A FRAGMENTATION CONTROL APPROACH IN JUMBO FRAME NETWORK

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"Dedicated to my beloved family and friends, without their understanding, supports, and most of all love, the completion of this work would not have been possible."

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ABSTRACT

Nowadays, an amazing growth of the Internet has impacted tremendously on the network's capability; from hundreds to thousands of Gigabits/s in the center of the network as well as at the access, and may soon to see an amazing amount of packets that needs to be processed. In the future, such a remarkable growth, there is an urgent need for an integration of packets of bigger sizes, called Jumbo frames. Jumbo frame is an approach that permits higher utilization as it decrease the amount of packets processed by the core routers while not having any adverse impact on the link utilization of fairness. The one major problem faced by Jumbo frame networks is that network paths are set not to transmit Jumbo frame capable end-to-end. This approach can't provide a reasonable performance; as in reality, many paths have bigger Maximum Transmission Unit (MTU)s and many Internet networking gear do support bigger MTUs and the performance is highly depends on the size of a packet. This process leads to suboptimal throughput and is wasting Internet resources. Therefore, it is advantageous to discover the link MTU in order to avoid fragmentation when dealing with Jumbo frame. This research proposes the use of the MTU discovery method with Jumbo frame and the modified IP fragmentation mechanism which are used with the Jumbo frame network to reduce packet drop and throughput by decreasing the overhead in the network. And also, on how to discover the return effective MTU for Jumbo frame situation. For the purpose of evaluation, network simulator NS-2.28 was set up together with Jumbo frame and the proposed methods. Moreover, to justify the research objectives, the proposed algorithm and technique for MTU discovery with Jumbo frame were compared against the existing MTU handling mechanism and techniques that are found in the literature review using simulation metrics such as packet drop and throughput.

ABSTRAK

Pada masa ini, pertumbuhan yang mengagumkan di Internet telah memberi kesan yang mendadak pada keupayaan rangkaian, dari ratusan hingga ribuan Gigabits di pusat rangkaian mahupun di akses; dan menyaksikan satu keadaan di mana satu jumlah paket yang banyak diperlukan untuk diproses. Pertumbuhan yang hebat sebegini akan mendesak satu keperluan segera untuk integrasi daripada saiz paket yang lebih besar, yang dikenali sebagai Bingkai Jumbo. Bingkai Jumbo membolehkan pengurangan jumlah paket yang diproses oleh teras router dan tidak mempunyai sebarang kesan negatif terhadap penggunaan pemanfaatan link. Satu masalah utama yang dihadapi oleh rangkaian Bingkai Jumbo adalah bahawa laluan rangkaian tidak digunakan sepenuhnya bagi membolehkan penggunaan paket Jumbo dari hujung ke hujung. Pendekatan ini tidak dapat memberikan prestasi yang sewajarnya, kerana terbukti banyak laluan mempunyai Unit Transmisi Maksimum (MTU)s yang mampu untuk menyokong paket Jumbo dan peralatan rangkaian Internet banyak yang boleh menyokong MTUs yang lebih besar. Proses ini menyebabkan "*throughput suboptimal*" dan pembaziran sumber Internet. Oleh kerana itu,adalah memberi manfaat jika setiap laluan link diketahui MTUnya bagi mengelakkan fragmentasi untuk Bingkai Jumbo. Penyelidikan ini mencadangkan penggunaan kaedah penemuan MTU dengan Bingkai Jumbo dan juga mekanisme IP fragmentasi untuk mengurangkan pakej rugi dan menaikkan "*throughput*" dengan berkurangnya overhed dalam rangkaian itu. Untuk tujuan penilaian, rangkaian simulator NS-2.28 ditubuhkan bersama-sama dengan Bingkai Jumbo menggunakan kaedah yang dicadangkan. Selain itu, algoritma dan teknik cadangan penemuan MTU dengan Bingkai Jumbo telah dibandingkan terhadap mekanisme pengendalian MTU yang sedia ada dan teknik-teknik yang ditemui dalam kesusasteraan menggunakan metrik simulasi seperti pakej rugi dan "*throughput*".