

Abstract

Performance analysis of server-side spam control strategies based on layer-3 classification

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Two server-side e-mail service strategies that utilize a layer-3 e-mail classification technique are presented. Based on layer-3 classification scores, the class of an e-mail can be estimated with minimal processing during normal reassembly on e-mail servers with a high accuracy. Non-spam e-mails are queued in a fast queue, whereas spam e-mails are queued in a slower queue. The non-spam queue is served with higher service capacity than the spam one. Two e-mail service strategies are analyzed using a priority queue model. The first service strategy assigns fixed service capacities to both queues. The second service strategy serves the spam queue based on the occupancies of both queues. We model these two strategies using discrete-time Markov chain analysis. The behavior and performance of the proposed service strategies are analyzed under different e-mail traffic loads. Our models show that non-spam e-mails can be delivered under small delay, as compared to the current strategy that uses a single queue approach. The proposed strategies exhibit delay and loss probability orders of magnitude smaller than the ones for the single queue approach, even under heavy e-mail loading and high spam to non-spam prior. Servicing e-mails by predicting an e-mail's class has two-fold advantages. First speeding up non-spam e-mail services and delivery at the expense of longer spam queuing delay, and second protecting e-mail servers in the events of spam attacks and high e-mail traffic.