# A SELF ORGANIZING MAP BASED APPROACH FOR CONGESTION AVOIDANCE IN AUTONOMOUS IP NETWORKS

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**Abstract:** This work presents a Self Organizing Map (SOM) based queue management approach against congestion in autonomous Internet Protocol (IP) networks. The new queue management approach is proposed with consideration to the pros and cons of two well-known queue management algorithms: Random Early Detection (RED) and Drop Tail (DT). At the beginning of this study, RED and DT are compared by observing their effects on two important indicators of congestion: end-to-end delay and delay variation. This comparison reveals that the performances of RED and DT vary according to the level of global congestion: under low congestion conditions, when packet losses caused by congestion are unlikely, DT outperforms RED; while under high congestion, RED is superior to DT. The SOM based approach takes into account the variations in the global congestion levels and makes decisions to optimise congestion avoidance. A centralized observation unit is designed for monitoring global congestion levels in autonomous IP networks. A traffic flow is generated between each router and the observation unit so as to follow the changes in the global congestion level. For this purpose, IP routers are specialized to send packets carrying queue length information to the observation unit. A SOM based decision mechanism is used by the observation unit, to make predictions on the future congestion behavior of the network and inform the routers. Routers use this information to update their congestion avoidance behavior, as their ability to update their RED parameters is enhanced by the congestion notifications sent by the observation unit. In this work, multiple simulations are undertaken in order to test the performance of the proposed SOM-based method. A considerable improvement is observed from the point of view of end-to-end delays and delay variations, by comparison with DT and RED as used in recent IP networks.

Key words: *Self Organizing Map, congestion avoidance, random early detection, drop tail*

*Received: November 16, 2012* **DOI:** 10.14311/NNW.2015.25.007
*Revised and accepted: April 1, 2015*

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