U.S. National Spatial Data Infrastructure

Update on FGDC-Coordinated Activities

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FGDC/GSDI Secretariat

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Presentation Overview

- Background on U.S. NSDI
- NSDI Coordination Activities
  - Baseline activities status
  - I-Team, Clearinghouse, Metadata, Framework, Standards
- Geospatial One-Stop Initiative
  - Module Status and Milestones
  - Participation
  - Relation to other e-government activities

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Foundation of US NSDI

- NSDI established as initiative under the interagency coordinating committee, the Federal Geographic Data Committee (FGDC)
- FGDC has 17 member federal organizations, official liaison with 35 state councils, and other sectoral organizations
- Executive Order 12906 (1994) compelled federal government participation in NSDI

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Objectives of the Infrastructure

- To promote use and re-use of spatial data for multiple purposes by government and citizens
- To encourage participation of self-disciplined providers or data and services
- To establish baseline services that support community discovery and access to geo-information (directory of services, common data schemas, search gateways, gazetteer, reference software implementation)

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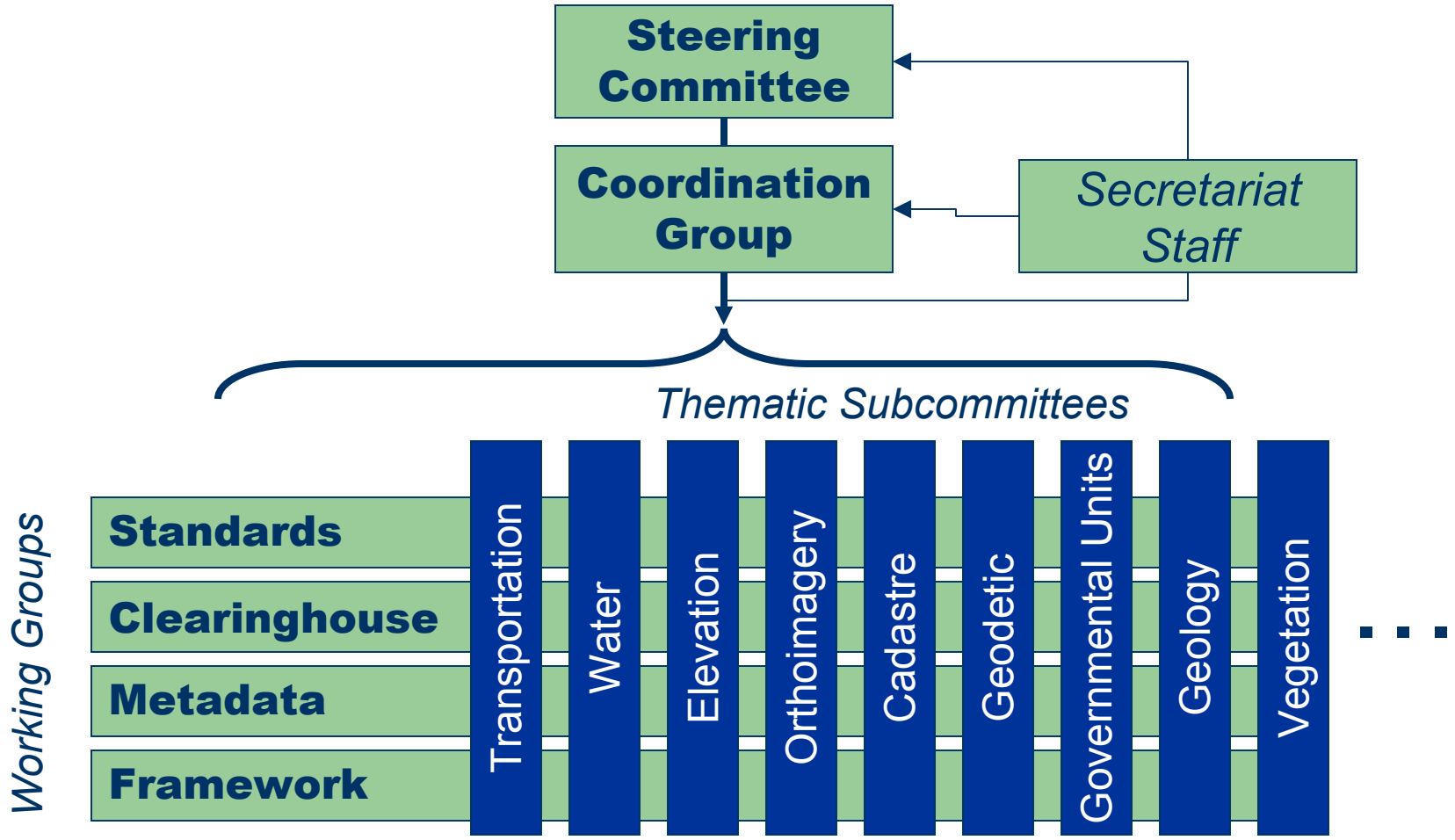
Organization of FGDC



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NSDI Coordination Activities

- Coordination Group of agency leads meets monthly to discuss common issues
- Steering Group meets 2-3 times per year to address high-level guidance
- FGDC Secretariat assists in the day-to-day coordination functions of the NSDI

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FGDC Secretariat

- Secretariat is a permanent office at U.S. Geological Survey to support the FGDC
- Staff of 20 continues to support ***baseline activities*** and assisting in Geospatial One-Stop Initiative coordination and execution
- Four new staff members handle executive management, project documentation, budget, and outreach activities for One-Stop

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Baseline activities

- FGDC continues to promote:
  - Interaction with consensus and formal standards activities
  - Metadata standardization and education
  - Clearinghouse implementation and enhancement
  - Framework data standardization
  - I-Team formation and coordination

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Interaction with Standards Groups

- FGDC has Standards Working Group for the development of consensus Federal standards
- FGDC is Principal Member of OpenGIS and contributes to technical specification development
- FGDC is member of the US ANSI/INCITS L1, which represents the US in ISO on geomatics
- FGDC participates through a number of national experts in ISO TC 211 Work Items creating the 19100 series of standards

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Metadata Standardization

- US Continues to use and promote the FGDC Metadata Content Standard, Version 2, 1998
- FGDC hosted informal workshop with US, Canada, and UK on interpreting and advancing ISO metadata, 22-24 January
- The U.S. and Canada are committed to co-develop a North American Profile of metadata working through Standards Canada and ANSI/INCITS

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ISO Metadata Activities

- ISO 19115 (Metadata) has recently been split into two documents:
  - 19115 will hold the formal UML and definitions
  - Technical Specification 19139 will publish the formalization of ISO 19115 metadata in XML through use of an XML Schema
- For education and development purposes, FGDC will focus on ISO 19139 for interoperability and clarity
- FGDC will promote development of XSL Stylesheets to render ISO 19139 metadata

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OpenGIS Involvement

- Catalog Services 2.0 Revision Working Group has been formed to integrate catalogs and registries
- FGDC is sponsoring a Geospatial One-Stop Transportation Pilot and Portal (discussed later)
- FGDC will participate in Critical Infrastructure Protection Initiative (CIPI-1)

