

# Improvement of Scalability in Sharing Visualization Contents for Heterogeneous Display Environments

Thursday, 17 March 2016 15:00 (30 minutes)

e-Science receives a lot of attention as the infrastructure that supports collaborative, computationally- or data-intensive researches through networks.

It is important in e-Science to build an infrastructure that streamlines the discussion between researchers that are located in different sites.

For efficient remote discussion, it is needed to visualize numerical data and to share visualized data because it is difficult to understand and analyze numerical data intuitively and there are many opportunities for researchers to change their research institute and university.

In recent researches that deal with large scale data, the visualization content that is the result of the visualization of the data is usually large and high-resolution image and video.

Tiled Display Wall (TDW) can display visualization contents on a large display in high-resolution.

TDW is a technique to build a large and high-resolution display by arranging multiple displays in matrix.

TDW also facilitates people to see the visualization contents simultaneously and to share their insights easily.

These features of TDW promote the efficient discussion for the visualized results of experiments and simulations.

For realizing the e-Science infrastructure, sharing visualization contents between multiple TDWs in remote sites is required.

This requirement needs visualization contents to be distributed in different resolution because each TDW system has a unique configuration about display environment.

Visualcasting is a technique to distribute visualization contents to multiple TDWs that are heterogeneous display environments.

In Visualcasting, one or more relay servers are deployed on WAN and duplicate the images that is sent from applications and distribute them to TDW systems.

Visualcasting doesn't have the high scalability for the number of TDWs because the number of relay servers is static from start-up.

When much of TDWs share visualization contents, the lack of bandwidth is caused since each relay server sent received packets of a visualization content to all TDWs that share the visualization content.

We propose the dynamic rearrangement mechanism for the problem of Visualcasting.

In the mechanism, nodes that are the relay servers are launched dynamically with the increase of TDWs and are connected to existing nodes on tree structure.

This mechanism solves the problem of the scalability for the number of TDWs in Visualcasting.

For implementing the mechanism, we used Scalable Adaptive Graphics Environment (SAGE).

SAGE is a middleware to realize TDW and has a component called to SAGE Bridge that is developed as Visualcasting.

We implemented the dynamic rearrangement mechanism by remodeling SAGE Bridge.

In the evaluation, it is shown that our proposed method improves the scalability for the number of TDWs.

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**Session Classification:** VRE Session

**Track Classification:** Networking, Security, Infrastructure & Operations