

**NSDI: 2009 Cooperative Agreement Program**

**Category 2: Behind the Portal: Use of GOS Map and Data Services**

Joint Center for  
Intelligent Spatial Computing

**GOS Map and Data Services for Cross-agency Earth  
Science and Geospatial Cyberinfrastructure Communities**

(G09AC00103 )

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George Mason University

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<http://cisc.gmu.edu>

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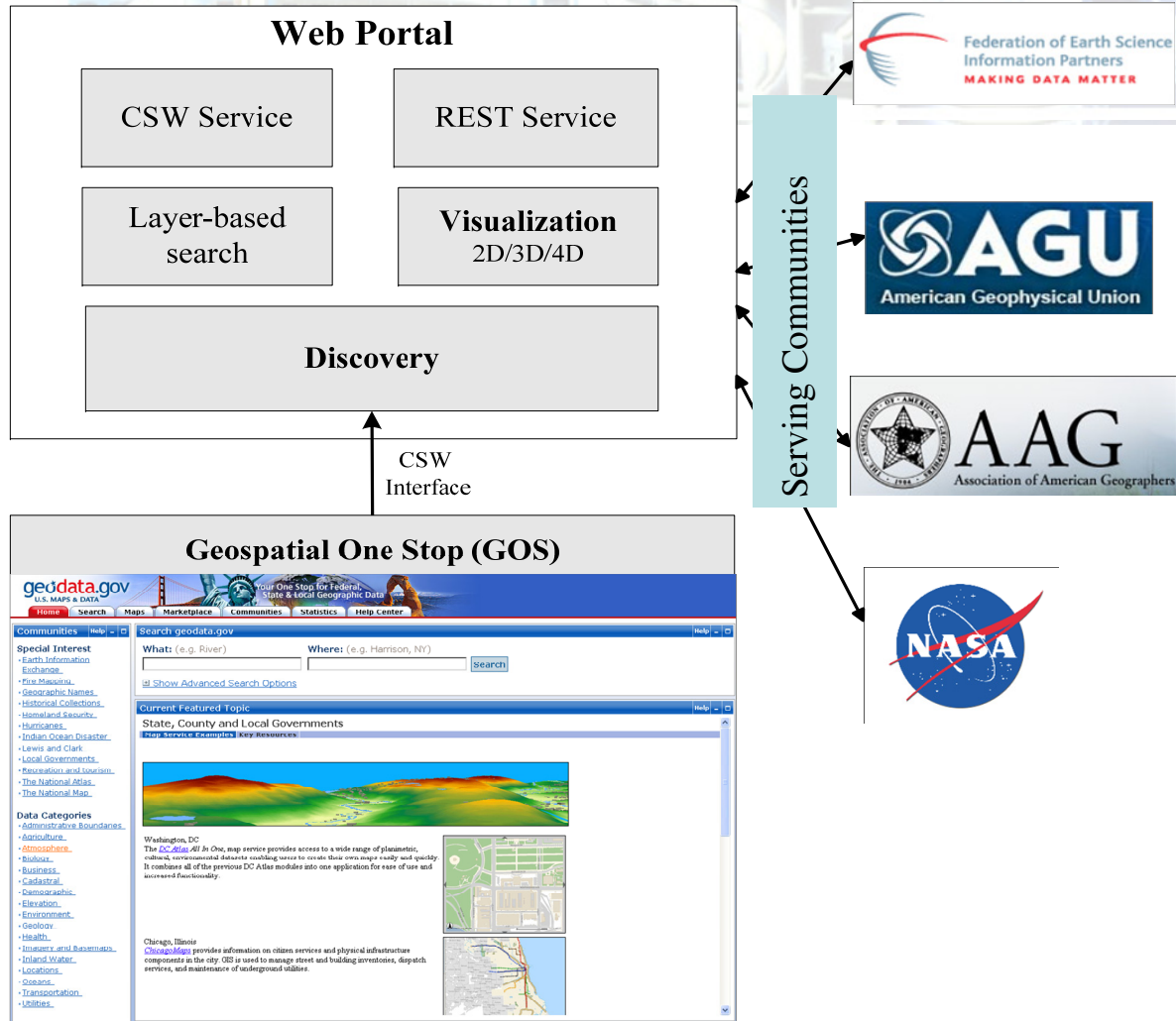
Joint Center for  
Intelligent Spatial Computing