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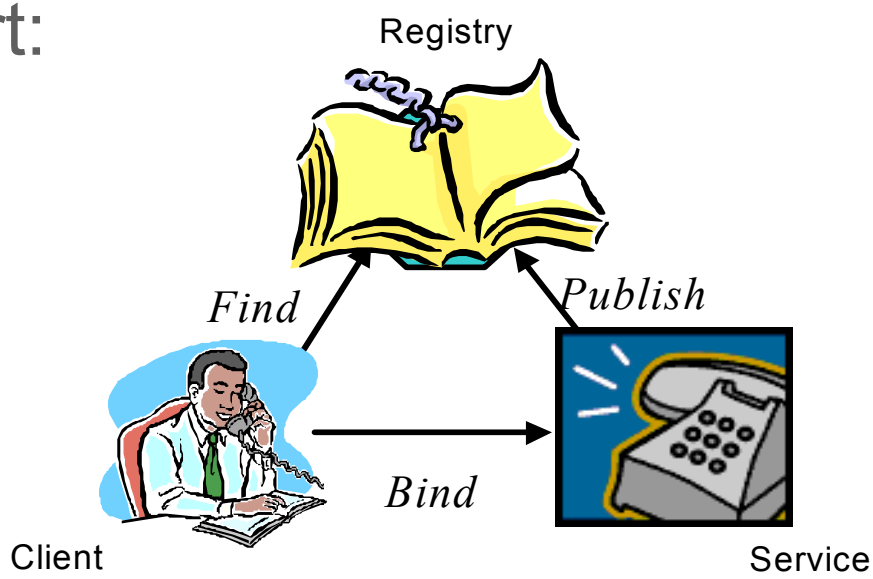
Catalog Services

- Foundation of Clearinghouse
- Supports the “Publish, Find, Bind” approach
- Challenge to support:
  - Data discovery
  - Service discovery
  - Association of each



Based on the Generic Web Services Model

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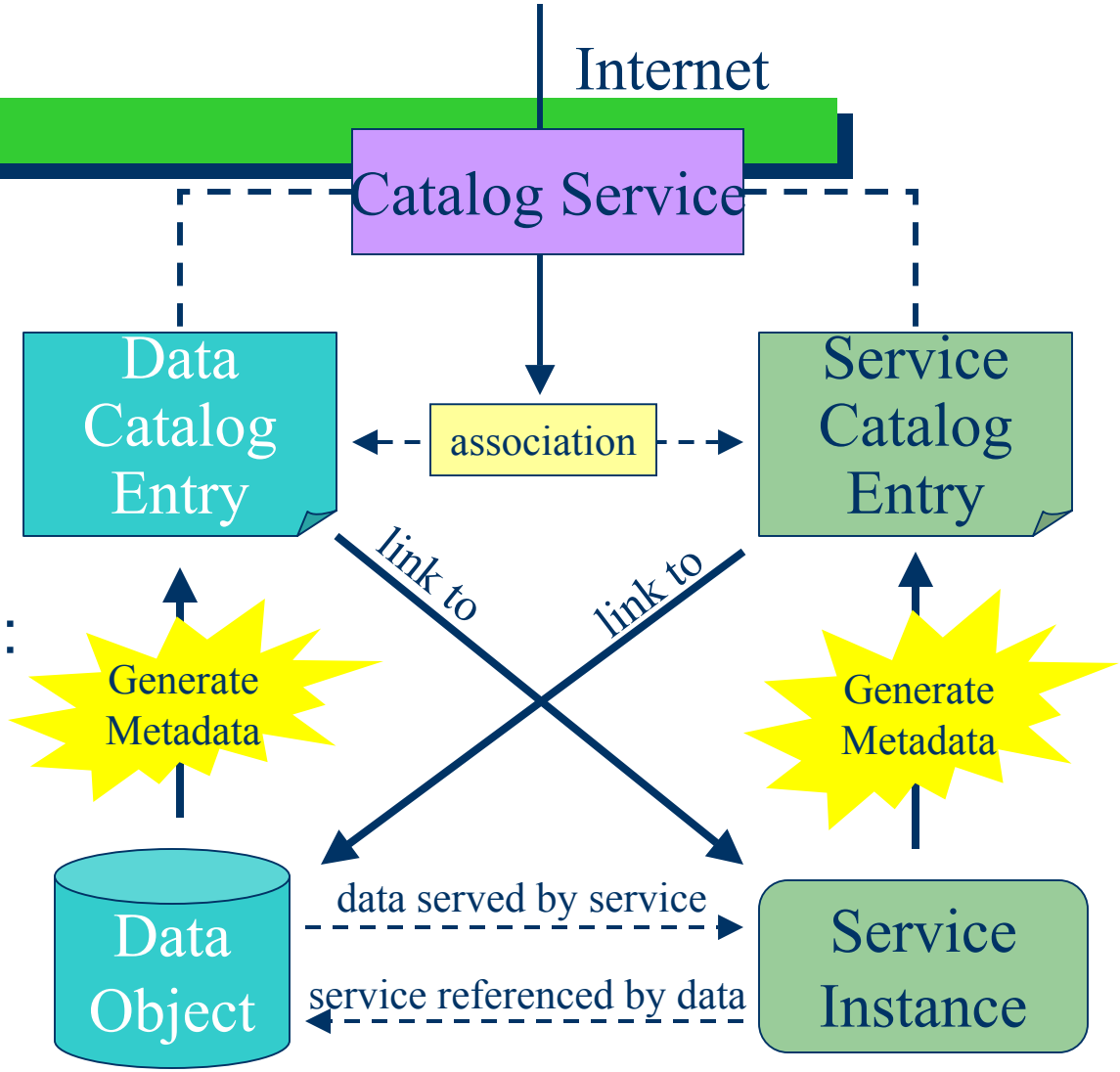
Catalog Service Research

Catalog V2 Choices:
- Z39.50
- CORBA
- UDDI?
- ebXML?
- SOAP?
- REST (Get/Post)



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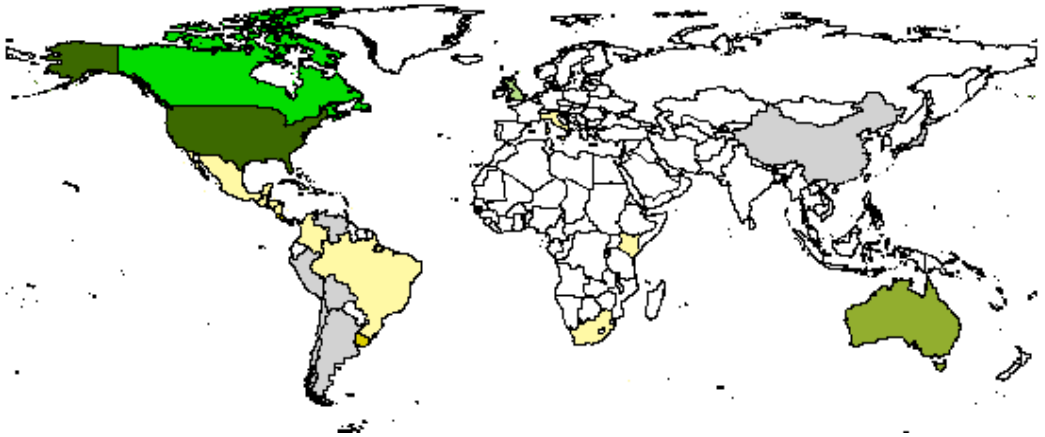
Clearinghouse Implementation

- The NSDI Clearinghouse continues to grow using the Z39.50 protocol
- 245 Metadata Collections are registered in the Clearinghouse registry



