

Interoperable Earth Observation Services and Their Use in a Variety of Decision Support Contexts

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Overview

- Introduction to the ESIP Federation
- Services Oriented Architectures
- Open Interoperability Standards
- Sample Implementations from ESIP Federation Members
 - Earth Data Analysis Center, University of New Mexico
 - Space Science Engineering Center, University of Wisconsin
 - Global Change Master Directory, NASA
 - Information Technology and Systems Center, University of Alabama, Huntsville

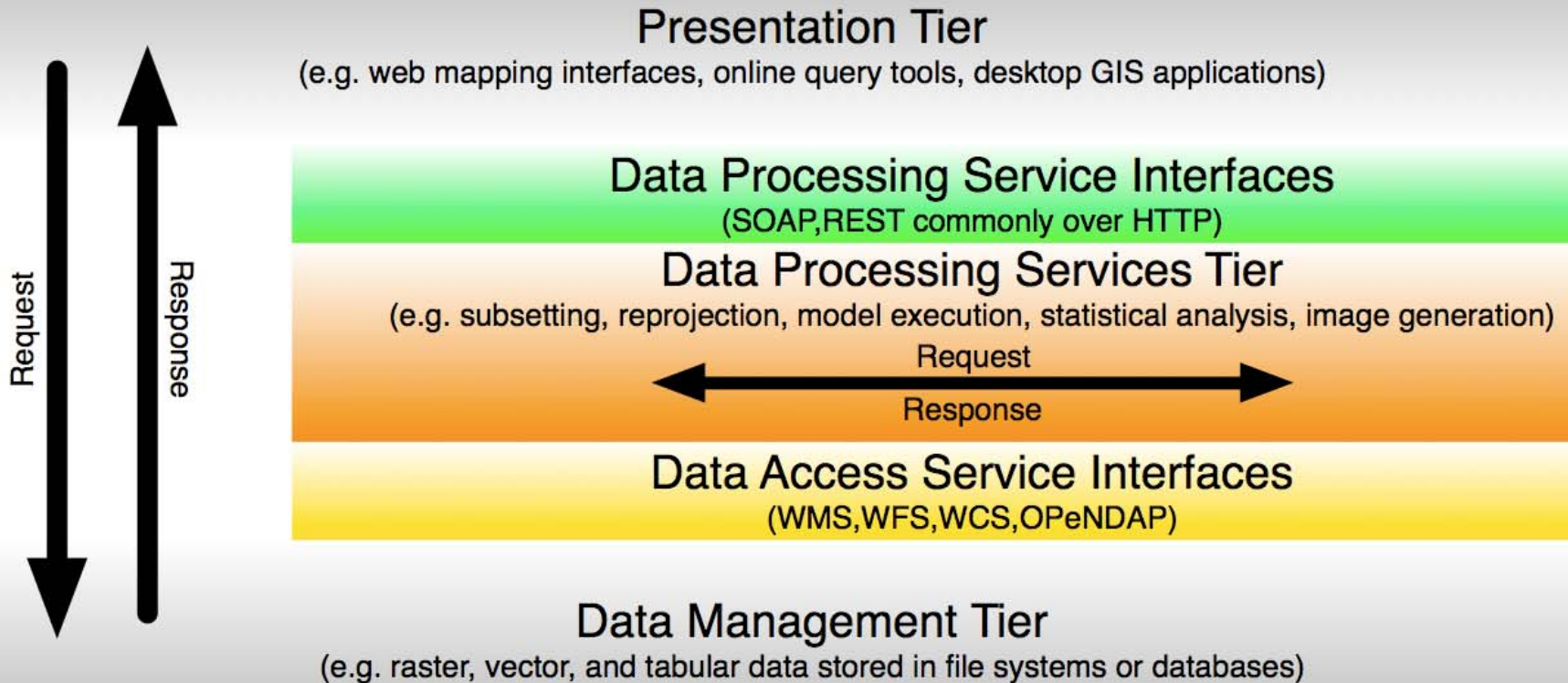


Federation of Earth Science Information Partners (AKA the ESIP Federation)

- Established in 1998 under a grant from NASA, support is now provided by NASA and NOAA
- Now over 100 member organizations, incl.
 - NASA and NOAA data centers
 - Research labs
 - Education resource providers
 - Technology developers
 - Non-profit and commercial enterprises



