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World-wide Visualization Environment for e-Science over High-speed Networks

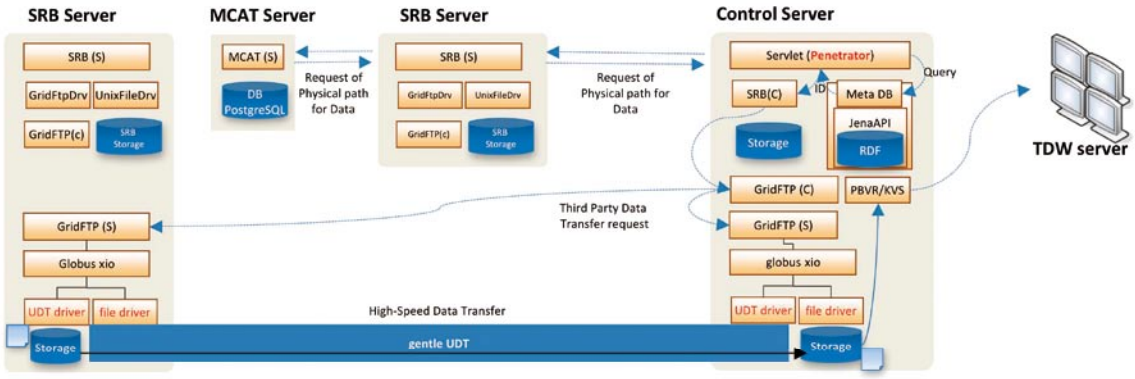
Cybermedia Center, Osaka University, Japan

The Applied Information System division of the Cybermedia Center aims for global computational and visualization services for scientific users. Not only large-scale computational facilities but also visualization service with petascale storage. We hope to promote next generation HPC/Visualization services with interdisciplinary scientists and companies.

HPC Analytic Science: Challenge for development of the world-wide platform of Visualization

Vorticity often causes chaos phenomenon in clinical cases. However, clinical cases are sometimes very hard to analyze and quantify as evidence. In some cases, Large Eddy Simulation (LES), a turbulence model, may help medical science computationally because it can estimate the effects of vorticity. Hence, speech science, which uses oral functions, will shift to a speech e-Science that regards vorticity as one of its main factors. (For LES analysis, we used FrontFlow/Blue.) However, LES analysis requires a huge amount of computational cost due to its algorism; moreover, a huge amount of analytical data needs to be exported in order to be visualized effectively. Therefore, the Cybermedia Center has been developing a remote visualization and database infrastructure similar to our SC07 demo that will share computational resources and visualization resources with speech scientists. Currently, as the core visualization technology, Particle- Based Volume Rendering was chosen because of its scalability and confidence of the interpolation for FEM simulation method.

Database and Visualization in e-Science Infrastructure



Scientific Visualization Middleware: Expansion modules for Tiled Display Wall

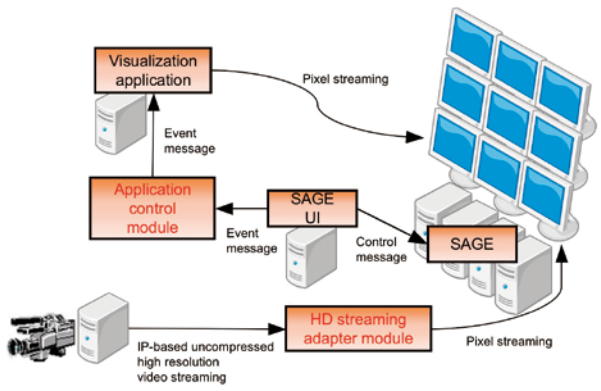
Application Control Module for SAGE

Recently, SAGE (Scalable Adaptive Graphics Environment) has been received attention as a middleware that allows scientists to control and drive a TDW. The most promising feature of SAGE is that it enables scientists at a site to visualize scientific data on a TDW located at the site through the use of network streaming technology even if the scientific data are stored and generated on different sites.

However, SAGE does not have any function or method to let the visualization application know user input from its user interface, SAGE UI. Thus, users have to use the application's interface directly without using SAGE UI. For the unification of these interfaces, we develop a built-in application control module for SAGE.

HD Streaming Adapter Module for SAGE

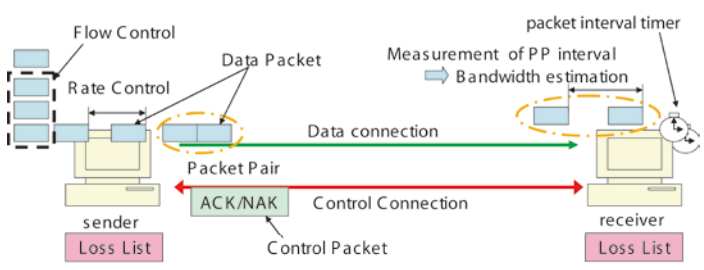
The advancement of networking technology allows transmission of uncompressed High Definition video over the Internet. We have been developing an HD streaming adapter module for SAGE that allows HD streaming video to be displayed in real-time on a SAGE-based TDW.

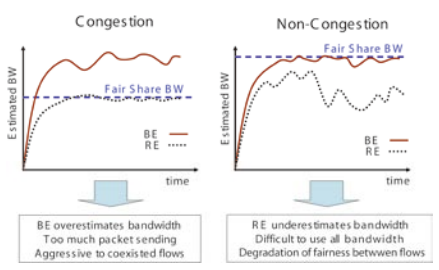


High-Speed Data Transfer Protocol: gentle UDT with fairness over High-speed networks

e-Science applications such as some Grid applications, World-wide data sharing applications, etc., require the transfer of large amounts of data over long distance networks. The throughput of conventional TCP (Reno or NewReno) over LFNs (Long Fat pipe Networks) is much smaller than the application requirements. High-speed protocols are being developed to overcome this problem. However, the fairness of these high-speed protocols with conventional TCP is not sufficient in LFNs.

Therefore we propose high-speed transport protocols considering fairness with other traffic in LFNs. One protocol is a "gentle UDT". The original UDT (UDP based data transfer protocol) is a high-speed protocol that estimates available bandwidth on the receiver side by using packet-pair algorithms. However, the fairness of UDT with conventional TCP and UDT itself over LFNs is not good enough because of late detection of congestion. Our gentle UDT can improve the fairness and achieve enough throughput over LFNs. We develop an estimation algorithm using a packet train with early recognition of congestion, and develop the AIMD algorithm with this recognition.





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