- **Project Approach**
- **Modules developed**
- **Solutions In Action**
- **Outreach**

# Project Approach

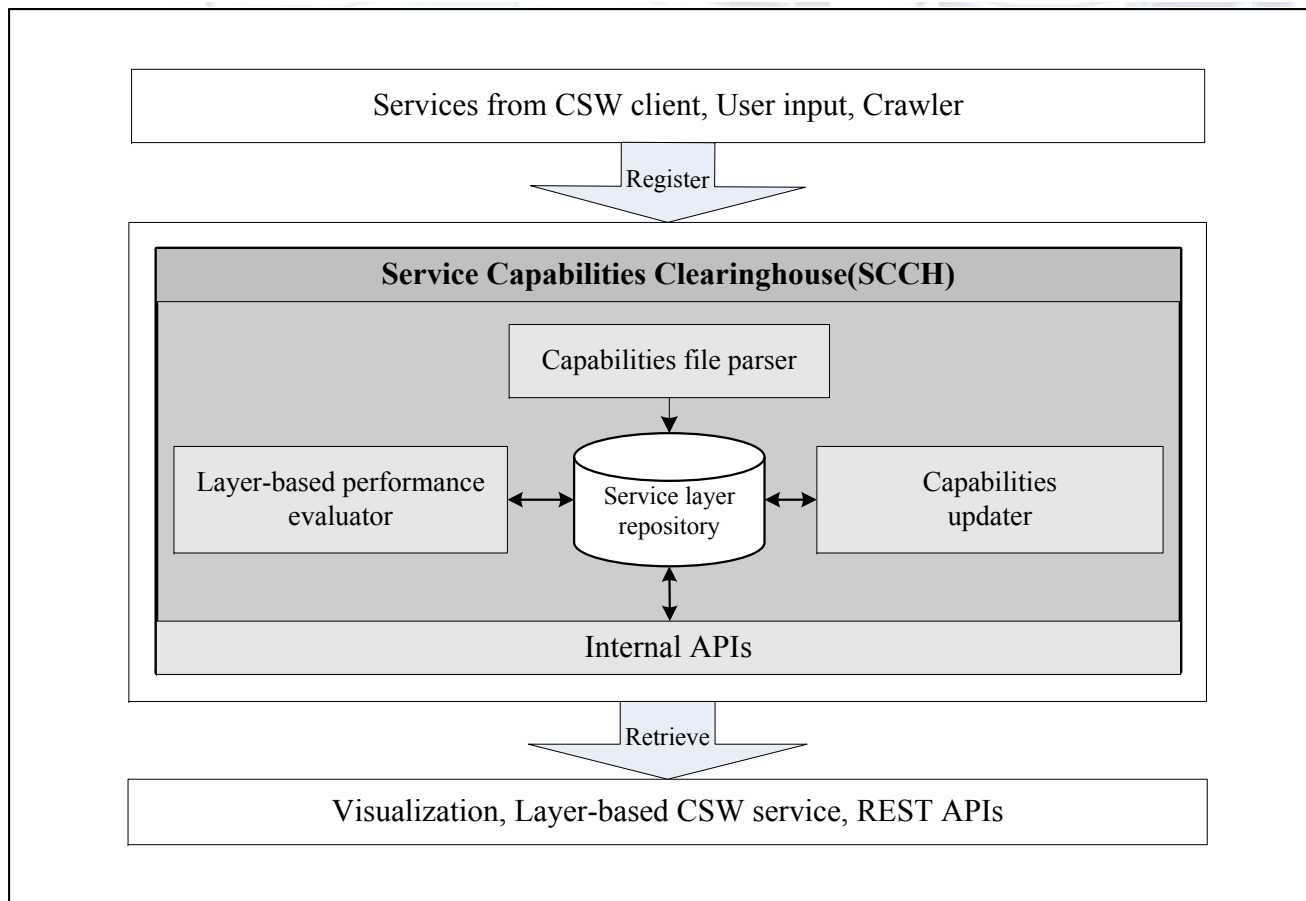
## Joint Center for Intelligent Spatial Computing



# Modules Developed

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## ■ Service Capability Clearinghouse (SCCH)



# Modules Developed

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## ■ Integration with GOS CSW

**GEOSS AIP Air Quality & Health Working Group**

User name:   
Password:   
New user?

