Improvement of Scalability in Sharing Visualization Contents for Heterogeneous Display Environment

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Outline

1. Background

- Efficient collaborative researches
- Visualization device
- SAGE
- 2. Problem
 - The scalability issue
- 3. Proposal
- 4. Evaluation
- 5. Conclusion

Background: Efficient collaborative researches

- The system for efficient discussions between remote sites is required as an e-Science infrastructure
 - It is difficult for Scientists to discuss experimental results between remote sites
- It is important to distribute visualization contents between remote sites
 - Numerical data prevents scientists from understanding and analyzing itself intuitively
 - Visualization is a technique to resolve the prevention

Background: To realize the efficient discussion

- We focus on SAGE* that is a middleware to realize a TDW system
 - The aggregation of contents in different sites
 - Sharing contents between multiple TDWs



* Scalable Adaptive Graphics Environment

Background:

The aggregation of contents in different sites

Multiple applications can be displayed in TDW
 This feature enables people to compare them on TDW



Background:

Sharing contents between multiple TDWs

- Visualcasting* was proposed in SAGE
 - Visualcasting is the technique for sharing visualization contents between multiple TDWs that have heterogeneous display environments



* Jeong, B. 2009. "Visualcasting: Scalable Real-time Image Distribution in Ultra-High Resolution Display Environment".

Problem:

The problem for the e-Science infrastructure

- SAGE is essential for efficient discussions between remote sites
 - The aggregation of contents in different sites
 Sharing contents between multiple TDWs
- Visualcasting has the problem that disturbs the discussions
 - The drop of throughput is caused

Problem: The scalability issue (1)

SAGE Bridge is implemented in SAGE

- 1. The application divides its image to sub-images
- 2. SAGE Bridge receives sub-images and send it to TDWs
- 3. TDWs construct the original image from sub-images



Problem: The scalability issue (2)

- Visualcasting has the low scalability for dynamic changes of the number of TDWs
 The number of SAGE Bridge is static
- This issue causes the drop of throughput



Outline

- 1. Background
- 2. Problem
- 3. Proposal
 - Our proposed method
 - The implementation
- 4. Evaluation
 - The experiments
 - The result of experiments
- 5. Conclusion

Proposal: Our proposed method

- We propose the dynamic rearrangement mechanism that improves the scalability of Visualcasting
 - SAGE Bridge nodes are added dynamically corresponding to the number of TDWs
 - SAGE Bridge nodes are arranged in tree topology



Proposal: The implementation

- The dynamic addition of SAGE Bridges
- The delegation of image data between SAGE Bridges for arranging them hierarchically



Evaluation: The experiments

- We experiment the drop of throughput is avoided when the number of TDWs increases
- We confirm that the dynamic rearrangement mechanism solves the scalability issue

Bandwidth capacity in each path : 1 Gbps



Conventional SAGE Bridge

Proposed SAGE Bridge

Evaluation: The result of experiments

- The proposed mechanism improves the scalability
 - Conventional SAGE Bridge
 - The drop of throughput is caused
 - Proposed SAGE Bridge
 - The drop of throughput is avoided

each consumed bandwidth when the number of TDWs is 4

Application	Conventional SAGE Bridge	Proposed SAGE Bridge
400 Mbps	245 Mbps	400 Mbps

Conclusion

- The e-Science infrastructure for efficient discussion between remote sites is required
- SAGE is essential for the infrastructure
- Visualcasting has the scalability issue
- We proposed dynamic rearrangement mechanism that improves the scalability of Visualcasting
- In the evaluation, we confirm the improvement of Visualcasting