Services Oriented Architectures



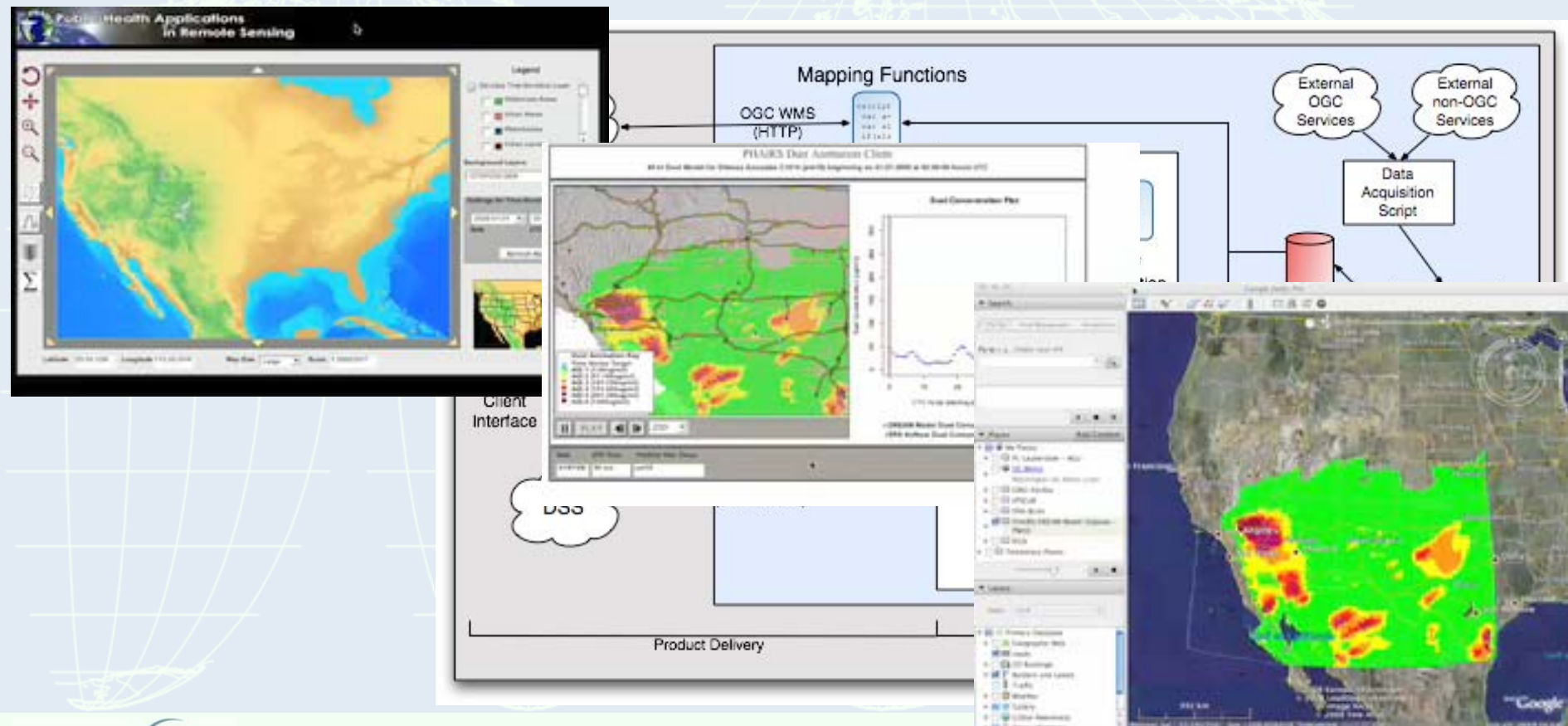
Open Interoperability Standards

- Key standards implemented by Federation members
 - Open Geospatial Consortium: WMS, WFS, WCS, KML, CAT & others
 - World Wide Web Consortium (W3C): HTTP (REST), SOAP, XML
 - ISO: 19115
 - FGDC: Metadata Standard for Geospatial Data
 - Others ...



