Session D_1: Communication Systems

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DiffServ-aware-MPLS Traffic Management Scheme for QoS Guarantee (ICEIC'04)

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Abstract: In an IP network, various types of traffics are statistically multiplexed to utilize efficiently the network resources. The DiffServ-aware-MPLS supports a wide variety of communication services with different QoS requirements. The DiffServ-aware-MPLS based on QoS architecture had become one of the most promising ways to guarantee QoS Multi-service IP network. But how to manage IP network with QoS guarantee is still an open issue. In this paper, we propose DiffServ-aware-MPLS buffer management technique using the specified policing, queuing, and scheduling

About 10 words. DiffServ, MPLS, DiffServ-aware-MPLS

1. INTRODUCTION

Recently, the internet service is fast still more developing rapidly and stable service demand is increasing. However, service technologies dependent speed improvement are not satisfying real time services that current internet service lets various traffic source such as voice & picture of high speed as well as data of high speed. That is, Packet transfer function does equally Best Effort processing without doing differentiation by service class. DiffServ(Differentiated Service) is satisfied to solve such problem. In spite of advantage about DiffServ by service type, there is defect that do not satisfy End-to-End QoS(Quality of Service). Technology that propose in IETF (Internet Engineering Task Force) to satisfy QoS as well as DiffServ by various internet service kinds and high speed's packet transmission is DiffServ-aware-MPLS (Multi-Protocol Label Switching) technology. Most present DiffServ-aware-MPLS service technology is servicing tunneling by fast Label switching of MPLS. In this paper, to service DiffServ-aware-MPLS, DiffServ and MPLS applying token bucket (Token Bucket), TSW3CM(Time Sliding Window with 3 color Markings) Policing and WRR(Weight Round Robin) Scheduling to manage traffic according to PHB efficiently, compare and analyzed QoS in DiffServ-aware-MPLS and TCP network, DiffServ network on same simulation model environment.

2. PROPOSED TRAFFIC MANAGEMENT TECHNIQUE

In this paper, giving parameter value according to precedence of service class differently, differentiation according to QoS done service efficiently offer, about PHB and PSC that satisfy RFC 3270 that proposed in IETF, apply token bucket policy EFn and DFn class with fig 1 and AF1n and AF2n applied TSW3CM policy. And by apply dsRED and drop-tail queue, and scheduling techniques uses WRR, did to minimize packet loss by overflow of buffer that become an issue when do DiffServ and MPLS to do Mapping.

Put these in policy parameter values that is applied every moment in precedence of class in Table 1, and is 60 when virtual queue parameter by Codepoint is High to EF according to class precedence, and 20 when is Low, and value of virtual queue of AF1 and AF2 gave each (50, 20), (40, 20). Finally, case of DF give (30, 20). And applied WRR Scheduling parameters giving E-drop probability as is small class precedence is high, did as can manage traffic as well as more differentiation service according to QoS efficiently in DiffServ-aware-MPLS network.

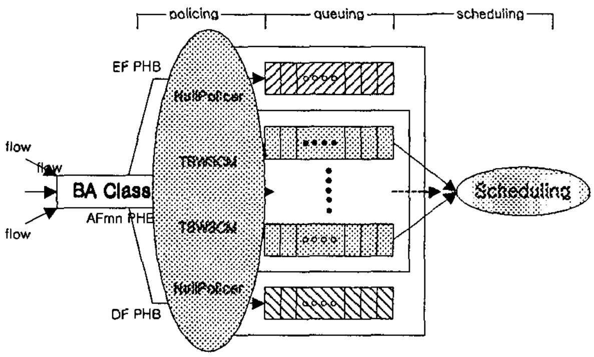

Fig 1. Policing, Queuing, Scheduling Diagram

Table 1. Policing & Scheduling about Class

Class	Policing	Parameter		RED VQ (CP)	VQ parameter		E-drop Probability
EF	Token	CIR	2400000	VQ1 (101110)	L	20	0.1
					H	60	
		CBS	3000	VQ2 (111110)	L	20	0.2
					H	60	

AF1	TSW3	CIR	1500000	VQ1 (001101)	L	20	0.2
					H	50	
				VQ2 (010100)	L	20	0.4
					H	50	
		PIR	3500000				
				VQ3 (011100)	L	20	0.8
					H	50	
AF2	TSW3	CIR	1500000	VQ1 (100000)	L	20	0.4
					H	40	
				VQ2 (101000)	L	20	0.8
		PIR	2800000		H	40	
				VQ3 (110000)	L	20	1.6
					H	40	
DF	Token	CIR	1500000	VQ1 (001000)	L	20	3
					H	30	
		PIR	5000	VQ2 (000000)	L	20	5
					H	30	

3. SIMULATION MODEL & PARAMETER

Composed figure 1 and Table 1 by each 4 source nodes ingress node (node 4) and egress node (node 10) like Fig 2 to do simulation in DiffServ-aware-MPLS network. Each source node did to have class (EFn, AF1n, AF2n, DFn) that differ, and each source node is equal, but did modeling to have 3 traffic source (n = 1, 2, 3) that precedence is different

Table 1 is that display component of simulation model of Fig 2. by table.