**Catalogue**

- CSW Servers
  - GEOSS Compuconsult CSW
  - GEOSS ESRI clearinghouse
  - GEOSS Virtual Arctic SDI
  - Geospatial One Stop CSW

Keyword:  in

Anywhere?

Results sort by

80 results are found.

**Sources**

**Maps&Animation**

**Query Results**

**Title:** FACILITY\_AIR  
**Subject:** climatology/Meteorology/Atmosphere,  
**Abstract:** This data set includes locations from the Missouri Emissions Inventory System (MOEIS) database. Locational data was obtained using a variety of methods including but not limited to geocoding, global positioning system (GPS) receivers, and map interpolation.  
**From:** <http://gos2.geodata.gov/Portal/csw202/discovery>  
[Full Metadata](#)

**Title:** Air Emissions Data  
**Subject:** climatology/Meteorology/Atmosphere,  
**Abstract:** Air emissions data (monitoring and model) from multiple sources.  
**From:** <http://gos2.geodata.gov/Portal/csw202/discovery>  
[Full Metadata](#)

**Title:** Permitted Air discharge facilities  
**Subject:** environment,  
**Abstract:** Tracks all permitted facilities that have permits to allow discharge into the atmosphere.  
**From:** <http://gos2.geodata.gov/Portal/csw202/discovery>  
[Full Metadata](#)

**Title:** Air Monitoring Stations 1993  
**Subject:** environment,  
**Abstract:** MDE's air monitoring stations used in 1993.  
**From:** <http://gos2.geodata.gov/Portal/csw202/discovery>  
[Full Metadata](#)

**Title:** Air Quality Designations (Polygons)  
**Subject:** environment,  
**Abstract:** This theme depicts the various air quality designations in Western Oregon according to geographic areas.  
**From:** <http://gos2.geodata.gov/Portal/csw202/discovery>  
[Full Metadata](#)

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Developed by [CISC](#) through the patnership with [NASA](#), [Washington Uni](#), [EPA](#) and [Northrop Grumman](#)

# Modules Developed

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## Seamless Integration and Visualization

**GEOS AIP**  
Air Quality & Health  
Working Group

User name:   
Password:   
New user?  Login

**Catalogue**

**Sources**

My List Search

WMS URL  Load

- WMS Servers(Recent loaded)
- WMS Servers(Guest)
  - DMSP Nighttime Lights Post
    - nighttime\_lights\_f15200
    - Countries**
    - DMSP Nighttime Lights P
    - F152003\_Poster
  - Compsult Limited METAR V
  - Gridded Population of the V
  - REASoN WebMap Interfac
  - NASA Earth Observations (f
  - Canadian Mineral Deposits(
  - Metacarta WMS VMaplV0(2
  - GlobalLandCoverWMS(3 EP
  - Meteorological Forcing Data
  - WRF-NMM model products(
  - Meteorological Forcing Data
  - NGDC\_EOG(4 EPSG:4326)
  - Image Web Server(108 EPS
  - AIRNOW DataFed Web Map
  - Web Map Service reade

**2D Viewer** OpenLayers Bing Map Google Earth Query Results Information Help

LAT/LONG: -103.07,98.5°

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View developed by CISC

# Modules Developed

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## Seamless Integration and Visualization

**GEO GROUP ON EARTH OBSERVATIONS** **GEOS AIP Air Quality & Health Working Group** User name:  Password:  New user?  Login

**Catalogue** 2D Viewer **OpenLayers** Bing Map Google Earth Query Results Information Help

**Sources** My List Search WMS URL  Load

- WMS Servers(Recent loaded)
- WMS Servers(Guest)
- 4326 DMSP Nighttime Lights Post
- 4326 Compuconsult Limited METAR V
- 4326 Gridded Population of the V
- 4326 REASoN WebMap Interface
- 84 NASA Earth Observations (f
- 4326 Canadian Mineral Deposits
- 4326 Metacarta WMS VMaplv0(26
- 4326 GlobalLandCoverWMS(3 EP
- 4326 Meteorological Forcing Data
- 4326 WRF-NMM model products
- 4326 Meteorological Forcing Data
- 4326 NGDC\_EOG(4 EPSG:4326)
- 4326 Image Web Server(108 EPS
- 4326 AIRNOW DataFed Web Map
- 4326 Web Map Service nsandt\_n
- 4326 NASA WorldWind WMS(15 E
- 4326 USDA NAIP (low resolutio
- Blue Marble NG 2004.06
- Blue Marble NG 2004.05

