Network Delay, Part I: Network Elements in Isolation, IEEE Transactions on Information Theory, vol. 37, no. 1, pp 114-131, 2010.
[9] Cruz, R. L., A Calculus for Network Delay, Part II: Network Analysis, IEEE Transactions on Information Theory, vol. 37, no. 1, pp 132-141, 1991.
[10] Davie, B., et al., An Expedited Forwarding PHB RFC

3246, 2002.
[11] Einhoff, G., Quality of Service Routing for an IP Premium Service based on MPLS Traffic Engineering, Master's Thesis, Aachen Universtiy, 2003.
[12] zFidler, M., Providing Internet Quality of Service based on Differentiated Services Traffic Engineering, Ph.D. Thesis, Aachen University, 2003.
[13] Fidler, M., On the Impacts of Traffic Shaping on End-to-End Delay Bounds in Aggregate Scheduling Networks, Springer, LNCS 2811, Proceedings of QofIS, 2003.
[14] Foster, I., Fidler, M., Roy, A., Sander, V., Winkler, L., End-to-End Quality of Service for High-End Applications Elsevier Computer Communications Journal, in press, 2003.
[15] Grossman, D., New Terminology and Clarifications for Diffserv RFC 3260, 2002. [17] Haverkort, B., Performance of Computer Communication Systems Wiley, 1998.
[16] Heinanen, J. et al., Assured Forwarding PHB Group RFC 2597, 1999.
[17] Kar, K., Kodialam, M., and Lakshman, T.V., Minimum Interference Routing of Bandwidth Guaranteed Tunnels with MPLS Traffic Engineering Applications, IEEE Journal of Selected Areas in Communications, vol. 18, no. 12, December, 2000.
[18] Law, A. M., and Kelton, W. D., Simulation, Modeling, and Analysis McGraw-Hill, 3rd edition, 2000.