Current Status of the Software Correlator for Geodetic VLBI (Part 2)

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Communications Research Laboratory (current National Institute of Information and Communications Technology) has been developing K5 VLBI system in which raw data are transferred to a data correlation site through the Internet (e-VLBI). K5 is a PC-based system equipped with a sampler board developed for a VLBI data acquisition. When the development of K5 was started, K5 was the first system that recorded the raw data on a hard disk. U.S. VLBI group also developed Mark-V system which was a hard disk recorder substituted for a conventional magnetic-tape recorder. Thus a hard disk recorder is gradually taking over a magnetic-tape recorder in a VLBI system. In parallel with the K5 system development, a software correlator (K5 software correlator) run on a PC has also been developed. In accordance with the improvement both in software algorithm and in a performance of a computer, software correlator can process VLBI data practically.

The K5 software correlator aims at obtaining the correlation data compatible with those processed by the hardware correlator for geodetic use. Since it has been developed by using the standard C language, it can run on almost all kinds of PCs available commercially. At present time this software correlator can process 8 Mbps data in real time when it runs on a PC equipped with a Pentium4 2GHz processor or a more powerful CPU. A benchmark test for various CPUs shows that the processing time of software correlator becomes short with the improvement in a performance of CPU. It is said that the performance of PC will double every two years for at least ten years from now. This means that we can expect the improvement in K5 software correlator without any improvement of software itself.

On the other hand, a distributed correlation processing using a number of PCs simultaneously is under consideration to achieve further speed up. Each PC processes only segmented data, and then processed data are combined for a further processing such as a bandwidth synthesis. There are two ways to segment geodetic VLBI data for a distributed processing. One is channel segmentation. Each channel data in raw VLBI data are assigned to each PC. The other is time segmentation. Raw VLBI data are divided into appropriate short-time period data and each segmented data are assigned to each PC. We are now developing a distributed processing system using the time-segmented data. Some approaches are considered to realize a distributed correlation system. One approach, we are trying, is a system consisting of a server PC and client PCs. A server program run on the server PC supplies time-segmented data responding to a requirement from a client PC. A client program run on a client PC processes time-segmented data and returns result to the server PC. A client program under the development is a screen-saver program. We named our client-server system VLBI@home after SETI@home.

We think that a software correlator will take over a hardware correlator in the future, because it is said that the performance of PC will improve double every two years and it will last at least about ten years from now. Actually although only a few years have passed since the development of K5 software correlator started, it becomes possible to process VLBI data practically. We can expect the improvement in a performance of software correlator with the improvement in a performance of CPU. However we think that a network-distributed processing represented by GRID will be an important technology to realize a software correlator bearing a more practical use. We will continue the development of the current software correlation system to realize a real-time VLBI system using the Internet.