**Maps&Animation**

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Developed by [CISC](#) through the patnership with [NASA](#), [Washington Uni.](#), [EPA](#) and [Northrop Grumman](#)

View based on OpenLayer

# Modules Developed

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Intelligent Spatial Computing

## Seamless Integration and Visualization

The screenshot displays the GEOS AIP (Air Quality & Health Working Group) web application interface. The top header includes the logo for the Group on Earth Observations, the title 'GEOS AIP Air Quality & Health Working Group', and a login section with fields for 'User name:', 'Password:', and 'New user? Login'. Below the header, there is a 'Catalogue' section on the left with a 'Sources' list. The main area is a map viewer showing a Bing Map of the Americas, with navigation controls (2D, 3D, Road, Aerial, Bird's eye, Labels) and a scale bar (1000 miles). The map shows various geographical features and data overlays. The bottom of the interface includes a footer with sponsorship information: 'Sponsored by ESIP, FGDC' and 'Developed by CISC through the partnership with NASA, Washington Uni, EPA and Northrop Grumman'.

GROUP ON EARTH OBSERVATIONS

GEOS AIP  
Air Quality & Health  
Working Group

User name:   
Password:   
New user?  Login

Catalogue

2D Viewer | OpenLayers | **Bing Map** | Google Earth | Query Results | Information | Help

Sources

My List | Search

WMS URL:  Load

- WMS Servers(Recent loaded)
- WMS Servers(Guest)
  - 4326 WMS DMSP Nighttime Lights Post
  - 4326 WMS Compusult Limited METAR V
  - 4326 WMS Gridded Population of the V
  - 4326 WMS REASoN WebMap Interface
  - 84 WMS NASA Earth Observations (f
  - 4326 WMS Canadian Mineral Deposits(
  - 4326 WMS Metacarta WMS VMaplv0(2f
  - 4326 WMS GlobalLandCoverWMS(3 EP
  - 4326 WMS Meteorological Forcing Data
  - 4326 WMS WRF-NMM model products(;
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  - 4326 WMS NGDC\_EOG(4 EPSG:4326)
  - 4326 WMS Image Web Server(108 EPS
  - 4326 WMS AIRNOW DataFed Web Map
  - 4326 WMS Web Map Service nsandt\_n
  - 4326 WMS NASA WorldWind WMS(15 E
  - 4326 WMS USDA NAIP (low resolutio
  - 4326 WMS Blue Marble NG 2004.06
  - 4326 WMS Blue Marble NG 2004.05

Maps&Animation

bing™

© 2010 Microsoft Corporation © 2010 NAVTEQ Image courtesy of NASA

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View based on Bing Map



# Modules Developed

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## Seamless Integration and Visualization

The screenshot displays the GEOS AIP (Air Quality & Health Working Group) interface. At the top, it features the Group on Earth Observations logo and a login section with fields for 'User name:', 'Password:', and 'New user?' with a 'Login' button. The main interface is divided into several panels:

- Catalogue:** A sidebar on the left containing a 'Sources' section with a 'My List' tab and a search field. Below this is a tree view of WMS Servers, including 'Recent loaded' and 'Guest' categories. A list of WMS servers is shown, such as 'DMSP Nighttime Lights Post', 'Compusult Limited METAR V', 'Gridded Population of the V', 'REASoN WebMap Interface', 'NASA Earth Observations (f', 'Canadian Mineral Deposits(', 'Metacarta WMS VMaplv0(26', 'GlobalLandCoverWMS(3 EP', 'Meteorological Forcing Data', 'WRF-NMM model products(', 'Meteorological Forcing Data', 'NGDC\_EOG(4 EPSG:4326)', 'Image Web Server(108 EPS', 'AIRNOW DataFed Web Map', 'Web Map Service nsandt\_n', and 'NASA WorldWind WMS(15 E'. A 'USDA NAIP (low resolutio' layer is also visible.
- Map View:** The central area shows a 3D view of the Earth in Google Earth mode. The map displays various data layers overlaid on a satellite-style background, with a prominent yellow and red overlay over North America. Navigation controls (compass, zoom, pan) are visible on the right side of the map.
- Footer:** At the bottom, there is a copyright notice: '© 2010 Tele Atlas', '© 2010 Europa Technologies', 'US Dept of State Geographer', and '© 2010 Google'. A 'Terms of Use' link is also present.