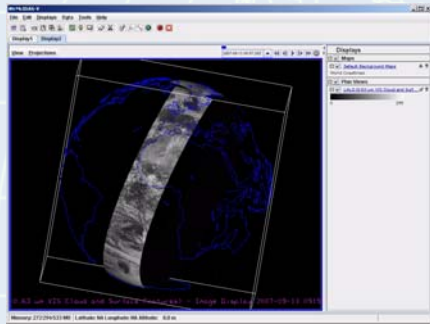
Sample Implementations: Earth Data Analysis Center

Public Health Application in Remote Sensing (PHAiRS)

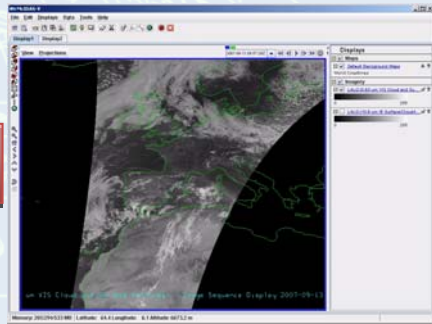


Sample Implementations: Space Science Engineering Center

3-Tiered Satellite Data Collection, Delivery and Visualization (XML, CCSDS)



Visualization Tools

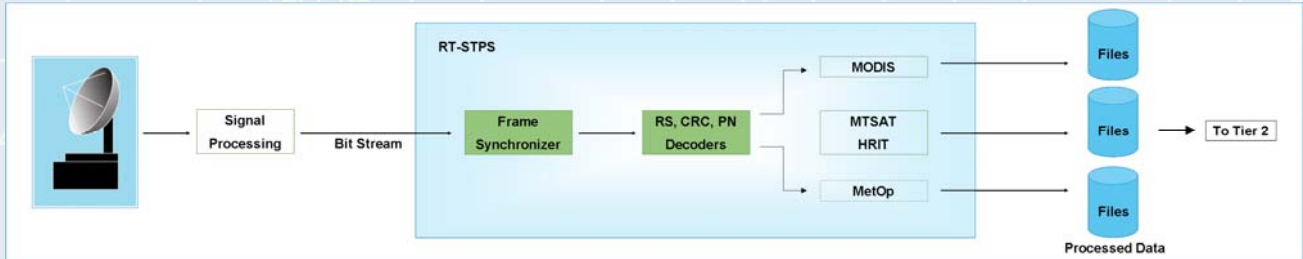


ADDE Server Protocol

NEXRAD

MODIS

Others ...



Sample Implementations: Global Change Master Directory

Standards-based data and services registry & portals

The image displays five sequential screenshots of the Global Change Master Directory website, illustrating its navigation and search capabilities. Each screenshot features the NASA Goddard Space Flight Center logo and the site's title, "Global Change Master Directory: Discover Earth science data and services".

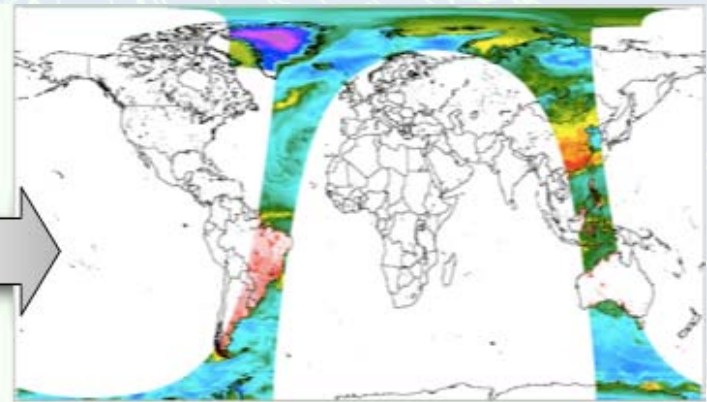
- Screenshot 1 (Home):** Shows the main navigation menu with links for Home, Data Sets, Data Services, Portals, and Add. A "Find Data" sidebar lists various categories such as Agriculture, Atmosphere, Biosphere, Biological Classification, Climate Indicators, Cryosphere, and Human Dimensions.
- Screenshot 2 (Search Results):** Displays a search results page for "Data Analysis And Visualization". It lists sub-categories like Data Management/Data Handling, Education/Outreach, Environmental Advisories, Hazards Management, Metadata Handling, Models, and Reference And Information Services. A "Display Feature Guide" link is also visible.
- Screenshot 3 (Detailed View):** Focuses on the "Environmental Advisories" category, listing sub-topics like Wildfires, Present, and Agricultural crop forecast.
- Screenshot 4 (Detailed View):** Focuses on the "Air Quality" category, listing sub-topics like Climate Advisories, Dust/Ash Advisories, Frost/Freeze, and Heat Advisories.
- Screenshot 5 (Advanced Search):** Shows an advanced search interface with filters for "Refine by Category" and "Refine by Full text". It includes a search bar and a "Go" button. Below the search area, there are search results for "Data Analysis And Visualization" and "Environmental Advisories".