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Clearinghouse Nodes

Updated: Jan 2003

Argentina:	1	Italy:	2
Australia:	19	India	1
Barbados:	2	Japan:	2
Bolivia:	1	Jamaica:	1
Brazil:	3	Kenya:	3
Canada:	>100	Mexico:	2
Chile	1	Nicaragua:	2
China:	1	Norway:	1
Colombia:	2	Peru:	1
Costa Rica:	3	South Africa:	2
Dominica:	1	Switzerland:	1
Dominican Republic:	1	Trinidad & Tobago:	1
El Salvador:	2	United Kingdom:	9
Ethiopia	3	United States:	186
Guatemala:	2	Uruguay:	2
Honduras:	2	Venezuela:	2

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2003 Plans for Clearinghouse

- Develop and implement compatible Web-based OGC catalog services for data and service discovery through Version 2.0 effort
- Investigate harvester, push, and indexing technology for construction of dynamic national indexes of spatial metadata and services
- Provide baseline infrastructure for the discovery of all types of data and services integrated with the Geospatial One-Stop Portal

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Framework Data

- Federal agency leads defined for each theme
- Multi-sectoral participation in ANSI-sponsored standards development teams for Framework underway to define Core representation
- Coordination of Framework data service providers to be formalized within each community
- Activity done in support of Geospatial One-Stop

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I-Teams

- Locally formed, interdependent
- Inclusive, voluntary, open
- State, local, federal, tribal, academic, private sector
- Expanded from existing collaborations
- Brand name to help build Executive and Legislative Branch awareness

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Stewarding America's Data Assets

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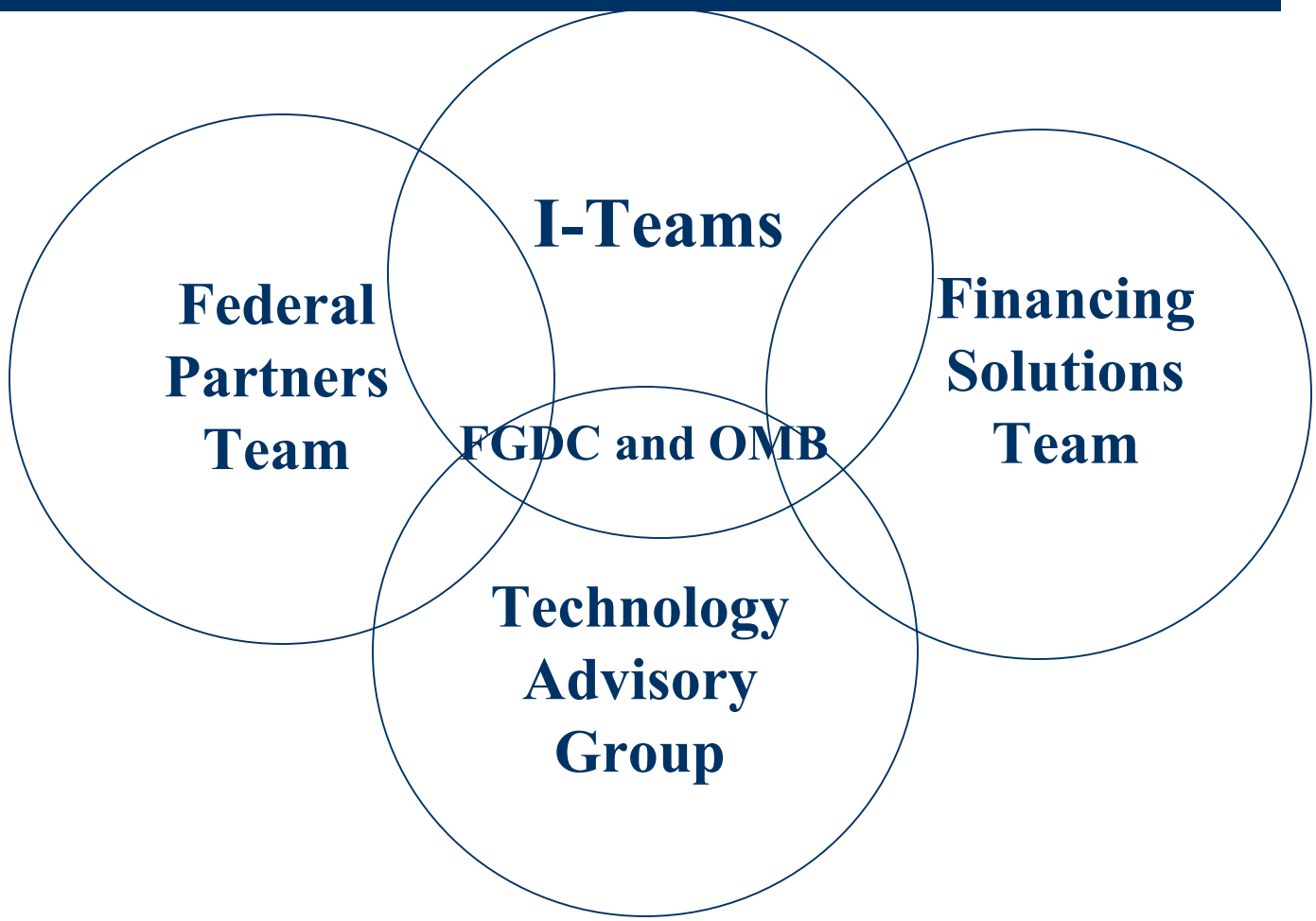
I-Team Implementation Strategy



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The I-Team Process

- Treat data as strategic, capital assets and public goods
- Collaborate and Coordinate
- Align roles, responsibilities and resources
- Steward Data
- Organize Effective and Efficient Production and Stewardship of Data
- Pool and Leverage Investments

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Stewarding America's Data Assets

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What Do I-Teams Do?

- Address Institutional Barriers
- Identify most effective ways to collect, maintain and distribute Data
- Determine business needs, inventory data assets, identify gaps, estimate investment cost
- Designate data stewards
- Develop Enterprise Plans (I-Plans) for Data production and publication by the most appropriate partner at accuracy and scale needed by local jurisdictions
- Provide plans to OMB, agencies, DHS

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What Do I-Teams Do?

- Aid State/local participation in Geospatial One-Stop
- Work with OGC on cutting edge of technology (Semantic Translators and exchange schemas, Web Services)
- Help OMB and agencies in budget process
- Enable role, responsibility, resource alignment
- Provide, steward, and publish America's Data Assets

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Reasons To Form I-Teams

- The I-Team process gives States and regions a mechanism to focus upon data as strategic long term capital assets.
- An organized region with a strategic plan and an investment strategy is more likely to attract Federal funds for essential national missions.
- Local and State governments are looking for a mechanism that will coordinate Federal initiatives.
- State and local governments perceive I-Teams as having the potential to result in financial incentives from the federal government.
- Participation in a national network will bring credibility with State executive and legislative branches.
- They have to do it anyway.