Important performance standard of QoS is transmission delay and average of delay change(Jitter), and bit/packet/frame loss probability of end-to-end in internet service network.

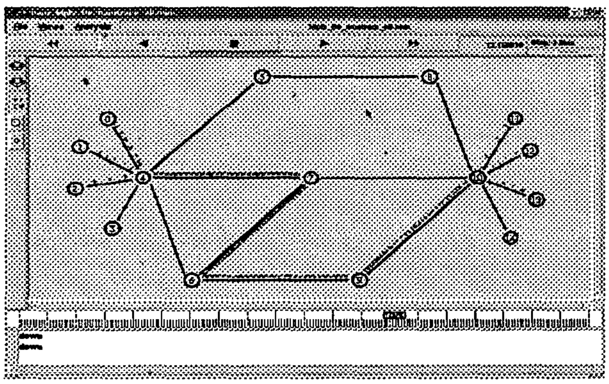

Fig 2. Drop-Down(Rerouting) Network Simulation Model

Table 2. Simulation Configuration Element

Configuration Element	Contents
Simulation Model	TCP, DiffServ DiffServ-aware-MPLS
Class Type	EFn, AF1n, AF2n, DFn
Traffic Source Number	Three of Each Class Type
Policing	Token-buket, TSW2, TSW3
Queueing	RED queue, Drop-tail
Scheduling	WRR
MPLS Routing	CR-LDP(E-LSP, L-LSP)
Node number	14

Link Bandwidth	10 Mbps
Simulation Time	20 sec
Drop Down Time	10 ~ 15 sec
Total Source Rate	9.6 Mbps

·Transmission Delay = Quantity of Information / Transmission Capacity

·Minimum Bandwidth = Guarantee by WRR Scheduling Algorithm

·Delay Jitter = Difference of the biggest delay and smallest delay of packet

·Packet Lose Rate = Lost Packet / Total Transmission Packet (By congestion from time to time occurrence)

4. SIMULATION RESULT & ANALYSIS

4.1. Simulation Result

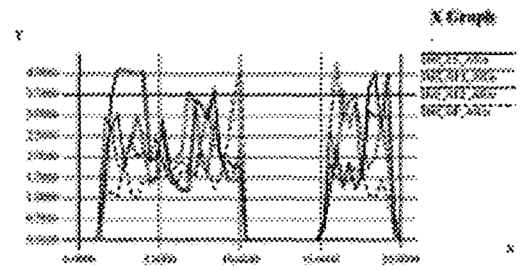

Fig 3. Received Rate of Drop-Down DiffServ Network by Service Class

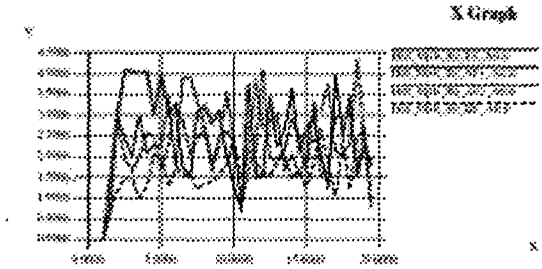

Fig 4. Received Rate of Rerouted DiffServ-awar-MPLS Network by Service Class

Apply differentiated service and DiffServ-aware-MPLS service that refer in chapter 2 to simulation model that present proposed policy and scheduling, and do this to show simulation result using ns-2 tools. Fig 3. shows network result that become case and Drop-down (Rerouting) that is not Drop-Down measure.

In simulation model of Fig 1. that propose to compare proposed traffic management scheme's advantage, node 7 and node 10 times 10 secs to 15 secs interval to do Drop-down, DiffServ path shortcoming that do not establish calamity prove .

In case of network model's X graph which there is no TCP network and Drop-Down omitted and DiffServ network becomes Drop-down in Fig 3, path problem that do not establish calamity show . However, Fig 4 that is DiffServ-aware-MPLS incidental and value path Drop-down when is done path doing rerouting packet loss less show.

To measure performance that apply proposed simulation model and traffic management scheme, analyzing abstracted data, show result that analyze delay and jitter, packet drop rate in 4.2.

4.2. Simulation Analysis

In this paper, Whether satisfy QoS in proposed techniques of DiffServ-aware-MPLS network, analyze average packet delay and average packet jitter, average packet drop rate, and difference does so that certify with measured result that is not with incidental and value after DiffServ-aware-MPLS's result value reroute path.

O Delay Performance Estimation

Table 3 is expressing class different average delay time about each service, and Fig 5 graphs. If see Fig 5, average latency in TCP network was no these according to class, and DiffServ's delay time expressed value that is some differential value according to class. But DiffServ-aware-MPLS's result value of in case is none drop-down network could know little more than DiffServ network's result value that differential service is consisting. Can know that it is seldom difference when compare with drop-down (Rerouting) DiffServ-aware-MPLS network, path as time that do rerouting delay be nothing but, differential service is None drop-down DiffServ-aware-MPLS.