Each screenshot includes a footer with the USA.gov logo, a "Privacy Policy" link, and a "Responsible NASA Official" notice: "Responsible NASA Official: Lola Olsen, Last Updated: November 2008".

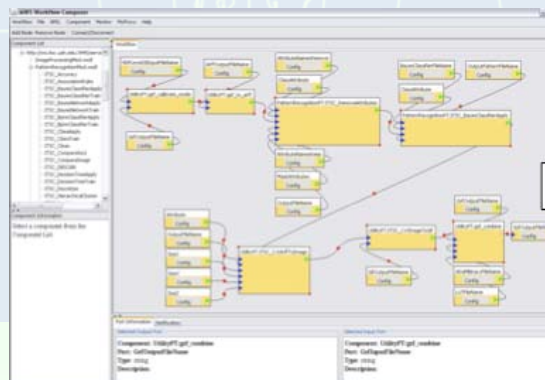


Sample Implementations: Information Technology and Systems Center

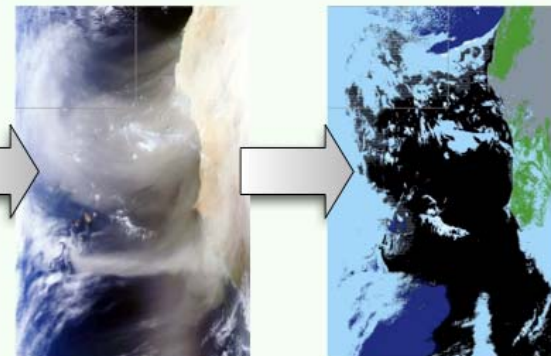
OGC WMS and WFS Services / SOAP Processing



Example WMS output for AMSU-A 15, 50299.91MHz channel on Jan 30, 2008, layered on country boundaries.



Mining Workflow Composer showing Bayes classification workflow



True Color MODIS showing dust blown off the coast of Africa

Result of Bayes classification using MWS to generate thematic map detailing dust



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Additional Information About Common Standards

- **AJAX** - Asynchronous JavaScript and XML - [http://en.wikipedia.org/wiki/Ajax_\(programming\)](http://en.wikipedia.org/wiki/Ajax_(programming))
- **CSW** - OpenGIS Catalogue Service Implementation Specification - <http://www.opengeospatial.org/standards/cat>
- **DIF** - Directory Interchange Format - <http://gcmd.nasa.gov/User/difguide/difman.html>
- **FGDC** - FGDC Content Standard for Digital Geospatial Metadata - http://www.fgdc.gov/standards/standards_publications/
- **HTML/XHTML** - Hypertext Markup Language - <http://www.w3.org/MarkUp/>
- **ISO 19115** - ISO Standard for Geographic Information Metadata - http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=26020
- **JavaScript** aka ECMAScript - Scripting language commonly used in web applications - <http://en.wikipedia.org/wiki/JavaScript>
- **REST** - Representational State Transfer - http://en.wikipedia.org/wiki/Representational_State_Transfer
- **SERF** - Service Entry Resource Format - <http://gcmd.nasa.gov/User/serfguide/>
- **SOAP** - Simple Object Access Protocol - <http://www.w3.org/TR/soap12-part1/>
- **WCS** - OpenGIS Web Coverage Service - <http://www.opengeospatial.org/standards/wcs>
- **WFS** - OpenGIS Web Feature Service - <http://www.opengeospatial.org/standards/wfs>
- **WMS** - OPenGIS Web Map Service - <http://www.opengeospatial.org/standards/wms>

