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CLUSTER BASED CONTENTION AVOIDANCE USING FEED BACK IN OPTICAL BURST SWITCHING NETWORKS

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Abstract: Optical burst switching (OBS) that combines the benefits of OPS and OCS. OBS has been most capable technique to support high bandwidth, bursty data traffic and the next generation optical internet. There are many challenging issues need to be solve to be achieve effective implementation of OBS. When Contention problem occurs two or more bursts are destined for the same wavelength. A number of techniques have been resolve the contention but these techniques cannot try to minimizing the occurrence of the contention in our scheme. Different techniques like, Wavelength Conversion, Deflection routing, Optical buffering, Fiber Delay line, burst segmentation, Retransmission. In this paper a technique to minimize the occurrence of contention in OBS networks. In this scheme a given network is logically divided to a number of clusters. A node within each cluster is selected as cluster head, which Keeps track of the resources available in the network. Implemented in feedback based contention technique. Our simulation results show that the proposed contention avoidance techniques improve the network utilization and reduce the burst loss probability as verified by the simulation results based on the C++ run on Microsoft visual studio.
Keywords: Optical Burst Switching, Contention Avoidance, Burst loss probability.

I. INTRODUCTION

Optical burst switching (OBS), data is transported in various-size of units, called bursts. Optical burst switching is designed to achieve a equilibrium between optical circuit switching and optical packet switching. In an optical burst-switched network, a data burst containing of multiple IP packets is switched through the network all-optically. A control packet is transmitted before the burst in order to configure the switches along the burst’s route. The offset time allows for the control packet to be processed and the switch to be set up before the burst arrives at the intermediate node; thus, no electronic or optical buffering is necessary at the in-between nodes while the control packet is being processed .The control packet may also specifies the duration of the burst in order to let the node know when it may reconfigure its switch for the next arriving burst. Since OBS networks provide connectionless transport, there exists the possibility that bursts may contend with one another at in-between nodes. Contention will occur if multiple bursts from different input ports are destined for the same output port at the same time [1].

II. RELATED WORK

Contention is an important issue in OBS networks. In packet switching network contention is solved by storing the contending packets in a buffer and forwarding other. Buffering of signal in optical domain difficult. Though, fiber delay lines (FDL) are proposed to use as buffer [9].there are many restrictions when Deployed in real network. Such as they are bulky, cannot be access randomly as in electronics domain and provide delay only for a fixed duration. A number of techniques have been proposed in the literature to resolve contention [2, 3, 4].But none of these technique try to reduce the occurrences of contention in the network. Contention avoidance policy must fulfill several goals: minimize the packet loss rate, minimize the average end-to-end packet delay, to fairness among all users and operate with minimum further signaling requirements. We propose a technique to minimize the occurrence of contention in OBS networks. Contention avoidance policies try to prevent a network from entering the congestion state before any contention occurs. In the propose scheme a given network is logically divided to a number of clusters. [6, 7]A node within each cluster is selected as cluster head, which keeps track of the resources available in the network. Cluster head exchange the status of the resources among themselves to maintain an up-to-date information. A node within a cluster that wishes to send a data burst make request it's cluster head for an available wavelength channel on the path of the data burst. A cluster head send a positive or negative reply depending on the availability of wavelength channel. A node on receiving positive reply transmit OBS control packet followed by the data burst on that channel else drop the data burst. In proposed approach, feedback control plan is mainly simplified in route control. The idea is to route the data bursts to the less congested links and reduce the high load on the links that discard packets intensively [5].In our proposed algorithm compare with Retransmission [8].

III. PROPOSED ALGORITHM

A. Procedure to Create Cluster

Let n be the number of nodes in a given n/w. N = 1, 2, 3, , n be a set, representing the nodes in the n/w.
D = d_1, d_2, d_3, , d_n be a set representing the degree of nodes in the n/w, where the element di of the set D, represents the degree of node i.

1.) Cluster Formation Algorithm
1. Initialize N and D. Perform i <---1.
2. While ($N \neq \varphi$) do the following
a.) Find a node has maximum degree in the set D. Let this

node be called Max Degree. Mark the node Max Degree as the cluster head of i^{th} cluster and increase it to $cluster_i$. Initially $cluster_i$ is empty.
b.) Include all node k in cluste r_i such that $k \in N$ and node k is neighboring cluster head Max Degree of i^{th} cluster.
c.) Delete all nodes which are included in the i^{th} cluster, $cluster_i$ from set N and Corrsponding degree from set D.
3 Sort the clusters formed in step 2consistent with the number of element in the cluster of element in $cluster_i$
4. All cluster i number of elements in the clusteri $\leq$ desired number of element
In the cluster.
Do the following
while ($cluster_i \neq \varphi$), remove a node form $cluster_i$. Let this node be called z.
node z in $cluster_j$, where $j \neq i$, such that
(i) Number of nodes in $cluster_j \geq$ desired number of nodes in a cluster, and
(ii) The hop distance between node z and head node of $cluster_j$ is minimum. delete the node z from $cluster_i$.