Table 3. Network average Delay by Service Class

	TCP	DiffServ	DiffServ-aware-MPLS	DiffServ-aware-MPLS Rerouting
EF	0.23	0.22	0.22	0.28
AF1	0.23	0.23	0.23	0.29
AF2	0.23	0.24	0.25	0.30
DF	0.23	0.26	0.27	0.33

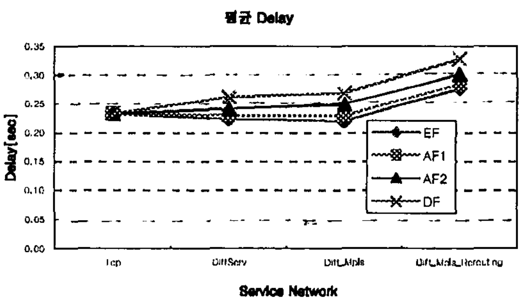

Fig 5. Network average delay by service class

o Jitter Performance Estimation

Table 4 and Fig 6 show average jitter's result value.

Average jitter for DiffServ network was less according to class as Average delay, but in the case of TCP network, nothing but average jitter is as result that is influenced to packet drop rate by class, it was no big difference.

And None Drop-Down DiffServ-aware-MPLS's average jitter became differentiation little more than Performance of average delay time because of re-transmission by packet dropping, and Drop-Down DiffServ-aware-MPLS's average jitter, path rerouting difference of done delay time degree show nothing but difference with None Drop-Down DiffServ-aware-MPLS's average jitter be .

Table 4. Network average Jitter by Service Class

	TCP	DiffServ	DiffServ-aware-MPLS	DiffServ-aware-MPLS Rerouting
EF	0.77	0.00	0.00	0.09
AF1	0.71	0.08	0.14	0.25
AF2	1.02	0.55	0.79	0.88
DF	1.44	3.01	3.43	3.66

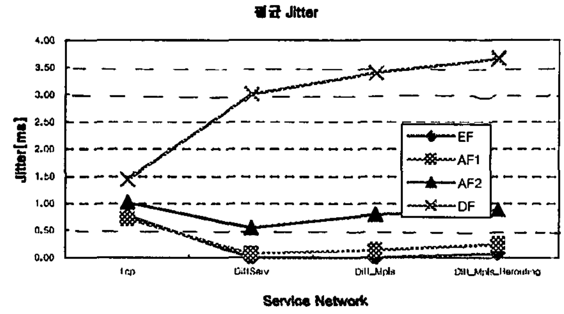

Fig 6. Network average jitter by service class

o Drop Rate Performance Estimation

Table 5 displays average packet drop rate's result value, and Fig 7 displays result value by graph. If see DiffServ-aware-MPLS's packet drop rate in Table 5, while drop rate of class DF is decrescent than DiffServ's result value, but if class AF1 and AF2's drop rate grow, could know that stable differentiated service consists relatively. And could know that packet loss rate increases some in drop-down DiffServ-aware-MPLS.

Table 5. Network Average Packet Drop Rate by Service Class

	TCP	DiffServ	DiffServ-aware-MPLS	DiffServ-aware-MPLS Rerouting
EF	200	0	0	11
AF1	200	22	38	48
AF2	230	103	230	240
DF	400	478	403	423

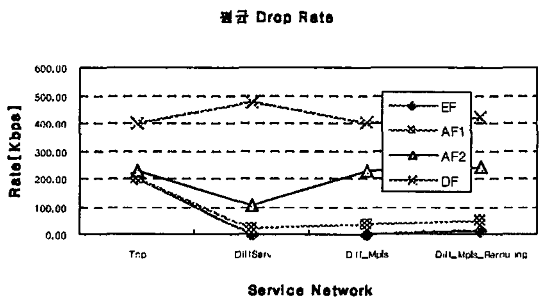

Fig 7. Network average drop rate by service class

5. CONCLUSION

With average delay, average jitter, and through Packet Drop rate's result values, big difference did not exist in DiffServ-aware-MPLS's differentiation service that DiffServ and proposed algorithm are applied. Also, it could know, but could know that get into packet loss like Fig 7 and can not guarantee QoS in this case when routing path becomes Drop that DiffServ network is providing differentiation service effectively.

But DiffServ-aware-MPLS network did not become value and big difference as result that do not become Rerouting, Rerouting done average Delay and average Jitter, and average packet Drop rate that routing path is no big difference with normal DiffServ network verify. Could know difference of Performance according to that apply some policing and scheduling in this research result DiffServ-aware-MPLS, but simulation that apply L-LSP service of CR-LDP way that is TE (Traffic Engineering) that is risen in MPLS does not and E-LSP simulation do. By differentiation service that is various more than hereafter, although PHB can increase, confined EXP field can not do more various PHB to do mapping by E-LSP. Therefore, technical development of TE that apply L-LSP to overcome confined EXP field of 3 bit is required.

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