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View based on Google Earth

# Solution in action

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**Utilize GOS map data services for Earth Science and GCI Communities** Welcome cap Logout

**Catalogue**

- CSW Servers
  - GMU CSW 2.0.2 for AQ
  - GEOSS Compusult CSW
  - GEOSS ESRI clearinghouse
  - GEOSS Virtual Arctic SDI
  - Geospatial One Stop CSW
  - WMS from GOS

Keyword:  in

Geographic region from map viewer:

Anywhere?

Results sort by:

7 results are found.

**Sources**

**Maps&Animation**

**2D Viewer** OpenLayers Google Earth **Query Results** Information Help

**Title:** VASDI JPL Global Imagery Service  
**Abstract:** WMS Server maintained by JPL, worldwide satellite imagery., Contact Email: lucian.plesea@jpl.nasa.gov, Contact Name: Lucian Plesea  
**WMS Address:** http://wms.jpl.nasa.gov/wms.cgi  
**From:** http://geossregistries.info:1090/GEOSSCSW202/discovery

**Utilize GOS map data services for Earth Science and GCI Communities** Welcome cap Logout

**Catalogue**

**Sources**

**My List** Search

WMS URL

- WMS Servers (Recent loaded)
  - WMS JPL Global Imagery
    - Digital Elevation
    - SRTM derived gl
    - Digital Elevation
    - Global 1km eleva
    - United States el
    - SRTM derived gl
    - Blue Marble Next
    - Daily composite
    - Blue Marble, Glo
    - WMS Global Mos
    - WMS Global Mos
    - CONUS mosaic o
    - SRTM reflectance
    - Current global v
    - Current global v
    - Daily composite
    - Daily composite
    - Daily composite
    - Daily composite

**Catalogue**

**Sources**

**My List** Search

WMS URL

- WMS Servers (Recent loaded)
  - WMS JPL Global Imagery Service
    - Digital Elevation Map of 1
    - SRTM derived global elev
    - Digital Elevation Map of 1
    - Global 1km elevation, se
    - United States elevation,
    - SRTM derived global elev
    - Blue Marble Next Gener
    - Daily composite of MODI
    - Blue Marble, Global MOD
    - WMS Global Mosaic, pan
    - WMS Global Mosaic, not
    - CONUS mosaic of 1990 M
    - SRTM reflectance magnit
    - Current global view of th
    - Current global view of th
    - Daily composite of MODI
    - Daily composite of MODI
    - Daily composite of MODI
    - Daily composite of MODI