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Accomplishments

- Established “I-Team” phrase to help build political awareness as multi-jurisdictional GIS consortium
- Federal agencies have accepted the idea of I-Teams and support them
- 46 States and regions have I-Teams
- Several established by Executive Order of Governor
- 9 I-Plans published, 14 I-Plans nearing completion (30-90 days)

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Stewarding America's Data Assets

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Obstacles to I-Teams

- Federal Partners may not have engaged agencies
- No national funding for I-Team administration and operations (It is all voluntary!)
- No Federal Financial Incentives (yet)
- Perception of and actual lack of coordination continues

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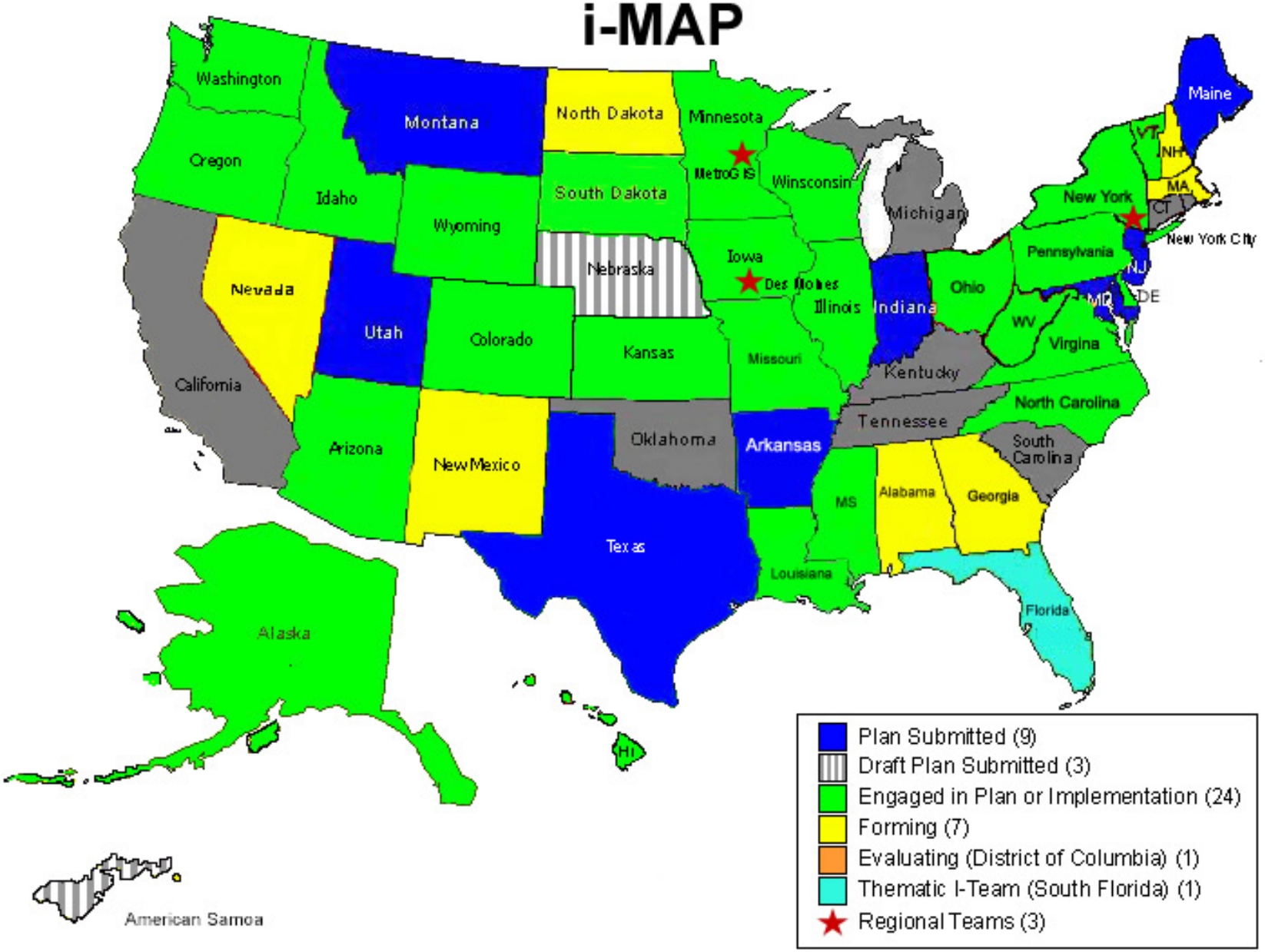
i-MAP



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How I-Teams participate

- Producers, users steward America's data assets
- NSDI - the infrastructure
- Geospatial One-Stop - a Presidential initiative to accelerate completion of the infrastructure
- I-Teams - a process to help produce and steward data
- The National Map, Census Modernization, FEMA NFIP, HSIP - Programs that can use I-Teams to produce products to fulfill essential national missions and foster coordination

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E-government: Geospatial One-Stop

- OMB has established 24 e-government initiatives across the U.S. Government to seek savings of scale by formalizing re-usable G2G services
- Geospatial One-Stop Initiative intends to make it easier, faster, cheaper for all levels of government and the public to get access to geospatial information.

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Purpose of Geospatial One-Stop

It improves our ability to:

- **Support the business of government**
  - planning, regulation, detecting change
- **Support Decision making**
  - response, mitigation, prediction, intergovernmental coordination

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Geospatial One-Stop Workplan

- **Requirements Gathering and Analysis**: defining business and transactional drivers with data
- **Data Standards Development Process**: Create abstract and implementation specifications for common data themes (Framework)
- **Documentation**: Catalogs for existing and planned data collection
- **Portal and Service Deployment**: Support discovery of and access to distributed data and services by web client users and other applications (E-gov)

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Geospatial One-Stop Modules

1. Develop rigorous data content standards for Framework data themes using a common structured modeling language
2. Document Framework holdings in Clearinghouse
3. Document planned Framework data collection in Clearinghouse
4. Implement Framework data services
5. Implement a common access portal

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Geospatial One-Stop Effects

- Raises the visibility of the strategic value of geographic information.
- Increases federal agency accountability for the stewardship and sharing of geospatial resources.
- Establishes a collaborative model for directing an intergovernmental initiative.

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Geo-Partnerships

Expectations

- Standards
- Metadata
- Stewardship

Incentives

- Tools
- Training
- Software
- Grants

Better data will result in improved public services

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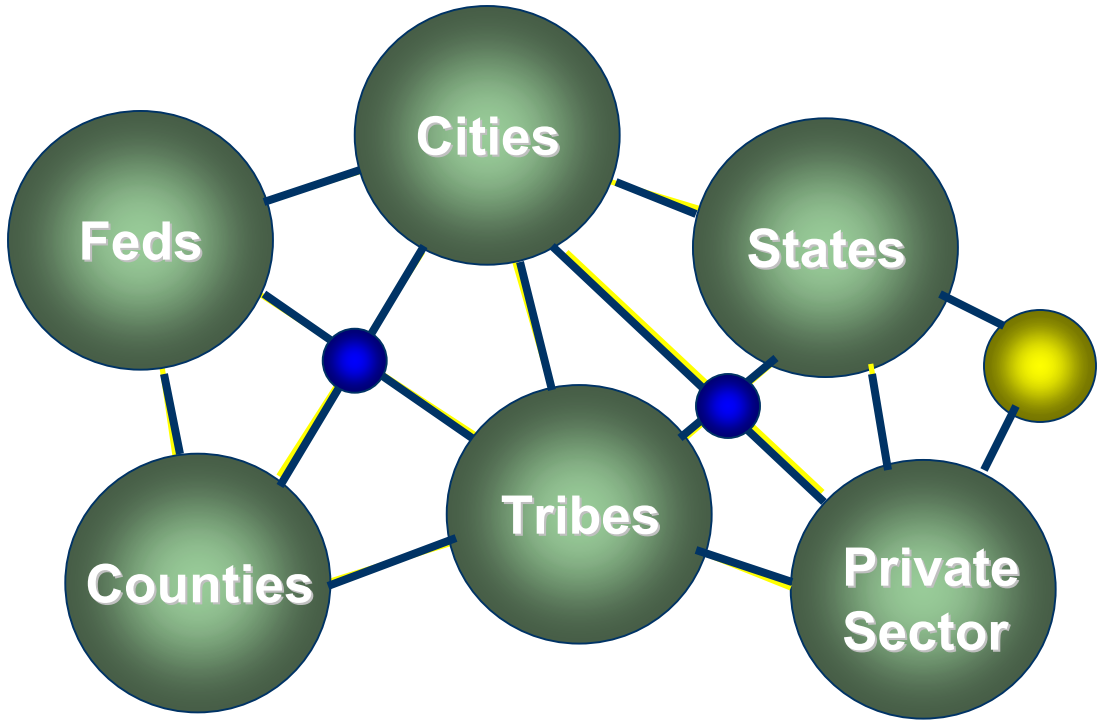
Geo-partnerships will lead to:



