Improving Network Performance with Threshold-Tuned Random Early Detection

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***Abstract*—This thesis studies active queue management and proposes threshold-tuned Random Early Detection (TqRED) for packet networks. The method adjusts the lower threshold and average queue size of RED, then compares the modified scheme with conventional RED in simulation. The report presents plots and discussion for packet loss, average queue delay, and throughput. The author concludes that the simulated TqRED cases perform better on those indicators, while acknowledging that the results are not yet optimal. The source does not establish performance across production routers or every traffic condition, and this summary does not add numerical gains that cannot be verified from the source. Its contribution is a documented comparative simulation and a proposed tuning approach. Broader scenario testing and implementation analysis would be needed to assess generality.**

***Index Terms*—active queue management, RED, TqRED, packet loss, throughput**

I. Introduction

Packet queues can become congested when arrival rates exceed forwarding capacity. Active queue management attempts to detect congestion before buffers fill. This thesis reviews RED and related schemes, then asks whether adjusting RED lower threshold and average queue size can improve network indicators. The work focuses on a proposed TqRED variation and a simulation comparison. It does not claim measured benefit in a live network deployment [1]. Earlier ICTU student work on related designs is included here for context [4], [5]. Related published studies provide context for the subject and methods [6], [7], [8], [9], [10]. These contextual works were selected for this English summary; they are not asserted to appear in the original thesis bibliography.

II. Methods

The report introduces packet delay, loss, throughput, and queue-management concepts before reviewing RED, A-RED, A-RIO, and BLUE. The author then defines TqRED through adjustment of the lower threshold and average queue size and compares it with RED in a simulation. Figures and text present the behavior of loss, mean queue delay, and average throughput. The source does not document an exhaustive parameter sweep or production hardware validation [1].

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III. Results

The simulation chapter includes comparative figures for RED and TqRED. The author reports lower packet loss, lower average queue delay, and higher average throughput for the tested TqRED configuration. The discussion attributes those differences to the altered threshold and queue-size handling. The manuscript does not justify extrapolating its plots to all traffic patterns or router types. No additional numerical performance estimates are introduced in this English summary [1].

IV. Discussion

A simulation can show how a queue-management rule behaves under the modeled load, but results depend on topology, traffic, parameters, and simulator assumptions. The author states that the current outcome is not yet optimal and proposes further refinement. The positive comparison therefore applies to the reported scenarios. Replication with documented parameters, broader traffic patterns, and actual equipment would be useful before claiming general network performance improvement [1].

V. Conclusion

The thesis proposes TqRED and compares it with RED through simulation. In the reported cases, the author finds improvement in packet loss, mean queue delay, and throughput. The work acknowledges that the method can be refined further. Its evidence is a comparative simulation rather than a field deployment. Future evaluation should test a wider range of loads and verify whether the observed advantages persist [1].

References

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