Display Sharing Technology

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As the Mission Operations Directorate (MOD) looks for innovative ways to reduce the sustaining cost of its facilities at Johnson Space Center, the directorate tasked MOD Operations Technology Facility personnel with studying the feasibility of alternative architectures for the video transport system. Most flight control data displays consist of text and graphics; however, motion imagery is also used. That imagery is delivered through the video transport system.

The current video transport system is a custom build of broadcast-quality hardware and video cabling, and requires specialized maintenance, sparing, and support. The system satisfies the MOD requirement that a given computer display can be shared to other displays, such as large projectors in the flight control rooms, or a picture-in-picture window within any console position workstation. Any alternative architecture for the video system must also satisfy this requirement. The system that was developed is called "display sharing."

The preliminary list of requirements for display sharing included: the ability to share a screen or application in a one-to-one, one-to-many, or many-to-many fashion; the ability to scale the image based on the target's screen resolution and size; the ability to easily configure and operate the display sharing system; and the ability to maintain an adequate performance margin and a high level of security.

Display sharing—while not intended to be an alternative to straight Internet Protocol (IP) video systems—delivers display sharing and video at a lower cost of sustaining and maintenance. There are definite advantages to the employment of this technology in the remote operations scenario because of the relatively significant lower bandwidth requirements.

The display sharing process is a means of actively sharing only the pixels that change from one viewing apparatus to another through a secure and robust IP infrastructure. This system delivers image sharing across the local area network while simultaneously managing bandwidth, supporting high-end U.S. government-accepted encryption, enabling recovery and resynchronization following a loss of signal, and minimizing latency, while being encompassed by an internal secure directory server that couples with local NASA Data Center credential authentication processes. Additional critical elements to be added include image scaling support, multi-sharing, ease of initial integration and configuration, integration with desktop window managers, collaboration tools, and host and recipient controls.

A tool developed by VSee Labs, Inc. (Sunnyvale, California), with inputs from MOD, is specifically designed to share data and imagery from a Microsoft Windows desktop by selecting a specific application or the entire desktop to another Microsoft Windows PC machine.

In compiling the proposed requirements for the display sharing tool, selected customer groups at Johnson Space Center were polled for input. Although there will be other interested customers, use of display sharing generally breaks down into three areas of interest: flight control rooms; conference room collaboration; and training and simulation.

Flight control room users require the ability to share any flight control discipline application to a variety of clients, including each other's workstations, the large projected screen, and via secure remote access to the office environment and remote users.

Conference room collaboration users require the ability to share any applications, most commonly the entire desktop, by pairing both subscription models ("push/share" and "pull/broadcast") in a quick, secure, and convenient way to share data over an existing network.

Training and simulation users require the ability to share any flight controller's application in an instructor-to-student-led training exercise over the network. Training and simulation functions encompass all flight control rooms sharing requirements with the addition of training-specific tasks. The instructor must be able to control imagery shared from their student's entire desktop without the student being aware of the instructor's actions. The instructor must be able to select particular monitors from the student's workstation to manage the training. Instructors may also require the use of recording and playback features to run simulations.

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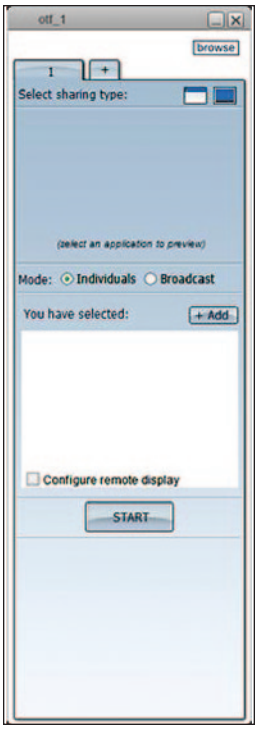

Fig. 1. *The VSee display sharing graphic user interface contains many functions of sharing including: the ability to automate the sign-on process using the existing Windows authentication from the Active Directory or Lightweight Directory Access Protocol; share up to 16 separate applications; share the entire desktop; or select multiple monitors or regions of the desktop.*

An individual can "push" their data to another individual (or set of individuals) without having to distinguish the different resolution factors from each shared personal computer.

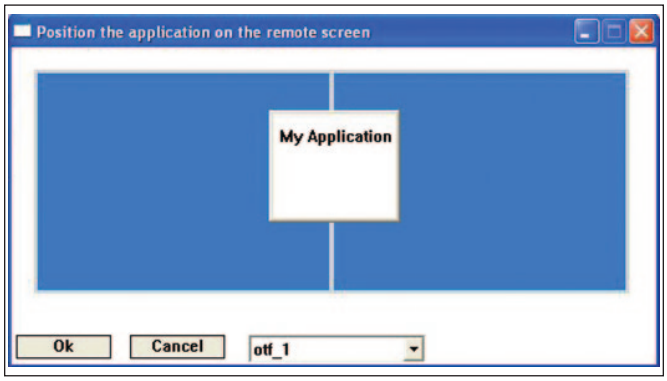

Fig. 2. *The data are displayed onto the existing destination monitors (i.e., two monitors in figure 2) and then resized and placed in a desired target location. Each shared space can be selectively chosen for a selected individual.*

An individual (or set of individuals) can "pull" existing shared data from a secured published broadcast of shared data.

The VSee display sharing graphic user interface, given in figure 1, shows a rather simple interface that has the ability to select specific members to visually collaborate.

The ability to collectively collaborate with the shared display includes "action" buttons that can intensify the visual conversation. This features a pen allocation for creative drawing, text annotation, color assignment, erasing previous annotations, and the ability to allow the remote control to another display.

Selected shared data for an individual can be managed through an "address book" that allows the individual to create specific groups of individuals, automatically accept display sharing calls, browse through a set of securely published data from broadcasted individuals, and acquire status activity from all registered members. This technology is significantly less resource-intensive than the existing non-commercial off-the-shelf implementation. This may be a first step toward the evolution of an enhanced commercial off-the-shelf desktop data sharing protocol through a pixel sharing image process in real time, thereby eliminating the need for large data handling bandwidth.