§ 19. High Quality Video Streaming System for Plasma Diagnostic Using Super SINET

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Smooth cooperative research requires effective remote participation. To this end, NIFS (National Institute for Fusion Science) has enhanced its network among domestic institutes. The new network, called the Super SINET [2] (Science Information Network), connects national universities and governmental organizations and has a 10 G bps backbone. NIFS connected Kyoto University and Nagoya University to this network at a speed of 1 G bps each way in 2002, and plans to connect other universities. The author developed a new video-streaming server to send non-compressed images between NIFS and Nagoya University and Kyoto University. Motional image data can help researchers recognize dynamic behavior of plasma such as plasma-wall interactions and impurity transport in the plasma periphery. It is common way to send video streaming by the limited network as lossy compressed format like RealVideo™, MPEG, QuickTime™, and the like. Shoji developed Video on Demand system for LHD experiments [3], and the system uses MPEG-1 or MPEG2 formats and provides them by the network to monitor plasma behavior. These format uses lossy algorithm that removes insignificant information from the original data. The reason because the lossy algorithm is used is that it is convenient to send images by limited bandwidth network like the Internet. For example, sending VGA size image 30 times per second requires the bandwith of 26MB/s, and the bandwidth is far from the capability of the normal network. These data can be used for entertainment purpose, but it cannot be used for research. Therefore, until SuperSINET is available, it is not realistic to send non-compressed motional images between universities. The network bandwodth of the new network between NIFS and the universies is 1Gbps, it is high enough to send non compressed images.

Fig.1. shows the system overview of this system. The specification of the server and client PC are listed in table 1. The servers and client uses two TCP/IP ports to communicate with each other. The clients connect to the server using the control port, and demand that the server start or stop streaming data. The source of the image is captured from the composite signal using NTSC format.

The main characteristic of this system is extensible by the cascade connection (Fig.2). The relay server locates between the capture server and the client, it receives the video image from the upper stream, and provides it for the two or more downstream servers or clients. By increasing the number of layers, the number of the clients can be unlimited.

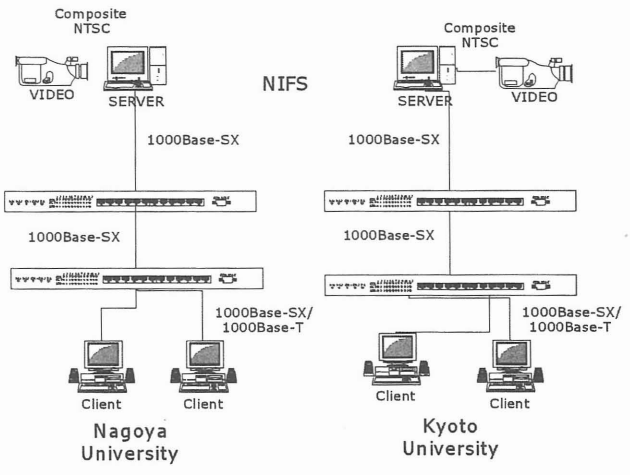

Fig. 1. The overview of the video streaming system

	Server	Client
CPU	Xeon 2GHz x 2	Pentium 4 2GHz
Memory	1GB	1GB
OS	Linux Kernel 2.4	Windows 2000 Professional
Capture card	BtB 878 based	
NIC	1000Base-SX	1000Base-T

Table I: The specifications of the servers and clients

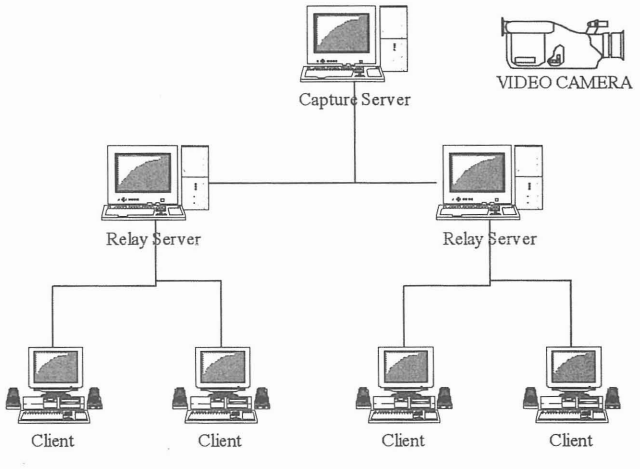

Fig2. Cascade connection of the servers. The relay server receive the motional images from the upstream, and forwards them to downstream

Reference
1) Emoto, M., et. al., Rev. Sci. Inst., 74,(2003), pp.1766
2) Shoji, M., et. al, PCaPAC2000, Hamburg, Oct. 2000
3) http://www.sinet.ad.jp/