**Utilize GOS map data services for Earth Science and GCI Communities** Welcome cap Logout

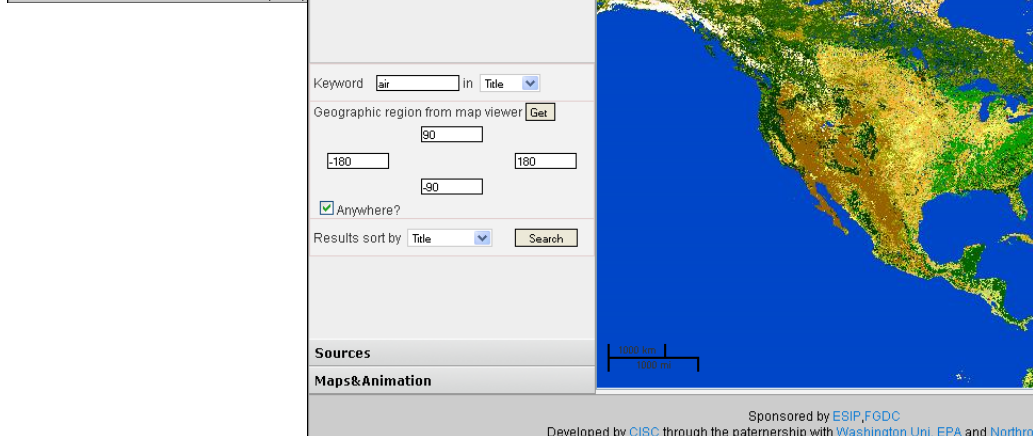
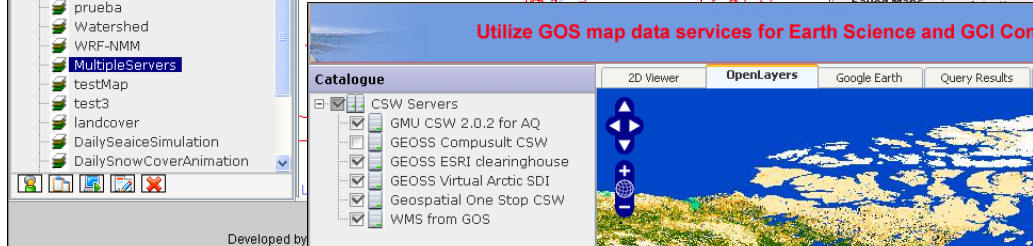
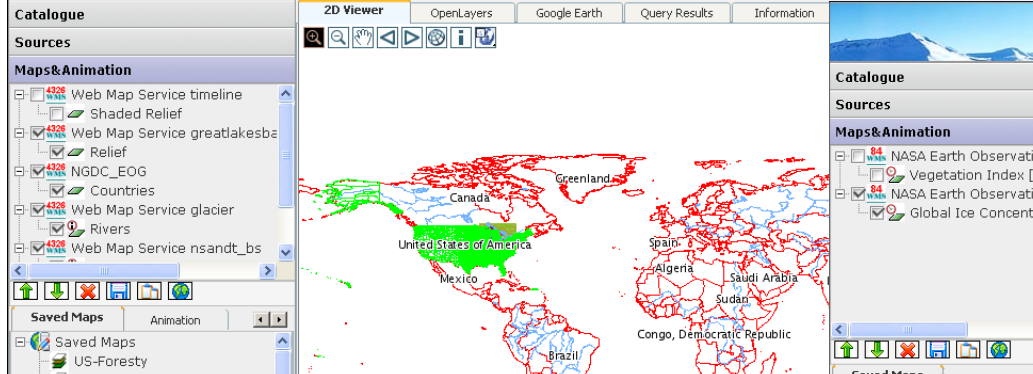
**2D Viewer** OpenLayers **Google Earth** Query Results Information Help

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US Dept of State Geographer  
© 2010 Google