Common Services

Catalog/Registry

. . . A National, Distributed GIS

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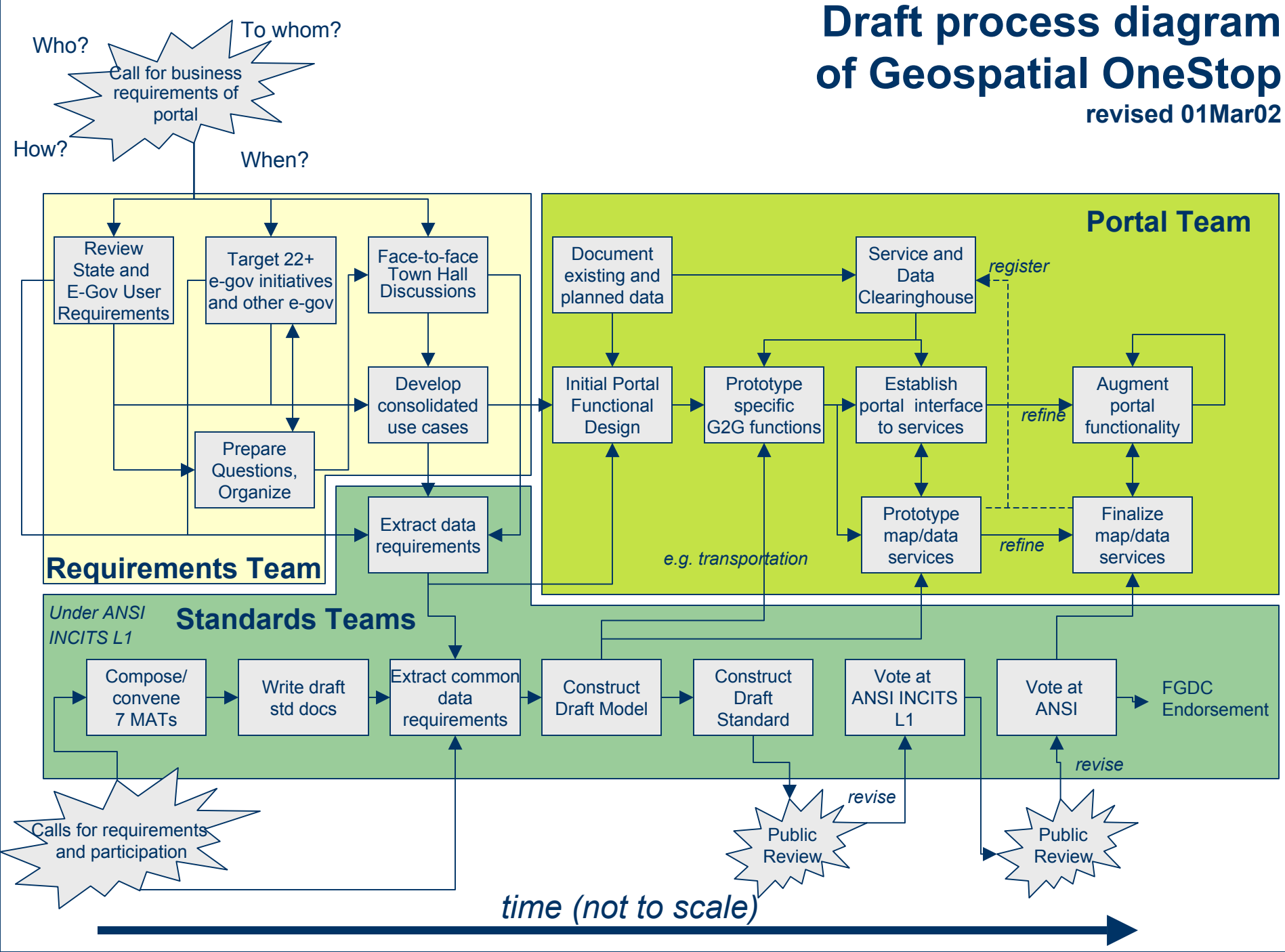
Intergovernmental Board of Directors

- National Association of State CIOs
- National States Geographic Information Council
- National Association of Counties
- National League of Cities
- International City/County Managers Association
- Intertribal GIS Council
- Western Governors Association
- Department of Interior
- Department of Commerce
- Department of Transportation
- NASA

Draft process diagram of Geospatial OneStop

revised 01Mar02



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1. Data Standards Development for One-Stop

- Develop business cases in a participatory process to define the intersection of functional requirements that lead to data
- Identify primary stakeholders, federal and otherwise
- Define a data content model adequate to support the intersection of needs
- Model using a common modeling language (UML)
- Develop full standard document to include model
- Publish as Framework Core Data Content Standard by ANSI, endorsed by FGDC
- Define a specific implementation schema in OGC Geography Markup Language (GML) that can be used for data access and validation
- Implement conformant services for Framework data

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Module 1: Data Standardization

- Define a well-known package of GIS data that can be exchanged without negotiation for immediate use
- More robust packages can be defined and exchanged by the same approach, but one must support Core at a minimum
- Do not replace more comprehensive FGDC standards, but are a subset of their content
- Do not define the internal data models used in mission critical systems, only a package for import and export

