

Network of Instruments Shared via the Internet

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The Challenge: Enabling many remote users to simultaneously perform measurements and laboratory exercises in an easy-to-use and cost-effective manner.

The Solution: Using NI LabVIEW for local process control, AppletVIEW for Web publishing, and a remote user interface so remote users can connect and run experiments via their Web browsers.

Introduction

With practical software tools such as LabVIEW, users have enhanced computer-based measurements by combining instruments, data acquisition, signal processing, and data analysis. This experiment adds the capability of performing measurements from a remote location.

Other solutions require remote users to have specific software installed or to have their own replicas of the application running on the server. With our solution, remote clients require no additional software regardless of their location or platform. In addition, all data transfer occurs simultaneously on all remote clients connected to the same session. The use of remote laboratories can reduce costs by sharing expensive equipment worldwide, as well as improve lecture and laboratory experiences for students residing in remote locations.

Performance

The first step was to control an instrument locally with a computer. We placed a network analyzer under computer control using LabVIEW and a GPIB card. We developed a graphical user interface (GUI) panel, for communication with the network analyzer.

The next step was to access the local process across the Internet. We needed to reduce the requirements for the remote user's computer by using AppletVIEW to create GUIs and manage data transfer.

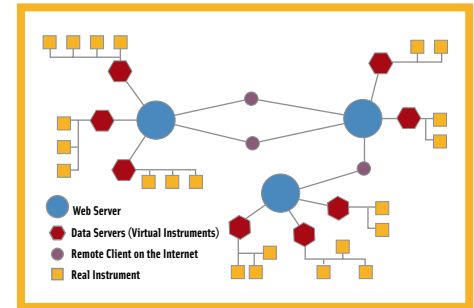
When students control the network analyzer, they can browse to a Web page that introduces the experiment and connect to it through that same Web page. The student can then control the remote instrument across their Web browser. The laptop computer was wirelessly networked, so students can use it from any location.

Remote User Benefits

Remote users only need a Web browser on their computer to connect and run the measurement, which avoids software compatibility issues between the host and clients.

Furthermore, concurrent, multi-user connections are possible. All users in the session receive instant updates of any parameter changes. They can organize sessions so every user has the same rights, or users have "read-only" and "read-write" authorization levels. All users can collaborate during the session through a chat window that is placed on the GUI.

A single GPIB card can control up to 14 instruments. By creating the corresponding virtual instruments and putting them on the



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Web, we can make an entire laboratory available on the Internet. We can replicate this setup to create a network of laboratories shared worldwide across the Internet.

Conclusion

We can use remote laboratories to improve the quality of presentations in the classroom, as well as experimentation in the laboratory. It provides students the opportunity to run or observe experiments from distant locations at convenient times and in a more comfortable surrounding. We can arrange laboratory groups and sessions in a more flexible way for both students and instructors. Sharing instrumentation in this manner offers tremendous savings and provides a means for a large number of students or researchers to use the equipment worldwide. ■

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