Leveraging GOS Map and Data Services for Search and Rescue Operations using NASA WorldWind Open Source 3D Visualization Platform

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Proposal

• Goal
  – Enhance the NASA Goddard Search and Rescue (SAR) Mission Office’s Decision Support Tools (already under development under a different contract)

• Technical Objectives
  – Discover SAR relevant data via the GOS portal catalog
  – Access, exploit and visualize discovered data in WorldWind’s 3D environment
  – Subscribe to and use GeoRSS to alert the SAR decision maker regarding latest relevant resource updates from GOS
What is NASA WorldWind?

- **3D Geospatial Information Visualization SDK**
  - Easily visualize distributed satellite imagery and products.
  - Zoom from satellite view to any place on Earth.
  - Explore data in a visually rich 3D as if you were really there.
What is NASA WorldWind?

- API-Centric Architecture of SDK
  - Suite of modular components embeddable as part of any application.
  - Incorporate virtual globe technology in support of any Earth science objective.
What is NASA WorldWind?

- **NASA Open Source**
  
  Anyone can advance the technology without being constrained by vendor features or proprietary lock-in.
WorldWind Goals

- Advanced Open Source components and alignment with international standards to further the infrastructure necessary for accelerated innovation and maximum interoperability of information and intelligence.
NASA Search and Rescue Laboratory

- NASA participates in the National Search and Rescue Committee NSARC
  - NASA provides research and development to provide SAR tools for the SAR forces
  - The Cospas-Sarsat satellite system that detects and locates transmitting distress beacons worldwind resulted from R&D by NASA

- Distress Alerting and Satellite System (DASS)
  - Current R&D project to prove the concept of using Mid-Earth-Orbit satellite constellations to provide the same detection and location of transmitting distress beacons but in a near instantaneous mode (2-3 hours)
    - SAR Visualization Software for Search Planners
SAR Planning Visualization using WorldWind

• Purpose
  – Aid a Search Planner to visualize conditions a missing pilot may have confronted and determine places to search

• Final goal
  – Automated determination of high probability places to search

• Current status
  – Under development; version almost ready for community
SAR Planning
Visualization using WorldWind

• Capabilities
  – Supports 3D terrain visualization (NAIP, USGS aerial, Landsat)
  – Provides capability to view aircraft tracks in the air and their subtrack on the ground including radar acquired tracks
  – Provides capability to view cloud ceilings, cloud cover both visible and IR
  – Provides capability to show all possible crash locations in challenging terrain for a chosen altitude
  – Provides capability to extend track to estimate pilot possible actions beyond last known point
Interest in other types of data

- Aeronautical sectional maps (runways, navaids, etc)
- Weather data
- Precipitation data
- Clouds
- Local data/county data (crash sites)
- Other high resolution imagery and base data
Technical Approach

1. Develop search user interface for discovery of data and services in GOS
   a) Simple search option (keyword and geographic extent)
   b) Advanced search option (GOS data category, publisher, time frame, type of resource, etc)

2. Exercise the CSW 2.0.2 to perform the search against the GOS catalog

3. Display returned results in sortable table format
   a) Based on information about each resource (e.g. publisher, data category, date)
   b) Enable clickable access to entire FGDC metadata record in separate window

4. In the case of web services returned
   a) Associate a different icon for different types of services (WMS, WFS, WCS, etc)
   b) Enable complete listing of layers/features/coverages (via GetCapabilities) via a simple button click
   c) Support 3D visualization of data layers served via WMS
   d) Support visualization of time-series data in 3D (already in scope for SAR)
   e) Provide the user with meaningful feedback when a service/layer fails

5. Support the subscription to GOS GeoRSS feeds to alert decision maker of new or updated data (e.g. weather) related to specific criteria
   a) Display alert when received
Team

• Nadine Alameh
  — Project manager and standards expert
• Patrick Hogan
  — WorldWind project manager
• David Collins
  — WorldWind programmer
• Dave Affens
  — Director of NASA SAR Lab
Outcomes of the Work

• Catalog + 3D visualization + Open Source SDK = powerful combination
  – None of the other virtual globe technologies support as many standards as WorldWind
  – International standards such as WMS and CSW = sustainability, more users, easier integration within applications, etc
  – Think the Google effect of discovery but based on actual international standards!

• CSW = opening new doors for connections
  – Opportunity to connect to ESA’s FedEO catalogs
  – JAXA is setting up CSW catalogs
  – NGA also has CSW catalogs (internally)

• FGDC = Federal government reach
  – WorldWind’s open source proposition will create amazing exposure into new markets and domains
  – No other virtual globe technology enables access to the US NSDI
Expanding Universe of Opportunities

Contact Information

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WorldWind resources

- Code: worldwind.arc.nasa.gov/java
- Demos: worldwind.arc.nasa.gov/java/demos
- Forums: forum.worldwindcentral.com/forumdisplay.php?f=37