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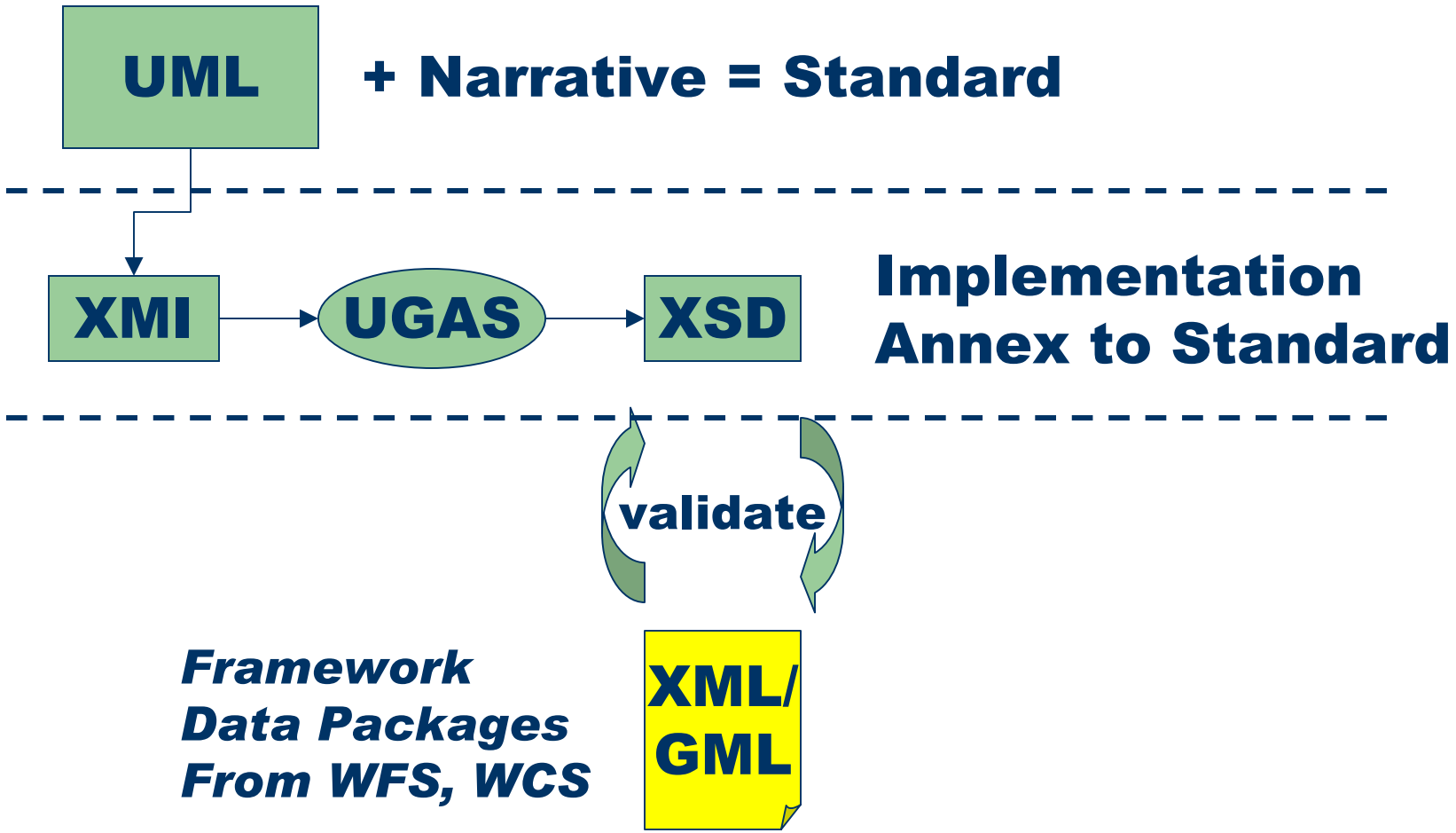
Data Standards approach



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Status of Draft Standards

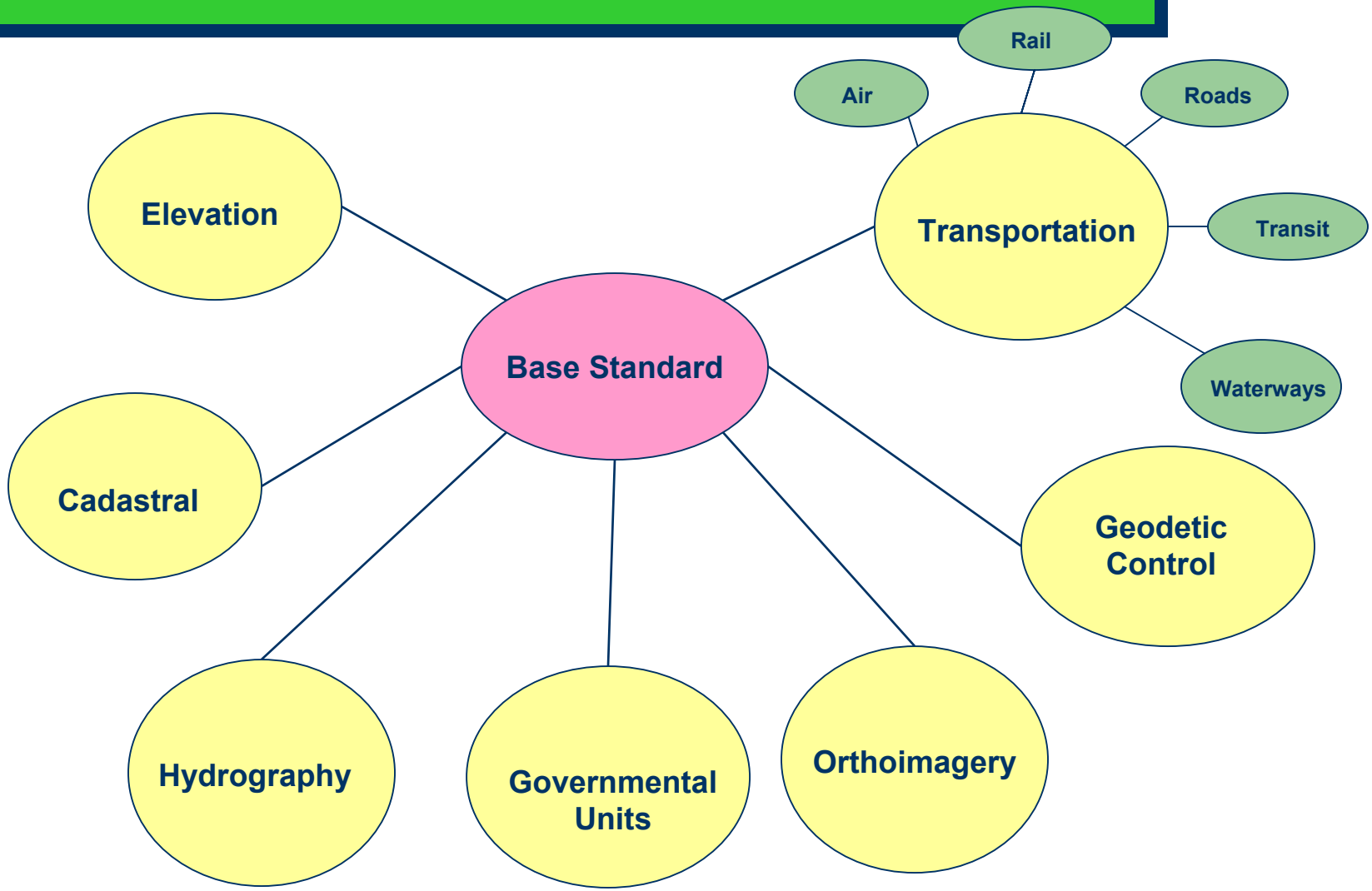
Available Now:

- Elevation
- Hydrography
- Government Units
- Geodetic Control
- DOQ
- Transportation (Roads)

Available February:

- Cadastral
- Air
- Rail
- Transit

Framework Data Themes



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Common Issues in Base Standard

- Standards documentation in support of ANSI
- Identification of unique features and assignment of IDs
- Source authority of data and modifications
- Theme maintenance and documentation
- Standardization of modeling methods
- Common referencing of linear features such as roads, streams, rail
- Management of similar or same features across themes.
- Co-management of data within a theme

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Module 2. Document Framework Holdings in Clearinghouse

- Identify agency holdings (only original or value-added) of Framework data themes
- When standards are approved and organization has Web services online to serve the data, must ‘flag’ data and register the services
- Use existing or new Clearinghouse nodes to host and serve the metadata

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Module 2 Approach

- Streamlined search interface for Framework Data
- On-line metadata tool for undocumented framework datasets
  - Temporary document
  - Replaced by detailed metadata

