

## **Creating an Isolated Practice Environment for Learning Ground System Software Tools**

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The Software Systems and Operations Engineering Section at the Jet Propulsion Laboratory has developed an intuitive visual approach to self-paced learning of software tools.

JPL's Ground Data System provides data monitoring and manipulation tools for use by used by multiple missions to assess the status of their spacecraft subsystems. When missions staff their flight teams to integrate and test hardware and software subsystems in preparation for launch, team members must be trained quickly and efficiently in use of the ground system. Data flowing from the spacecraft is first verified and validated from simulated test bits to prepare for real-time, high rate flight data.

Obstacles: computer availability, flight team development deadlines, test and integration conflicts, review boards and meeting schedules leave few hours and resources available for training multiple teams or individuals. Ground system tool training may become a rushed activity that must be squeezed into a brief span of time.

A promising alternative is a suite of tool simulations developed by JPL trainers using Macromedia's FLASH, an animation development program commonly used to create games in the commercial world. FLASH provides a low cost method for reproducing the look, feel, and functionality of complex tools, allowing access to them from the Laboratory's Intranet.

These animated working models provide a safe playground for engineers and scientists to develop proficiency in tool usage at their convenience. They are visual facsimiles of the ground system's delivered tools and operate by means of choreographed inputs and outputs, depending on the chosen paths of the "operator." Simulations are available 24 hours a day from most computers on the Laboratory's LAN. Twenty-four hour availability is a major benefit to flight projects because there is no contention for hardware during periods when test and integration exercises severely limit system availability for training.

Interactive training segments are built into the simulations to provide scenario-based exercises for the more advanced learners; novices may elect to follow sequential instructions provided when object-sensitive triggers are activated. A secondary motive for using these position-based triggers is to protect the operator's wrist from hazardous continual clicking efforts that often produce multiple time-consuming screen changes. Although some mouse clicking is inescapable, clicking is kept to a minimum, except when required to emulate the functionality of the delivered software.

Actions are applied over images of actual graphical user interfaces to replicate the user's visual environment in every detail. When transition into the real-time environment occurs, there is an established level of comfort and confidence that accompanies the now familiar environment.

FLASH produces a web-ready module during publication. Published animations are relatively small, which expedites loading to the Web browser. Action is enabled as the browser plug-in player interprets animation instructions from the FLASH movie.