

Successful Global Food Security Inter-Agency Project Leads to High Performance Computing Model to Address Analytical Difficulties Utilizing Multiple Satellite Sensor Datasets

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Image: NASA MODIS 250m Global View MODIS NDVI Anomaly, May 8, 2009, Northern Afghanistan, (courtesy of NASA Earth Observatory)

Project Overview

The successful results of a Global Food Security Project supported by the National Geospatial-Intelligence Agency (NGA), the National Aeronautics and Space Administration (NASA), the United States Department of Agriculture (USDA) and other government entities led to the development of a pilot project where data experts are coordinating and sharing their expertise with the private sector—to perform project work requiring extremely difficult computational analytics with high volume satellite imagery.

Data Sets Utilized

TRMM (NOAA- The Tropical Rainfall Measuring Mission)- Precipitation Radar/ GOES-8/10, METEOSAT-7/5
MODIS (NASA - Moderate Resolution Imaging Spectroradiometer)/ TERRA/AQUA Satellites
NCEP (The National Center for Environmental Prediction)- NCEP/NCAR Reanalysis 1
AFWA-LIS (Air Force Weather Agency-Land Information System)
SPOT-Veg NDVI (Satellite Pour l'Observation de la Terre, France)
LANDSAT (NASA)
AWIFS (Advanced Wide Field Sensor)/ ResourceSat-1 - India)
QuickBird (Digital Globe – High Resolution Panchromatic)
PET (Global Potential Evapotranspiration)

The large volume of data needed for this pilot project led developers to research ways in which to access and manipulate even larger datasets in an on-demand, real-time, interoperable environment. These new data sets required the addition of live weather data in order to provide even greater predictive analytics.

Successful Government to Government and Government to Business Collaboration

This pilot project is an excellent example of government entities such as NASA, USDA and other government experts (with in-depth remote sensing and weather analytical experience) coordinating and sharing their expertise with the private sector.

Project Process and Methodology

The data have been placed in a secure, interoperable cloud at the Rocky Mountain Supercomputing Centers, Inc. (RMSC) running Microsoft HPC Server 2008 and SQL Server Enterprise with the latest edition of ESRI ArcGIS. The scalable solution is being used to complete high-fidelity analytics: time series analysis, change detection, and correlation analysis for geoprocessing and geostatistics benefit. This effort exemplifies the type of public-private collaboration that RMSC was designed to foster and stimulate – solving hard problems using the investment that the State of Montana, IBM, Microsoft, ESRI, GCS Research and others have made in RMSC.

Convergence of Evidence Methodology

For nearly three decades the “convergence of evidence” methodology has been utilized in research projects. Now the high level of availability of commercial data sets and free government data sets such as MODIS (provided by NASA) allow this methodology to become “operational” and provide the ability to solve “real-time problems” in hundreds of other applications where remote analysis is required. Remote sensing crop analysts can assess crop health and conditions without laborious, costly and sometimes dangerous field data collections.

Project Future

This project enables:

- next-generation discoveries
- advancements and solutions for commercial, academic, tribal and governmental stakeholders utilizing high performance computing applications
- immediate access to multiple sensors
- analytics and 3D visualizations of any monitored region of the globe

The paradigm shifting vision of this project integrates a secure high performance cyberinfrastructure, cloud computing capabilities and an “on demand,” pay-as-you-go business model that maximizes human capital and minimizes asset investments.

The outcomes of the project can change earth observation monitoring forever using this same processing for the entire globe, with all the data sets in an interoperable, real-time environment, for Global Water Resource Management, or any other application requiring real-time management of multiple input variables these predictive models will save precious resources and most importantly provide enormous societal benefit.

Partner Participation and Contribution

The SI Organization, Inc. is exploring the potential of the RMSC high performance computing to provide innovative, new mission solutions to the U.S. Fed/Civil and Intel Communities through the application of a broad set of engineering and analytical capabilities in the imagery, signals, communications, geographic and data processing domains. The RMSC has the potential to play a significant role to meet these challenges as a global data processing and dissemination engine that can revolutionize the way governments, businesses and other organizations meet their needs through the application of remote sensing and geospatial data. The SI envisions RMSC as a smart, high capacity, high volume data ingest and processing “hub” that integrates data from a wide variety of providers and creates new, value added products based on innovative applications developed by industry, academic and government users, both domestically and internationally.

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