B. Signaling Issues

1) Channel request packet (CRP): A node prior to sending OBS control packet, request its cluster head for an available wavelength channel on the path to destination by sending a channel request packet (CRP).
2) Channel Reply Packet: This packet is sent by cluster head in response to CRP. Cluster head send a positive channel reply (PCR) if a wavelength channel is available on the path from the source to destination else a negative channel reply (NCR).
3) Resource Update Packet (RUP**)**: Clusters head exchange resource information using resource update packet. If the response of a cluster head to channel request is positive then it send a resource update packet to other clusters head in the network. Clusters head update the usage of the wavelength channel in their database on receiving RUP packet which contains information on the usage of a wavelength channel sent in PCR packet.

IV. COMMUNICATION PROCEDURE

Step 1: Start
Step 2: if (any burst is arrive an edge node) then
Step 3: Send CRP packet to corresponding cluster head node.
Step 4: if (path available source to destination) then
Step 5: Send PCR packet
Step 6: else
Step 7: Send NCR packet
Step 8: if (packet is PCR) then
Step 9: Send control burst
Step 10.Stop some indicated time duration after than send a control packet
Step 11: End if
Step 12: End

Consider the fig .1, here light path is established in between the head node 6 and node 9 through node 10.Suppose node 3 want to send burst node 7 so node 3 will send RRP OR CRP Packet to cluster head node 6 After check the request depends available of wavelength to node 3, then node 3 send control burst followed by data burst on wavelength. Suppose node 13 want to send burst CRP packet to head node 6 but unavailable of wavelength the head node sending NCR OR NAK Packet. So node 13 Stop to Send Control packet some indicated time duration after that made another request. IHI Packet in between them to keep up to date information.

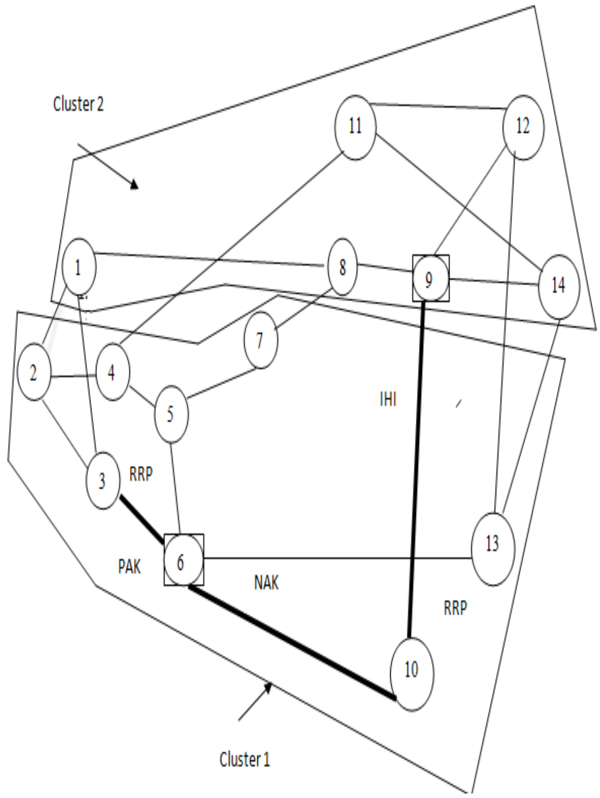

Fig. 1. A Cluster NSFNET
A node encircled within a square indicates a cluster heads.

V. SIMULATION RESULTS

In this section we compare the performance of our propose scheme with Retransmission schemes. For Language is using C++ Simulation run on Microsoft visual studio. We consider 14 node NSFNET. Traffic for Simulation is generated Self Similar traffic. Maximum Burst Size is 50KB, Switch reconfiguration time is 10µs,Control packet processing time 1.5 µs, Reservation Protocol is JET , Burst arrival rate is Poisson and burst length be exponential distributed, And let mean transmission time be 1/µ.Channel capacity 5Gbps.
In Fig. 2. Shows that Burst loss ratio is calculated as number of burst lost divided by number of burst sent. Lower in our propose cluster base scheme. In Retransmissions to allow the dropped burst to retransmitted in OBS layer. However, this scheme results in an extra delay, namely retransmission delay. For lower network traffic, retransmit data bursts get more chances to complete their journey. For this reason burst loss ratio is lower at low Normalized load in Retransmission.

