To Support Flexible Transmission Unit in the Future Networks

Jingcheng Zhang, Zha Min
HuaWei Technolgies, Co., Ltd.
ShenZhen, China

***Abstract*—This presentation explores the cause for the mismatch between the physical port rate and actual much lower throughput of today's networks. We argue that the network QoS is a result of interplay between the network infrastructure and the end systems. The end to end network performance reaches the optimum state when the network throughput is maximized but not more than the amount of data that can be further processed by the end system. Based on our research, one of the methods to achieve this goal is to dynamically update the MTU size to accommodate the network condition change. Our simulation shows that the size of the MTU greatly affect the network throughput and end system resource usage, which are the two main impact factors of the end to end network performance.**

Our presentation is organized as the following. Firstly, by revisiting the history of the Ethernet development, we compare the fast growing Ethernet port rate and the bandwidth requirement of the future applications summarized in the working group. In order to facilitate these newly emerged applications, operators will need to upgrade their network by purchasing more routers and switches with higher port rate. However, in today's network, the actual goodput is only a small percent of the physical bandwidth. Statistics shows that the network QoS cannot be proportionally improved by simply increasing the network scale. Our presentation continues by analyzing this problem both from the network perspective and from the end system perspective. We reveal that the potential problem is the fixed 1500 B MTU size is too small for the current network. We present theoretical analysis and simulation results that shows the network goodput can be significantly improved by increasing the MTU size. Meanwhile, small packet size results of more packets that needs to be handled by the end system when transmitting the same amount of data. Such resource could have been saved for applications when processing large MTUs. In the last part of our presentation, we claim that the network performance is a combined performance of the network and the end system. We need to maximize the network throughput when the end system approaching its optimum performance point.

We believe that the future network is mixed with large frames (mostly for data transport) and short frames (mostly for network control and management). Thanks to the SJF (frame that is usually larger than 9 KB) utilization, the number of inflight packets in the network can be greatly reduced. Due to this, we picture the further network where the SJFs can be centrally managed by a sort of network controller end to end. This mechanism obsolete the legacy TCP mechanism since the bandwidth is centrally managed. Moreover, the centralized traffic management minimize the frames being buffered which optimize the network latency. It also provide a better opportunity to optimize the network monitoring and diagnose features.

Our presentation is a joined research work together with academia, more presentation could be presented in the later event in the same thread, e.g., Geneva meeting in October.

Jingcheng Zhang received the Ph.D. degree in communication electronics from Linköping University, Sweden, in 2014. He is currently a research engineer in Network Technology lab, Central Research Institute, HuaWei Technologies Co. Ltd. His research interest includes IoT, network congestion control protocols and communications.

Zha Min has 20 years of R&D experience in data communication networks, especially in ATM, Ethernet, IPv6, MPLS network architecture and solution. He is a principal research engineer in Network Technology lab, Central Research Institute, HuaWei Technologies Co. Ltd. He is now working on the research for forwarding techniques in future network.