

This approach also employs a novel technique that enables storage of the majority of data on the cloud and some data locally. This feature is used to store the most recent data locally in order to guarantee utmost reliability in case of an outage or disconnect from the Internet. This also obviates any changes to the software that generates the most recent data set as it still has the same interface to the file system as it did before updates.

This software provides a seamless integration between existing software tools that would enable any mission across NASA to leverage the capability with minimal customization. It also unleashes a virtually limitless amount of storage and delivers it to projects without having to worry about provisioning, managing, and backing up large storage arrays.

The software integrates with Amazon Simple Storage Service (Amazon S3) service to provide the aforementioned

solutions. By integrating with S3, unprecedented durability is delivered to the storage system with 99.999999999% data retention rate. Furthermore, it is a self-healing replication system that repairs objects automatically if they are ever lost. Since data is stored on a per-object basis rather than a file system mount, correlated losses of objects are extremely unlikely and recovery of each object is fast. This also reduces reliance on a single file system, where an outage can take the system offline for extended duration. The solution, built on cloud computing technology, reduces MER Maestro's storage costs by over 80%. Most importantly, the solution is completely server-side, providing a seamless integration with existing clients without modifying any of their code or redelivering code.

An HTTP proxy was built that enables clients to access large amounts of data

on S3 securely, and without any changes to existing software. The proxy caches information and is capable of accessing data from local channels as well as on S3. This enables the proxy to serve the most recent data from local storage, while the older archived data is retrieved on-demand from S3. The data stored on S3 is private and can only be accessed by the proxy. Furthermore, the proxy authenticates its users through JPL LDAP, and verifies their membership in a specific group before giving them access to the data.

This work was done by George W. Chang, Mark W. Powell, John L. Callas, Recaredo J. Torres, and Khawaja S. Shams of Caltech for NASA's Jet Propulsion Laboratory. For more information, contact iaoffice@jpl.nasa.gov.

This software is available for commercial licensing. Please contact Daniel Broderick of the California Institute of Technology at danielb@caltech.edu. Refer to NPO-48189.

WMS Server 2.0

NASA's Jet Propulsion Laboratory, Pasadena, California

This software is a simple, yet flexible server of raster map products, compliant with the OGC WMS 1.1.1 protocol. The server is a full implementation of the OGC WMS 1.1.1 as a fastCGI client and using GDAL for data access. The server can operate in a proxy mode, where all or part of the WMS requests are done on a back server.

The server has explicit support for a colocated tiled WMS, including rapid response of black (no-data) requests. It generates JPEG and PNG images, in-

cluding 16-bit PNG. The GDAL backend support allows great flexibility on the data access.

The server is a port to a Linux/GDAL platform from the original IRIX/IL platform. It is simpler to configure and use, and depending on the storage format used, it has better performance than other available implementations.

The WMS server 2.0 is a high-performance WMS implementation due to the fastCGI architecture. The use of GDAL data back end allows for great

flexibility. The configuration is relatively simple, based on a single XML file. It provides scaling and cropping, as well as blending of multiple layers based on layer transparency.

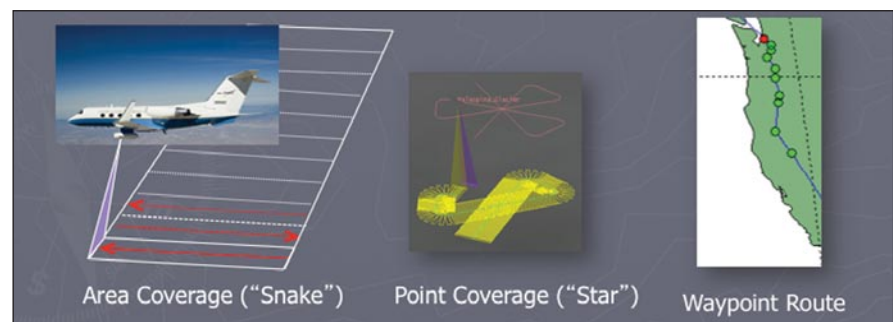
This work was done by Lucian Plesea and James F. Wood of Caltech for NASA's Jet Propulsion Laboratory. For more information, contact iaoffice@jpl.nasa.gov.

This software is available for commercial licensing. Please contact Daniel Broderick of the California Institute of Technology at danielb@caltech.edu. Refer to NPO-48330.

I-FORCAST: Rapid Flight Planning Tool

NASA's Jet Propulsion Laboratory, Pasadena, California

I-FORCAST (Instrument – Field of Regard Coverage Analysis and Simulation Tool) is a flight planning tool specifically designed for quickly verifying the feasibility and estimating the cost of airborne remote sensing campaigns (see figure). Flights are simulated by being broken into three predefined routing algorithms as necessary: mapping in a snaking pattern, mapping the area around a point target (like a volcano) with a star pattern, and mapping the area between a list of points.



Three Possible Scenarios were identified. This tool can handle all three as well as combinations.

The tool has been used to plan missions for radar, lidar, and in-situ atmospheric measuring instruments for a variety of aircraft. It has also been used for global and regional scale campaigns and automatically includes landings when refueling is required.

The software has been compared to the flight times of known commercial

aircraft route travel times, as well as a UAVSAR (Uninhabited Aerial Vehicle Synthetic Aperture Radar) campaign, and was within 15% of the actual flight time. Most of the discrepancy is due to non-optimal flight paths taken by actual aircraft to avoid restricted airspace and used to follow landing and take-off corridors.

This work was done by Bogdan Oaida, Mohammed O. Khan, and Michael B. Mercury 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 Daniel Broderick of the California Institute of Technology at danielb@caltech.edu. Refer to NPO-48127.

Earth-Science Data Co-Locating Tool

NASA's Jet Propulsion Laboratory, Pasadena, California

This software is used to locate Earth-science satellite data and climate-model analysis outputs in space and time. This enables the direct comparison of any set of data with different spatial and temporal resolutions. It is written in three separate modules that are clearly separated for their functionality and interface with other modules. This enables a fast develop-

ment of supporting any new data set. In this updated version of the tool, several new front ends are developed for new products.

This software finds co-locatable data pairs for given sets of data products and creates new data products that share the same spatial and temporal coordinates. This facilitates the direct comparison between the two heterogeneous datasets

and the comprehensive and synergistic use of the datasets.

This work was done by Seungwon Lee, Lei Pan, and Gary L. Block 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 Daniel Broderick of the California Institute of Technology at danielb@caltech.edu. Refer to NPO-48506.

Ascent/Descent Software

Lyndon B. Johnson Space Center, Houston, Texas

The Ascent/Descent Software Suite has been used to support a variety of NASA Shuttle Program mission planning and analysis activities, such as range safety, on the Integrated Planning System (IPS) platform. The Ascent/Descent Software Suite, containing Ascent Flight Design (ASC)/Descent Flight Design (DESC)

Configuration items (Cis), lifecycle documents, and data files used for shuttle ascent and entry modeling analysis and mission design, resides on IPS/Linux workstations. A list of tools in Navigation (NAV)/Prop Software Suite represents tool versions established during or after the IPS Equipment Rehost-3 project.

This work was done by Charles Brown, Robert Andrew, Scott Roe, Ronald Frye, Michael Harvey, Tuan Vu, Krishnaiyer Balachandran, and Ben Bly of the United Space Alliance for Johnson Space Center. For further information, contact the JSC Innovation Partnerships Office at (281) 483-3809. MSC-24960-1