For higher network load, more data burst gets blocked. Lower burst loss ratio in our proposed cluster base scheme is attributed to the selection of wavelength channel that is more likely to be available on the path to destination giving rise to lesser contention and lower burst loss. End-to-end delay is calculated as the total time taken by a successful data burst from source to destination. It is observed Fig. 3. Shows that the end-to-end delay is higher in our cluster base scheme. This is because in the proposed scheme delay is calculated as the sum of the propagation delay between sources to destination plus the round trip delay between a source and its cluster head. Higher delay in the proposed scheme is attributed to the addition of round trip delay between source and its cluster head. Though the delay is higher, increase in delay with Normalized load is only marginal. In Retransmissions end-to-end delay is lower at low Normalized load but increases proportionately at higher Normalized load. This is because at higher load more data bursts follow another route rather than normal route As a result end-to-end delay increases with load in Retransmissions. Finally, the plot for burst loss ratio vs. Normalized load for three, five and eight number of wavelength channel in a fourteen node NSFNET. Fig .4. Shows that no. of wavelength increased burst loss ratio decreased with Normalized load.Fig .5. Shows that in Retransmission Average no. of hops increases with increases in intended no. of hops. Since the burst with large hop count have higher chance of getting blocked than burst with smaller hop count in retransmission contending burst follow another route. Which are not always without delay route, In proposed scheme contending burst are dropped so Average no. of hops travelled is same as intended no. of hops. Fig. 6.Shows that Throughput vs. Normalized Load in higher cluster-base with comparison lowers in Retransmission. Normalized load increases so throughput decreases.

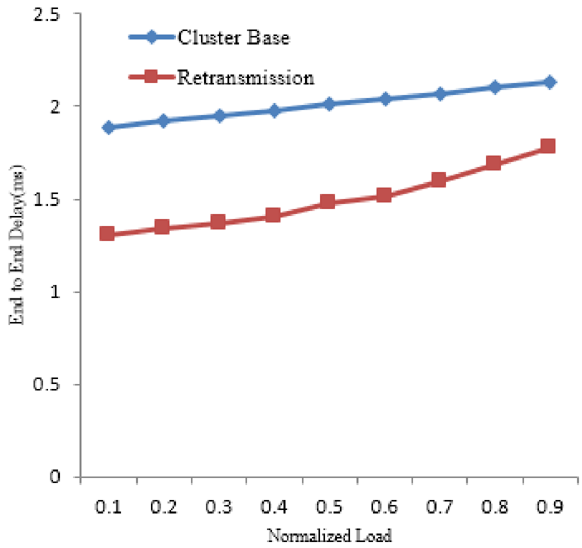

Fig.3. End-to-end delay vs. Normalized Load for three wavelength Channel NSFNET

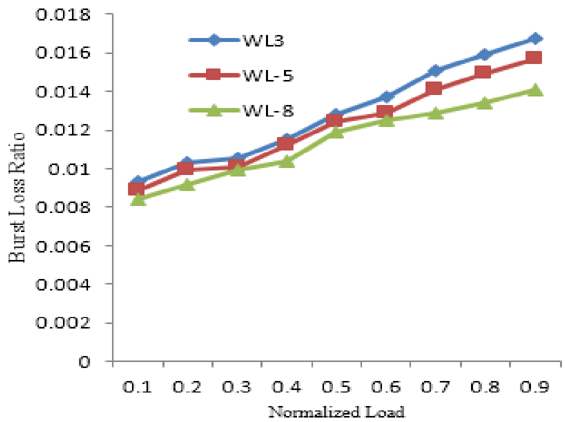

Fig.4. Burst loss ratio vs. Normalized Load for three, five and eight Number of wavelengths in cluster-base routing of NSFNET.

