The Echoes of Earth Science

Originating Technology/NASA Contribution

NASA’s Earth Observing System Data and Information System (EOSDIS) acquires, archives, and manages data from all of NASA’s Earth science satellites, for the benefit of the Space Agency and for the benefit of others, including local governments, first responders, the commercial remote sensing industry, teachers, museums, and the general public. EOSDIS is currently handling an extraordinary amount of NASA scientific data. To give an idea of the volume of information it receives, NASA’s Terra Earth-observing satellite, just one of many NASA satellites sending down data, sends it hundreds of gigabytes a day, almost as much data as the Hubble Space Telescope acquires in an entire year, or about equal to the amount of information that could be found in hundreds of pickup trucks filled with books.

To make EOSDIS data completely accessible to the Earth science community, NASA teamed up with private industry in 2000 to develop an Earth science “marketplace” registry that lets public users quickly drill down to the exact information they need. It also enables them to publish their research and resources alongside of NASA’s research and resources. This registry is known as the Earth Observing System ClearingHouse, or ECHO.

The charter for this project focused on having an infrastructure completely independent from EOSDIS that would allow for more contributors and open up additional data access options. Accordingly, it is only fitting that the term ECHO is more than just an acronym; it represents the functionality of the system in that it can echo out and create interoperability among other systems, all while maturing with time as industry technologies and standards change and improve.

Partnership

In streamlining the public access path to Earth science data and materials culled by EOSDIS, NASA’s Goddard Space Flight Center joined ranks with Global Science & Technology, Inc., a science, engineering, and information technology company serving Federal and corporate clients, and Blueprint Technologies, Inc., formerly a woman-owned, small business specialist in providing architecture-based solutions that was recently acquired by Pearson Government Solutions, Inc. (The company is now recognized as Pearson Blueprint Technologies, Inc.)

From 2000 to 2002, Goddard worked with Global Science & Technology (the prime contractor on the project) and Blueprint Technologies (the subcontractor) to develop the ECHO registry platform. A public version was released in November 2002. Feedback from early adopters on this initial operational system led to a new set of enhancements, considering the data access needs and expectations of America’s Earth science ring were changing before its very eyes. The development team refined the original version to expand the capabilities offered to the community.

The expansion of the project took place through 2004, with a strong emphasis on data collection. By 2005—and several software versions later—a much-improved ECHO service registry was in place, complete with more
than 60 million pieces of Earth science metadata and
customized client interfaces for improved searching
capabilities. Furthermore, this metadata registry allowed
users to publish and exchange their services, algorithms,
and models.

**Product Outcome**

Today, the Earth science solution developed in part
by NASA and for NASA is fully live and operational as
ECHO version 8.0. The public registry is officially a
Web-based brokering system that enables information
and resource sharing that ultimately leads to improve-
ments in research and analysis, as well as copious societal
benefits. For example, local governments can use ECHO
8.0 to make key decisions about adverse weather condi-
tions facing their regions, such as floods and hurricanes.

Having access to the latest satellite imagery via ECHO can
give them a leg up in taking any precautions they can to
become fully prepared.

“ECHO poses an exciting example of how technology
can be used to solve real-world challenges and create
important foundations of change for generations to
come,” said Jeanne O’Kelley, general manager of Pearson
Blueprint Technologies. “Indeed, what makes this
particularly relevant is the use of Web-services technology
that can be applied not only within the geospatial realm,
but across numerous sectors—including homeland
security—making any set of data easier to record, access,
and share.”

Version 8.0 provides a mechanism of interoperability
between organizations who offer Earth observation data
and independent organizations who offer tools, algorithms,
and models that utilize this data, essentially serving as
“middleware” between data and client partners. With
this feature, Earth scientists have a basic infrastructure to
leverage resources from global partners and, hence, build
dynamic applications.

“The future of a global exchange of Earth-observing
resources allows for effective use of the resources for cur-
rent science applications and enables future innovation
in putting together these data, algorithms, models, and
other services in new and unintended ways,” said Pearson
Blueprint Technologies’ Michael Burnett, the lead ECHO
architect. “ECHO is built as infrastructure for a service-
oriented enterprise, the future of enterprise-level exchange
in many domains, including that of Earth observation.”

In order to retrieve data stored in ECHO, a user can
search for specific metadata using keywords or certain spa-
tial or temporal parameters. In performing a spatial search,
for instance, a user can enter geographic parameters, such
as the name of a state or an exact latitudinal/longitudinal
location. The search will then generate a set of results for
access within the user’s application.

Because ECHO is a Web-brokering system, the user
can order information in a manner similar to how he or
she would go about purchasing items from traditional
online retailers. The user can simply add any data items
of interest to a personal online shopping cart and then
proceed to checkout. If the data items retrieved by the
ECHO-generated report are not of any interest to the
user, he or she can then initiate a new search based on new
keywords or parameters.

With Web-based services continuing to expand and
reaching new users as a result, the developers of ECHO
anticipate that publicly available Earth science data will
proliferate for tomorrow’s Earth science generation, all
because of the synergy between today’s data contributors
and customers.