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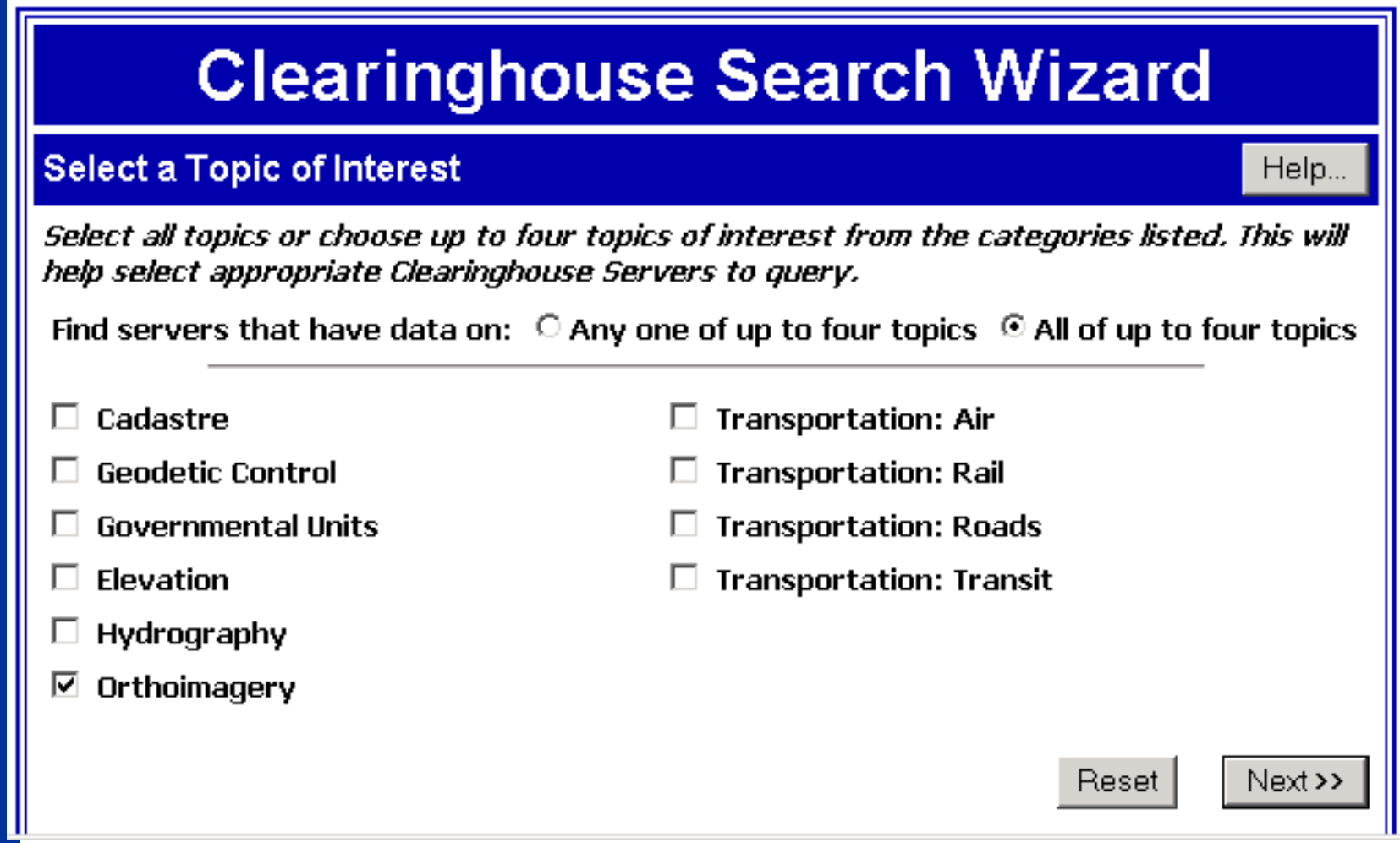
Selecting Framework Theme



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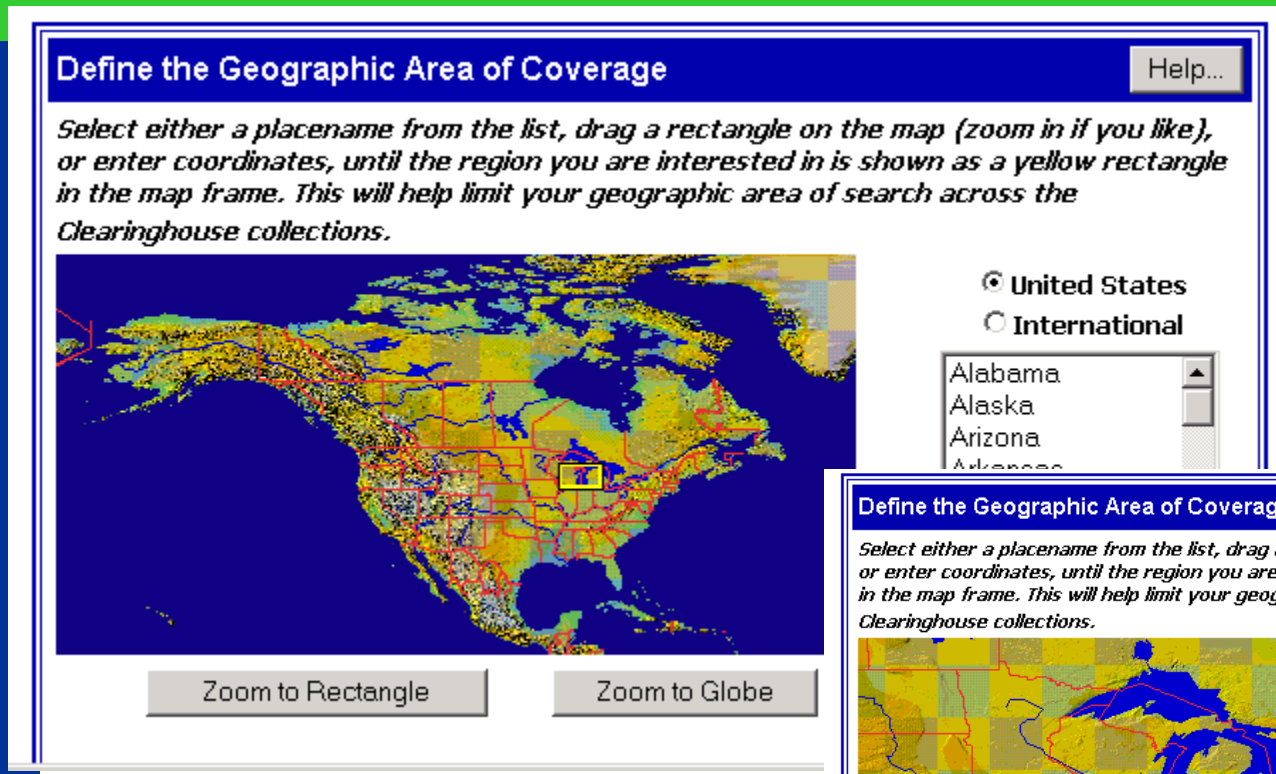
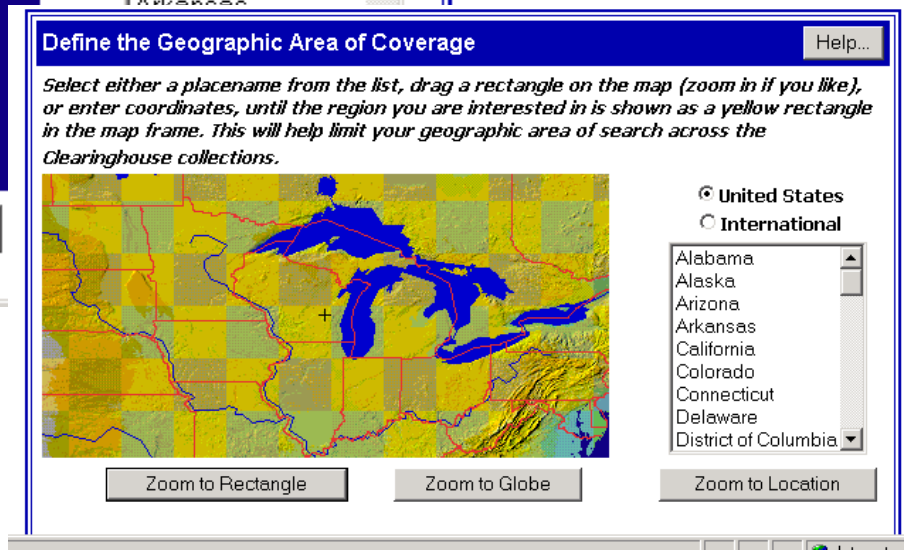
Selecting Geographic Area





