Improving UDP/IP Transmission Without Increasing Congestion

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Datagram Retransmission (DGR) is a computer program that, within certain limits, ensures the reception of each datagram transmitted under the User Datagram Protocol/Internet Protocol. [User Datagram Protocol (UDP) is considered unreliable because it does not involve a reliability-ensuring connection-initiation dialogue between sender and receiver. UDP is well suited to issuing of many small messages to many different receivers.] Unlike prior software for ensuring reception of UDP datagrams, DGR does not contribute to network congestion by retransmitting data more frequently as an ever-increasing number of messages and acknowledgements is lost. Instead, DGR does just the opposite: DGR includes an adaptive timeout-interval-computing component that provides maximum opportunity for reception of acknowledgements, minimizing retransmission. By monitoring changes in the rate at which message-transmission transactions are completed, DGR detects changes in the level of congestion and responds by imposing varying degrees of delay on the transmission of new messages. In addition, DGR maximizes throughput by not waiting for acknowledgement of a message before sending the next message. All DGR communication is asynchronous, to maximize efficient utilization of network connections. DGR manages multiple concurrent datagram transmission and acknowledgement conversations.

*This program was written by Scott Burleigh of Caltech for **NASA's Jet Propulsion Laboratory**. Further information is contained in a TSP (see page 1).*

This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-40868.

FORTRAN Versions of Reformulated HFGMC Codes

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Several FORTRAN codes have been written to implement the reformulated version of the high-fidelity generalized method of cells (HFGMC). Various aspects of the HFGMC and its predecessors were described in several prior *NASA Tech Briefs* articles, the most recent being "HFGMC Enhancement of MAC/GMC" (LEW-17818-1), *NASA Tech Briefs*, Vol. 30, No. 3 (March 2006), page 34. The HFGMC is a mathematical model of micromechanics for simulating stress and strain responses of fiber/matrix and other composite materials. The HFGMC overcomes a major limitation of a prior version of the GMC by accounting for coupling of shear and normal stresses and thereby affords greater accuracy, albeit at a large computational cost. In the reformulation of the HFGMC, the issue of computational efficiency was addressed: as a result, codes that implement the reformulated HFGMC complete their calculations about 10 times as fast as do those that implement the HFGMC. The present FORTRAN implementations of the reformulated HFGMC were written to satisfy a need for compatibility with other FORTRAN programs used to analyze structures and composite materials. The FORTRAN implementations also afford capabilities, beyond those of the basic HFGMC, for modeling inelasticity, fiber/matrix debonding, and coupled thermal, mechanical, piezo, and electromagnetic effects.

*These programs were written by Steven M. Arnold of **Glenn Research Center** and Jacob Aboudi and Brett A. Bednarcyk of Ohio Aerospace Institute. Further information is contained in a TSP (see page 1). .*

Inquiries concerning rights for the commercial use of this invention should be addressed to NASA Glenn Research Center, Innovative Partnerships Office, Attn: Steve Fedor, Mail Stop 4–8, 21000 Brookpark Road, Cleveland, Ohio 44135. Refer to LEW-17960-1.

Program for Editing Spacecraft Command Sequences

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Sequence Translator, Editor, and Expander Resource (STEER) is a computer program that facilitates construction of sequences and blocks of sequences (hereafter denoted generally as sequence products) for commanding a spacecraft. STEER also provides mechanisms for translating among various sequence product types and quickly expanding activities of a given sequence in chronological order for review and analysis of the sequence. To date, construction of sequence products has generally been done by use of such clumsy mechanisms as text-editor programs, translating among sequence product types has been challenging, and expanding sequences to time-ordered lists has involved arduous processes of converting sequence products to "real" sequences and running them through Class-A software (defined, loosely, as flight and ground software critical to a spacecraft mission). Also, heretofore, generating sequence products in standard formats has been troublesome because precise formatting and syntax are required. STEER alleviates these issues by providing a graphical user interface containing intuitive fields in which the user can enter the necessary information. The STEER expansion function provides a "quick and dirty" means of seeing how a sequence and sequence block would expand into a chronological list, without need to use of Class-A software.

*This program was written by Roy Gladden, Bruce Waggoner, Mark Kordon, Mahnaz Hashemi, David Hanks, and Jose Salcedo of Caltech for **NASA's Jet Propulsion Laboratory**. Further information is contained in a TSP (see page 1).*

This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-41175.