

25. Integrated QoS management technique for internet protocol storage area networks

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Abstract

The increasing number of Information Technology Users around the world has led to tremendous increase in the amount of data that requires storage. Traditional implementations of storage area networks are not able to meet the increasing demand for storage capacity as well as a reduction in the operational and capital expenditures. In response to this challenge, new storage area network architectures based on Ethernet (IP) have evolved. IP storage network is a network of storage devices where the underlying technology is based on IP protocol. The creation Internet protocol storage SANs is enabled by the use of iSCSI protocol which makes it possible for SCSI commands to be transmitted over IP network. Meanwhile, storage QoS has become of great importance with the need of assuring a suitable storage service to the clients who share the same pool of IP storage. With the coexistence of storage traffic with other types of traffic in the same IP network, it is important to offer storage traffic QoS guarantees to prevent performance degradation for storage users. Regrettably, the storage device itself does not provide any capability of guaranteeing storage QoS. The research process involved four stages: This first stage involved systematic review of literature to determine techniques for providing QoS in IP networks and then categorized based on performance isolation, bandwidth management and burst handling. However most of the techniques reviewed were found to implement QoS techniques in the storage devices themselves which means the same algorithm run on different devices. In addition, the reviewed techniques did not put into consideration the network statistics when assigning resources. The second stage involved the optimization of QoS techniques for performance isolation, bandwidth management and burst handling for users in IP SANs. Third phase involved the integration of performance isolation, bandwidth management and burst handling techniques for QoS in IP SANs. The fourth stage involved the validation of the integration of the QoS techniques of performance isolation, bandwidth management and validation of the integrated technique based on the response time, throughput and jitter QoS metrics. To optimize the performance isolation, the study formulates an optimization problem to find optimal performance isolation schedule and use it to bind resources to class of users. The study optimized the process of matching packets to rules by sorting rules based on priority, splitting rules and use of a linear tree structure. Experimental results generated proves that the proposed performance isolation technique show significant reduction in response time and increase in throughput. To optimize bandwidth management also formulate an optimization problem to find out the optimal bandwidth allocation for optimal burst handling using network statistics. The research put forward HPDDRR a hierarchical

priority based scheduling technique that used a quantum generated based network statistics and priority of users. Experiments results proves that HPDDRR is able to allocated bandwidth proportionate to the user's priority and when there is idle bandwidth is shared based on priority. The results further show that users that generate burst within their allowed limits do not miss deadlines.

Keywords: *Quality of Service (QoS); Internet Protocols; Storage Area Networks (SAN)*