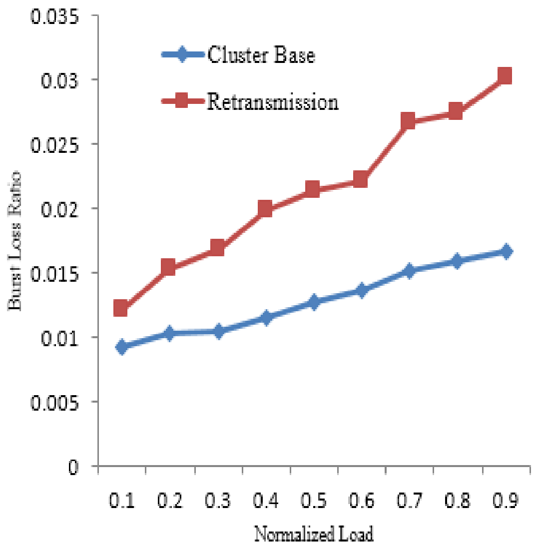

Fig.2. BLR vs. Normalized Load for three wavelength chennel

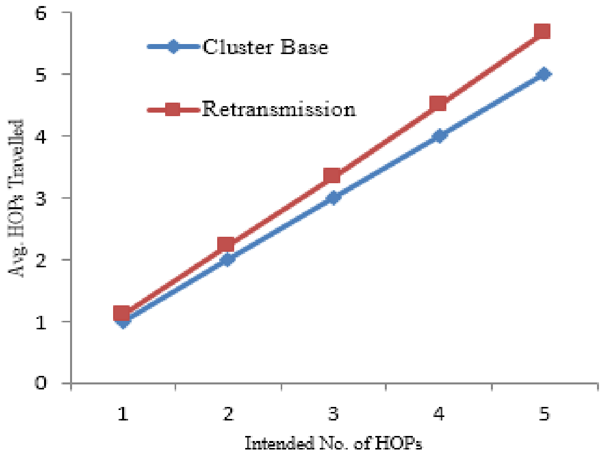

Fig.5.Avg, HOPs Travelled vs. Intended No. Of HOPs

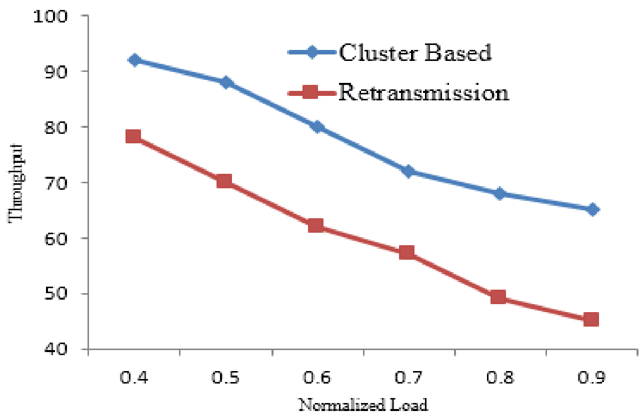

Fig.6. Throughput vs. Normalized Load for three wavelengths Channel NSFNET

VI. CONCLUSION AND FUTURE WORK

We compared our scheme with Retransmission Scheme. We found that burst loss ratio is higher in Retransmission and lower in the proposed scheme. Lower burst loss in our proposed scheme comes with an additional delay. End to-End delay in our proposed scheme is higher than Retransmission scheme. The suitable wavelength assignment scheme can be adopted to further reduce the BLR and delay.

REFERENCES

[1] Tzvetelina Battestilli and Harry Perros, ‘An Introduction to optical burst switching’, IEEE Optical Communications August 2003.

[2] V. Vokkarane, J. P. Jue, and S. Sitaraman,’Burst Segmentation: An Approach for Reducing Packet Loss in Optical Burst Switched Networks. In Proceeding of IEEE ICC 2002’, pages 2673 - 2677, 2002.

[3] S. Lee, K. Sriram, H. Kim, and J. Song, ’Contention-based Limited Detection Routing in OBS Networks’,In Proceeding of IEEE Globecom 2003, pages 2633 - 2637, 2003.

[4] Zalesky, H. L. Vu, M. Zukerman, Z. Rosberg, and E. W. M. Wong, ’Evaluation of Limited Wavelength Conversion and Detection Routing as Methods to Reduce Blocking Probability in Optical Burst Switched Networks’, In Proceedings of IEEE ICC 2004, 2004.

[5] F. Farahmand, Q. Zhang, J. P. Jue, “A feedback-based contention avoidance mechanism for optical burst switching networks,” Proc. 3rd International Workshop on Optical Burst Switching, Oct. 2004.

[6] Ihsan Ul Haq, Henrique M. Salgado and Jorge C.S.Castro, ‘Cooperative Clustered Architecture and Resource Reservation for OBS Networks’, 6th International Conference on Systems and Networks Communications, Barcelona, Spain, pages 213-219 ,October-2011.

[7] Ihsan VI Haq, Henrique M. Salgado, and Jorge C.S. Castrol,’Resource Aware Routing and Intelligent Wavelength Assignment for Cooperative Clustered OBS Networks, In proceeding of IEEE IINESC TEC, Porto Portugal, pages 207,210 2012.

[8] Son-Hong Ngo and Xiaohong Jiang and Susumu Horiguchi,’ Hybrid Deflection and Retransmission Routing Schemes for OBS Networks’,School of Information Sciences Tohoku University, Sendai, Japan.

[9] Vinay Chamola, Manoj Kr. Dutta, and V.K.Chaubey,’ Performance Analysis of Optical Burst Switching (OBS) Network using Fiber Delay Line: A Simulation Approach’, In Proceeding of International Conference on Communication, Information & Computing Technology (ICCICT) 2012, Oct. 19-20, Mumbai, India.

