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Realization of a stable network flow with high performance communication in high bandwidth-delay product network

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It is important that the total bandwidth of the multiple streams should not exceed the network bandwidth in order to achieve a stable network flow with high performance in high bandwidth-delay product networks. Software control of bandwidth for each stream sometimes exceed the specified bandwidth. We proposed the hardware control technique for total bandwidth of multiple streams with high accuracy.

GNET-1 is the hardware gigabit network testbed that we developed. It provides functions such as wide area network emulation, network instrumentation, and traffic generation at gigabit Ethernet wire speeds. GNET-1 is a powerful tool for developing network-aware grid software. It can control the total bandwidth of the multiple streams with high accuracy by adjusting the interframe gap (IFG).

To see the effect of the highly accurate bandwidth control by GNET-1, the file exchange of large-scale data was done on a Trans-pacific Grid Datafarm testbed between Japan-U.S.. We used three trans-pacific networks, APAN/TransPAC Los Angels line and its Chicago line and SuperSINET New York line. Its total bandwidth that can be used was 3.9 Gbps. In this feasible study, GNET-1 controlled five gigabit Ethernet ports, and achieved the total bandwidth of 3.78 Gbps in stable for about one hour. The bandwidth was 97 % of the peak bandwidth of used networks.

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