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# Solution in action

Serve AQ & PH Community



## Virtual Arctic SDI Portal



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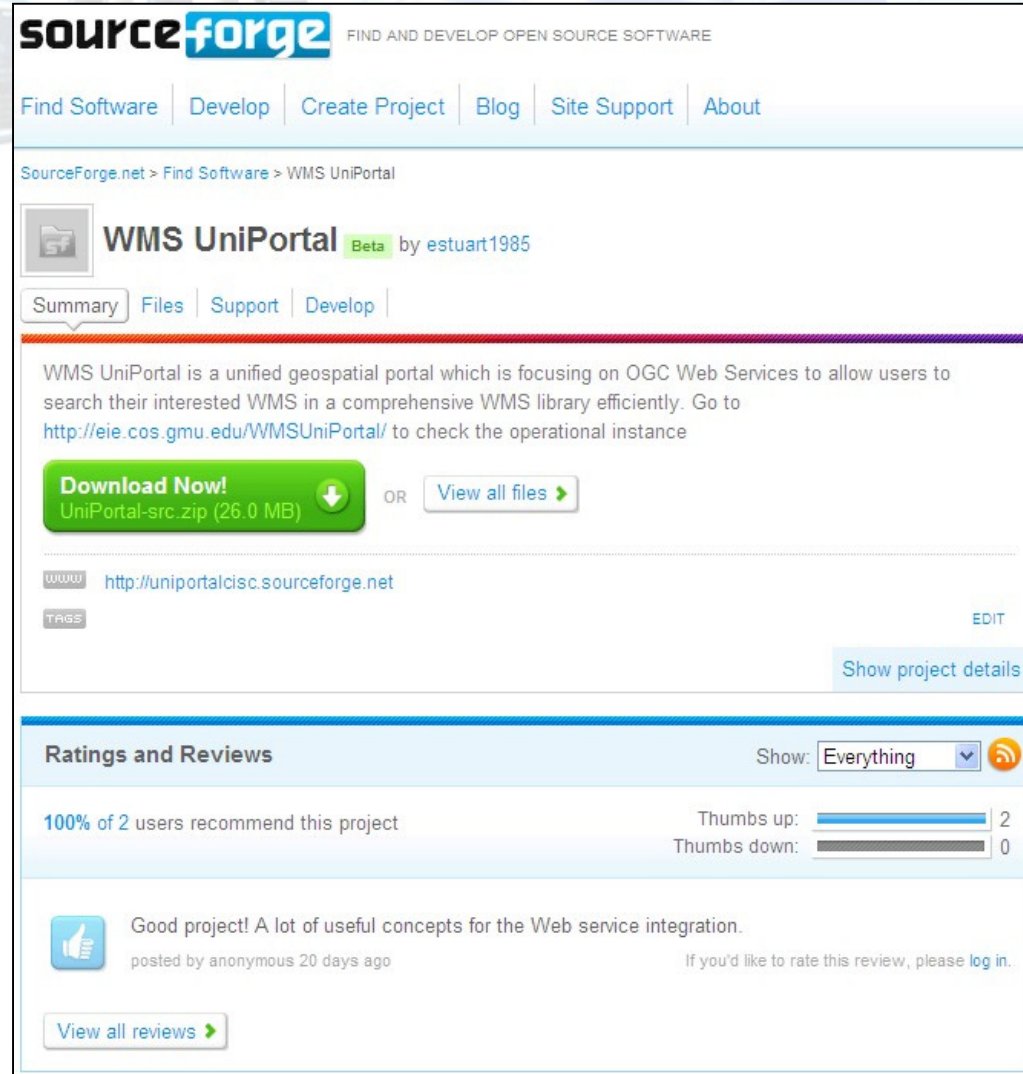
## Serve the GCI Community

# Solution in Actions

Joint Center for  
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## ■ 1) Open source

- We set up a project site in SourceForge (<http://sourceforge.net/projects/uniportalcisc/>) Our source codes as well as supporting documents are uploaded to this site. Currently, it has been downloaded 28 times in about a month.




The screenshot shows the SourceForge project page for "WMS UniPortal". The page header includes the SourceForge logo and the tagline "FIND AND DEVELOP OPEN SOURCE SOFTWARE". Navigation links for "Find Software", "Develop", "Create Project", "Blog", "Site Support", and "About" are visible. The breadcrumb trail indicates the location: "SourceForge.net > Find Software > WMS UniPortal". The project name "WMS UniPortal" is displayed with a "Beta" badge and the creator's name "estuart1985". Below the project name are tabs for "Summary", "Files", "Support", and "Develop". The main content area contains a description of the project as a unified geospatial portal focusing on OGC Web Services. A prominent green "Download Now!" button is shown, along with a link to "View all files". The project's website URL is listed as "http://uniportalcisc.sourceforge.net". The "Ratings and Reviews" section shows that 100% of 2 users recommend the project, with 2 thumbs up and 0 thumbs down. A review from an anonymous user is displayed, praising the project's concepts for web service integration.

**sourceforge** FIND AND DEVELOP OPEN SOURCE SOFTWARE


Find Software | Develop | Create Project | Blog | Site Support | About

SourceForge.net > Find Software > WMS UniPortal

 **WMS UniPortal** Beta by estuart1985


Summary | Files | Support | Develop

WMS UniPortal is a unified geospatial portal which is focusing on OGC Web Services to allow users to search their interested WMS in a comprehensive WMS library efficiently. Go to <http://eie.cos.gmu.edu/WMSUniPortal/> to check the operational instance



**Download Now!**  
UniPortal-src.zip (26.0 MB)  OR [View all files](#) 


WWW <http://uniportalcisc.sourceforge.net> EDIT


TAGS [Show project details](#)

**Ratings and Reviews** Show:  

100% of 2 users recommend this project

Thumbs up:  2  
Thumbs down:  0

 Good project! A lot of useful concepts for the Web service integration.  
posted by anonymous 20 days ago If you'd like to rate this review, please [log in](#).

