

World Wind Tools Reveal Environmental Change

NASA Technology

“Who has more satellite data than NASA?” asks Patrick Hogan.

The question is a rhetorical one. After dozens of Earth-observing satellite launches and missions to other planets, NASA has accumulated an unmatched amount of planetary science information, including satellite imagery, terrain information, and climate data. To visualize this data and make it accessible, in 2002 Hogan and his colleagues at Ames Research Center started building a software program called World Wind.

Originally developed under NASA’s Learning Technologies program as a tool to engage and inspire students, World Wind aspired to help NASA move 3D visualization of NASA data into the classroom, using videogame-like virtual globes of Earth, Moon, Venus, Mars, and Jupiter.

In 2005, shortly after the release of World Wind, the U.S. Department of Energy (DOE) was impressed by the technology at a geographic information systems (GIS) conference. “At the time, World Wind was an Internet application, specific to the Windows platform. DOE wanted something cross-platform,” says Hogan, World Wind project manager at Ames.

With support from DOE, Hogan and his team designed World Wind to be a technology that others could simply plug into their application, rather than an application that required others to plug into it. This redesign is the World Wind Java Software Development Kit (SDK) and the Web Mapping Services (WMS) Server. Currently, there are over a million requests for World Wind data each day.

Partnership

Released under the NASA Open Source Agreement (NOSA) license, anyone is permitted to use World Wind for their purposes, with one caveat: According to the license, if a user changes the SDK or WMS Server, the



NASA’s World Wind geospatial visualization technology allows users to zoom from satellite altitude to any place on Earth. World Wind includes the cloud-free, true-color images of Earth called “Blue Marble: Next Generation,” one of which is pictured here. For a deeper look at World Wind, scan this code.

code changes fall under the NOSA and need to be made open and available.

Hogan describes World Wind as enabling government, commercial enterprise, and individual developers to focus on their needs, without having to “recreate the wheel” for 3D visualization. “We’re providing the essential infrastructure for spatial data so others can make their data come alive in a virtual world. This allows those people to concentrate on information intelligence and data analysis.

We make it possible to see the information in its native concept of the real world.” As a testament to the software’s success, World Wind was awarded the prestigious NASA “Software of the Year” for 2009.

One of the companies currently making use of the NASA technology is Honolulu, Hawaii-based Intelescope Technologies (*Spinoff* 2007). Started by Stanford University and former NASA engineers to provide global monitoring services, today the company uses the

By not having to develop a technology like NASA's World Wind, Intelesense has saved approximately \$1 million in costs.

technology for environmental, public health, and other monitoring applications for nonprofit organizations and government agencies.

Benefits

Intelesense develops wireless sensor networks that support its three integrated global monitoring products and services: IntelCell, a dedicated data acquisition platform that communicates data from the sensors through the Internet; IntelNet, a real-time distributed mesh network that integrates data from different sources; and IntelView, a secure GIS-based 3D visualizer based on NASA's World Wind.

According to Kevin Montgomery, the chief executive officer of Intelesense, by not having to develop a technology like NASA's World Wind, the company has saved approximately \$1 million in costs. After adopting World Wind 4 years ago, the company significantly enhanced the technology. "We've added security features like authentication, advanced visualization features, and linked it to our server cluster that has hundreds of thousands of layers and other capabilities," says Montgomery.

Some of the applications for Intelesense's system include monitoring climate change, air quality, security, and public health.

In 2010, Intelesense started working with The Nature Conservancy to deploy a remote monitoring system on 6,500 acres of intact native-dominated lowland and wet forest in the Hawaiian island of Kauai. The project involves the trapping of feral pigs to assist in conservation efforts across the area. "Our sensor devices allow us to transmit the state of the traps, images from the traps, and even allow personnel to remotely arm or trigger the traps,

despite the traps being located deep in the rainforest," says Montgomery.

In another environmental project, Intelesense is working with the Planetary Skin Institute to use information technology to help decision-makers manage



Intelesense Technologies is working with The Nature Conservancy to develop and deploy a remote monitoring system in Hawaii's Wainiha preserve and Alakai plateau to assist in conservation efforts. The monitoring system includes visualization technology that incorporates NASA's World Wind software.

scarce resources and risks. With 170 different layers, the visualization technology can show disturbances in land patterns; create views like global heat maps to identify hot spots; and zoom in to reveal roads, settlements, or other human factors.

As part of the Center for Island, Maritime, and Extreme Environment Security (CIMES) project, supported by the Department of Homeland Security, Intelesense is developing advanced sensors and data fusion and visualization for maritime domain awareness. "We're integrating live feeds of satellite data, ship transponders, and advanced sensors and other maritime data into a visualizer that Coast Guard or others could use," says Montgomery.

The company is also involved with the University of Hawaii and the University of Alaska Fairbanks to work on the Pacific Area Climate Modeling and Analysis Network (PACMAN) project. The goal of PACMAN is to help community groups work together and better understand the impacts of climate change locally, especially on the freshwater resources in Alaska and Hawaii.

Lastly, under the President's Emergency Program for AIDS Relief, Intelesense is using its NASA spinoff technology to monitor public health in Ethiopia. As part of a large antiretroviral (ARV) therapy study, which uses ARV drugs to suppress and stop the progression of HIV, the project aims to provide a wireless infrastructure for transmitting patient and drug information from 126 clinics to five main hospitals.

By providing the infrastructure for spatial data, Hogan says World Wind exemplifies the NASA motto: For the benefit of all. "We're providing the foundation for others to compete, innovate, and deliver solutions that result in higher quality and lower cost. World Wind provides a stimulus for companies like Intelesense to innovate." ❖

Windows® is a registered trademark of Microsoft Corporation. IntelCell™, IntelNet™, and IntelView™ are trademarks of Intelesense Technologies.