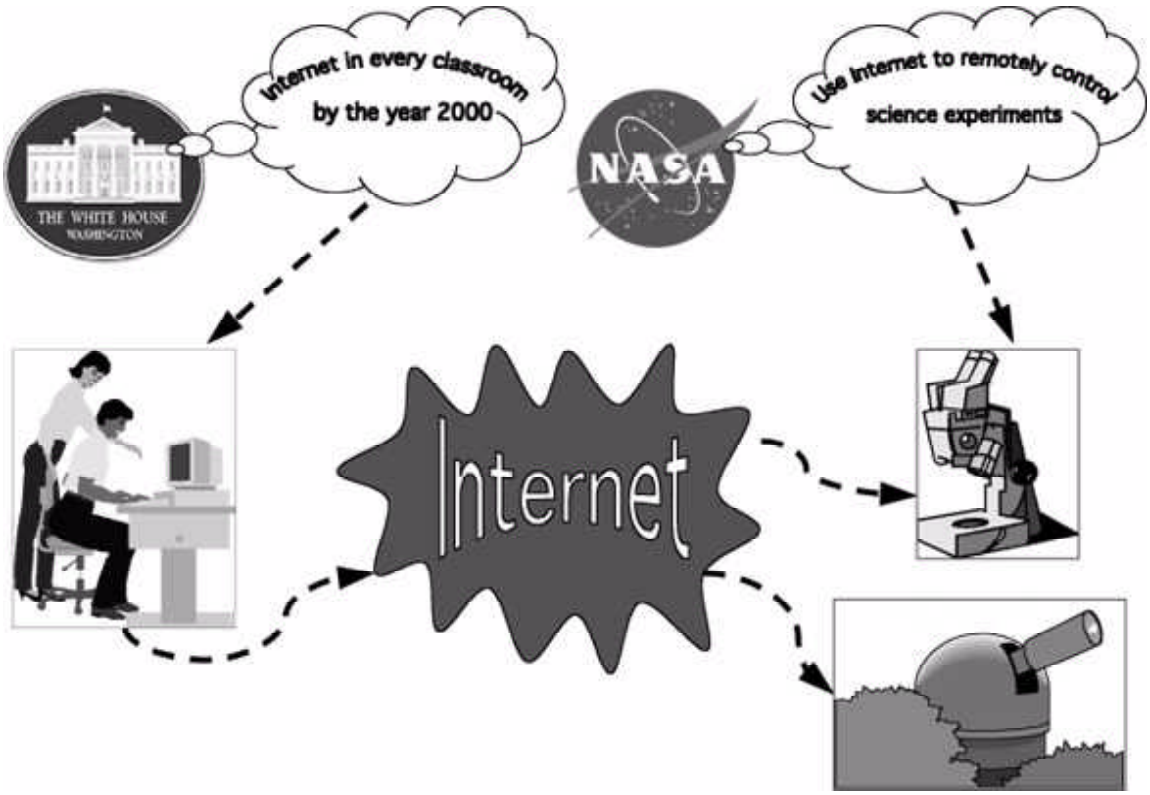
Virtual Interactive Classroom: A New Technology for Distance Learning Developed

The Virtual Interactive Classroom (VIC) allows Internet users, specifically students, to remotely control and access data from scientific equipment. This is a significant advantage to school systems that cannot afford experimental equipment, have Internet access, and are seeking to improve science and math scores with current resources.

The VIC concept was initially identified as an application of Embedded Web Technology in June of 1997. VIC uses the 1998 NASA Software of the Year Award winner, *Tempest*, an embedded web server developed at the NASA Lewis Research Center (ref. 1). VIC and *Tempest* were developed by the same civil servant team at Lewis.



Virtual Interactive Classroom concept. Lewis' Virtual Interactive Classroom leverages the vision of "Internet in every classroom," allowing students to remotely control scientific experiments.

A VIC Development Lab was established at Lewis to demonstrate that scientific equipment can be controlled by remote users over the Internet. Current projects include a wind tunnel, a room camera, a science table, and a microscope:

- The wind tunnel project accesses the 6- by 6-in. laminar flow test section of a research-grade wind tunnel. Users can read pressure transducers located in the upper and lower surfaces of a wing as well as an airflow transducer in the test section. Remote users can turn the airflow on and off, set wind velocity, adjust the wing angle of attack, and read the pressure values.

- The room camera project uses a charge-coupled discharge (CCD) device mounted to a pan/tilt mechanism. Users can control the pan, tilt, zoom, and focus. The image received by the user is refreshed at regular intervals.

- The science table project includes a horizontal surface with a two-axis servomechanism that positions a color camera. The table has interchangeable surfaces. Several surfaces are available with fossils, Native American artifacts, geology samples, and antique tools. The user, from any remote location, can select a specific position for the camera and retrieve either high-speed or high-quality images in real time.

- The microscope comprises a two-axis servomechanism that positions a microscope camera and lens, and a microscope slide holder that can contain up to 360 slides. Remote users can position the microscope over any of the slides in the holder and download high-quality color images.

Metrics are being collected, as well as feedback from users, to determine the desirability, popularity, and educational benefits of each project. Modifications will be made in response to user feedback. After the projects have been developed and tested, they will be duplicated at remote VIC Operations Labs. These labs may be owned and/or operated by institutions of learning. Students will be able to operate these remote labs to learn about the Internet or study the subjects made available by VIC projects. These opportunities are directly related to careers in science and engineering.

Find out more about Lewis' Virtual Interactive Classroom:
Learning Technologies Project http://www.grc.nasa.gov/WWW/K-12/
Embedded Web Technology http://vic.grc.nasa.gov/

Reference

1. Daniele, C.J.: Embedded Web Technology: Internet Technology Applied to Real-Time System Control. Research & Technology 1997, NASA TM-98-206312, 1998, pp. 165-166. (Available online: http://www.grc.nasa.gov/WWW/RT1997/7000/7750daniele.htm

Lewis contacts: David W. York, (216) 433-3162, David.W.York@grc.nasa.gov; Maria Babula, (216) 433-5221, Maria.Babula@grc.nasa.gov; Lisa M. Lambert, (216) 433-3994, Lisa.M.Lambert@grc.nasa.gov; and Joseph G. Ponyik, (216) 433-8592, Joseph.G.Ponyik@grc.nasa.gov
Author: David W. York and Maria Babula
Headquarters program office: OLMSA, External Programs

Programs/Projects: SEMAA, LTP, FCF, EWT
Special Recognition: *Tempest* received the 1998 NASA Software of the Year Award.