[View all reviews](#) 

# Outreach

Joint Center for  
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- Incorporate the model with the graduate courses and training in GMU



# Outreach

Joint Center for  
Intelligent Spatial Computing

## ■ Selected Conference Sessions Organized

- Service Oriented Computing and Architecture, technical session in AAG 2010 Annual Meeting, Friday, 4/16/10, from 12:40 PM - 2:20 PM in Tyler, Marriott Mezzanine, Organized by Huayi Wu (CISC) and Xuan Shi through the CISG AAG.
- What are the Grand Challenges of Geographic Information Science? Panel discussion in AAG 2010 Annual Meeting, Saturday, 4/17/10, from 12:40 PM - 2:20 PM in Virginia Suite B, Marriott Lobby Level, Organized by Dawn Wright and Chaowei Yang through CISG, AAG
- Geospatial Web Services in Government, Panel discussion in AAG 2010 Annual Meeting, Organized by Douglas Nebert and Chaowei Yang through CISG, AAG

# Outreach

Joint Center for  
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## ■ Publications

- Yang C., Raskin R., Goodchild M., Gahegan M., 2010. Geospatial Cyberinfrastructure: Past, Present, and the Future, *CEUS*, 34(4):264-277.
- Li Z., Yang C., Wu H., Li W., Miao L., 2010, An optimized framework for seamlessly integrating OGC web services to support geospatial sciences, *IJGIS* (in press).
- Wu H., Li Z., Zhang H., Yang C., Shen S., 2010, Monitoring and Evaluating Web Map Service Resources for Optimizing Map Composition over the Internet to Support Decision Making, *Computer and Geoscience* (in press).
- Yang C. et al., 2010, WebGIS Performance Issues and Solutions, in ISPRS WebGIS book. Li et al. (eds) (in press).
- Yang C., Wu H., Huang Q., Li Z., Li J., 2010. Spatial Computing for Supporting Geographic Science, *PNAS* (submitted).

# Outreach

Joint Center for  
Intelligent Spatial Computing

## ■ Selected Presentations

- Huayi Wu, Zhenlong Li, Chaowei Yang, Quality-supported architecture for Geospatial Information Service, AAG 2010, Washington DC, 14-18 April, 2010-4-15.
- Zhenlong Li, Huayi Wu, Chaowei Yang, Application Composition based on WMS Layers for Supporting Spatial Data Infrastructure, ESIP (Federation of Earth Science Information Partnership) 2009 Winter Meeting, Washington DC, 5-7 Jan., 2010.
- Zhenlong LI, Huayi Wu, Chaowei Yang, Application Composition based on WMS Layers for Supporting Spatial Data Infrastructure, American Geophysical Union, Fall Meeting 2009, abstract #IN12A-06, San Francisco, CA, Dec 14-18, 2009-12-3.
- Huayi Wu, Zhenlong Li, Chaowei Yang , Real-time Monitoring of WMS Quality for Optimized Map Composition with Distributed WMS Layers, AGU 2009 Fall Meeting, San Francisco, CA, Dec 14-18, 2009-12-30.



# Accomplishments

Joint Center for  
Intelligent Spatial Computing

1. Serving 5 communities
  - ESIP Air Quality and Public Health
  - AAG CISG GCI
  - Arctic SDI
  - NASA Spatial Web Portal
  - Microsoft BingEO Project
2. Organized 6 sessions/workshops in AAG & ESIP
3. Gave over 10 presentations
4. Published 5 peer reviewed journal papers
5. In planning
  - GEOSS Clearinghouse
  - ESIP QoS Checker
  - GeoCloud
  - USDA

# Acknowledgements

- FGDC provided funding support
- Guidance from Doug Nebert
- Reliable support from Gita Urban-Mathieux
- Collaboration with AAG, ESIP, Microsoft, and NASA
- CAP 2 Projects Team
- Project Team @ GMU
  - Zhenlong Li, Wenwen Li, Jing Li, Min Sun
  - Kai Liu, Xin Qu
  - Hannes Wu
- Other staff and students involved