sion of traversability maps that result from pose estimation uncertainties, dealing with boundary effects to enable tighter maneuvers, and handling a wider range of obstacles.

This work advances what has been previously developed and integrated on the Mars Exploration Rovers by using algorithms that are capable of traversing more rock-dense terrains,

enabling tight, thread-the-needle maneuvers. These algorithms were integrated on the newly refurbished Athena Mars research rover, and were fielded in the JPL Mars Yard. Forty-three runs were conducted with targets at distances ranging from 5 to 15 m, and a success rate of 93% was achieved for placement of the instrument within 2–3 cm of the target.

Computing Radiative Transfer in a 3D Medium

NASA's Jet Propulsion Laboratory, Pasadena, California

A package of software computes the time-dependent propagation of a narrow laser beam in an arbitrary three-dimensional (3D) medium with absorption and scattering, using the transient-discrete-ordinates method and a direct integration method. Unlike prior software that utilizes a Monte Carlo method, this software enables simulation at very small signal-to-noise ratios. The ability to simulate propagation of a narrow laser beam in a 3D medium is an improvement over other discrete-ordinate software. Unlike other direct-

integration software, this software is not limited to simulation of propagation of thermal radiation with broad angular spread in three dimensions or of a laser pulse with narrow angular spread in two dimensions. Uses for this software include (1) computing scattering of a pulsed laser beam on a material having given elastic scattering and absorption profiles, and (2) evaluating concepts for laser-based instruments for sensing oceanic turbulence and related measurements of oceanic mixed-layer depths. With suitable augmentation, this soft-

ware could be used to compute radiative transfer in ultrasound imaging in biological tissues, radiative transfer in the upper Earth crust for oil exploration, and propagation of laser pulses in telecommunication applications.

Architectural Implementation of NASA Space Telecommunications Radio System Specification

NASA's Jet Propulsion Laboratory, Pasadena, California

This software demonstrates a working implementation of the NASA STRS (Space Telecommunications Radio System) architecture specification. This is a developing specification of software architecture and required interfaces to provide commonality among future NASA and commercial software-defined radios for space, and allow for easier mixing of software and hardware from different vendors.

It provides required functions, and supports interaction with STRS-compliant simple test plug-ins ("waveforms"). All of it is programmed in "plain C," except where necessary to interact with C++ plug-ins. It offers a small footprint, suitable for use in JPL radio hardware.

Future NASA work is expected to develop into fully capable software-defined radios for use on the space station, other

space vehicles, and interplanetary probes.

Journal and Wave Bearing Impedance Calculation Software

John H. Glenn Research Center, Cleveland, Ohio

The wave bearing software suite is a MALTA application that computes bearing properties for user-specified wave bearing conditions, as well as plain journal bearings. Wave bearings are fluid

film journal bearings with multi-lobed wave patterns around the circumference of the bearing surface. In this software suite, the dynamic coefficients are outputted in a way for easy implementation

in a finite element model used in rotor dynamics analysis. The software has a graphical user interface (GUI) for inputting bearing geometry parameters, and uses MATLAB's structure interface

for ease of interpreting data. This innovation was developed to provide the stiffness and damping components of wave bearing impedances.

The computational method for computing bearing coefficients was originally designed for plain journal bearings and tilting pad bearings. Modifications to include a wave bearing profile consisted of changing the film thickness profile given by an equation, and writing an algorithm to locate the integration limits for each fluid region. Careful consideration was needed to implement the correct integration limits while computing the dynamic coefficients, depending on the form of the input/output variables specified in the algorithm.

This work was done by Amanda Hanford and Robert Campbell of ARL/Penn State for

Scalable Integrated Multi-Mission Support System (SIMSS) Simulator Release 2.0 for GMSEC

Goddard Space Flight Center, Greenbelt, Maryland

Scalable Integrated Multi-Mission Support System (SIMSS) Simulator Release 2.0 software is designed to perform a variety of test activities related to spacecraft simulations and ground segment checks. This innovation uses the existing SIMSS framework, which interfaces with the GMSEC (Goddard Mission Services Evolution Center) Application Programming Interface (API) Version 3.0 message middleware, and allows SIMSS to accept GMSEC standard messages via the GMSEC message bus service.

SIMSS is a distributed, component-based, plug-and-play client-server system that is useful for performing real-time monitoring and communications testing. SIMSS runs on one or more workstations, and is designed to be user-configurable, or to use predefined configurations for routine operations. SIMSS consists of more than 100 modules that can be configured to create, receive, process, and/or transmit data. The SIMSS/GMSEC innovation is intended to provide missions with a low-cost solution for implementing their ground systems, as well as to significantly reduce a mission's integration time and risk.

Policy-Based Negotiation Engine for Cross-Domain Interoperability
This method can be used by any organization with distributed Web entities.

NASA's Jet Propulsion Laboratory, Pasadena, California

A successful policy negotiation scheme for Policy-Based Management (PBM) has been implemented. Policy negotiation is the process of determining the "best" communication policy that all of the parties involved can agree on. Specifically, the problem is how to reconcile the various (and possibly conflicting) communication protocols used by different divisions. The solution must use protocols available to all parties involved, and should attempt to do so in the best way possible. Which protocols are commonly available, and what the definition of "best" is will be dependent on the parties involved and their individual communications priorities.

This method is based on defeasible policy composition (DPC), a new approach for finding conflicts and resolv-
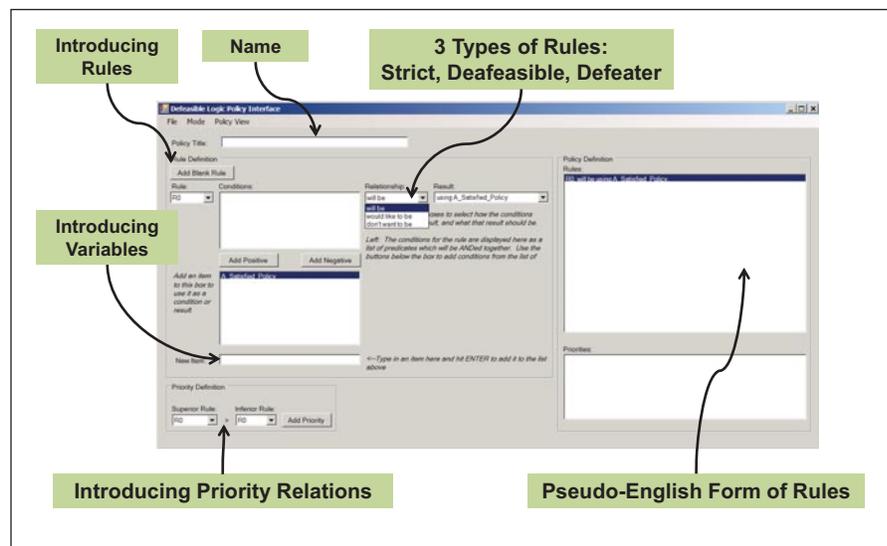
Defeasible Logic Policy Editor