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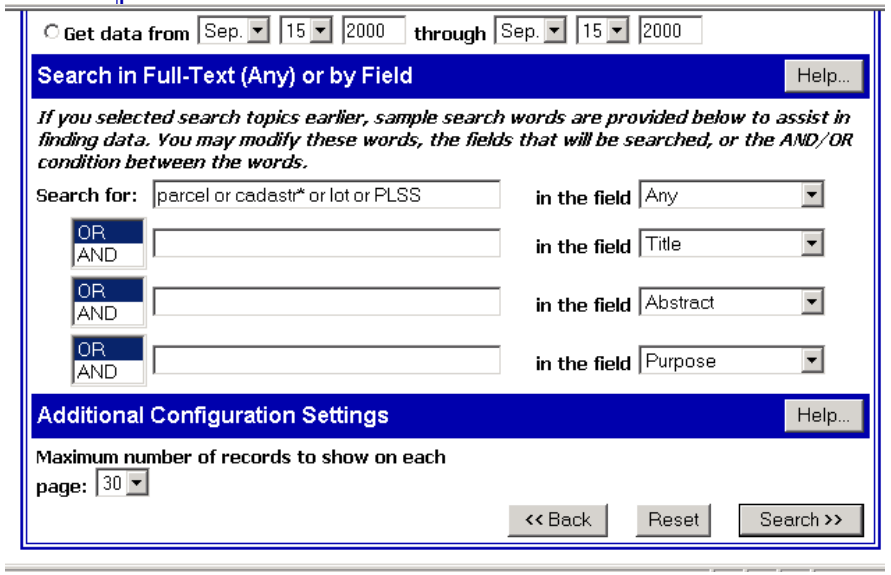
Selecting Clearinghouses

Querying



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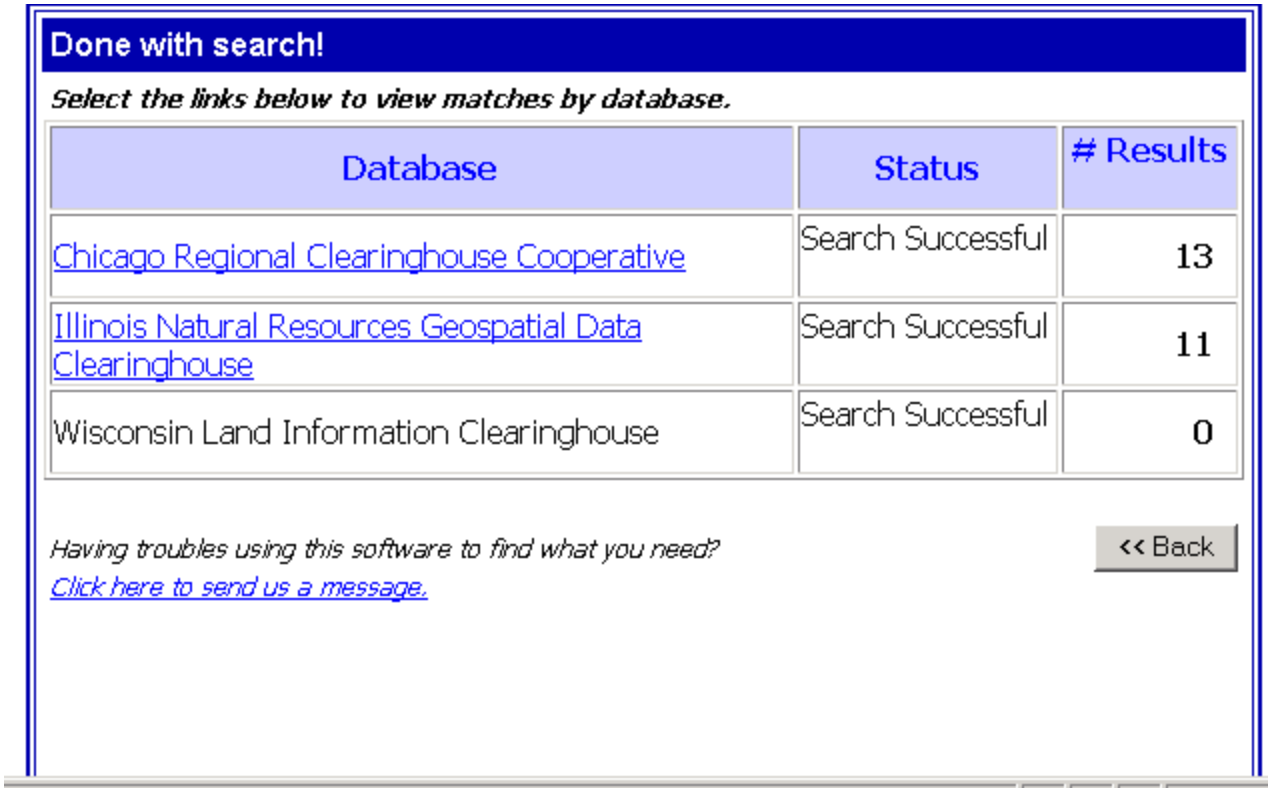
Reviewing Results



Done with search!

Select the links below to view matches by database.

Database	Status	# Results
Chicago Regional Clearinghouse Cooperative	Search Successful	13
Illinois Natural Resources Geospatial Data Clearinghouse	Search Successful	11
Wisconsin Land Information Clearinghouse	Search Successful	0

Having troubles using this software to find what you need?
Click here to send us a message.

<< Back

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Module 3. Document planned Framework data collection in Clearinghouse

- Revitalizing the former annual A-16 call for data requirements, establish a new common system within Clearinghouse to advertise data collection plans and data requirements
- System valid for all levels of government and commercial interests can participate

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Module 3 Approach

- Modify existing FGDC on-line metadata collection tool
- Add budget information fields
- Upload XML or comma delimited files
- Data Access via simplified query page
- Plans visualization through geographic interface

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Investment Elements

- Type of funding
  - Incremental
  - Recurring
  - Other
- Costs
  - Projected
  - Budgeted
  - Other
- Partnered Funds
  - Partnering Agency
- Timing
  - Estimated start
  - Estimated completion

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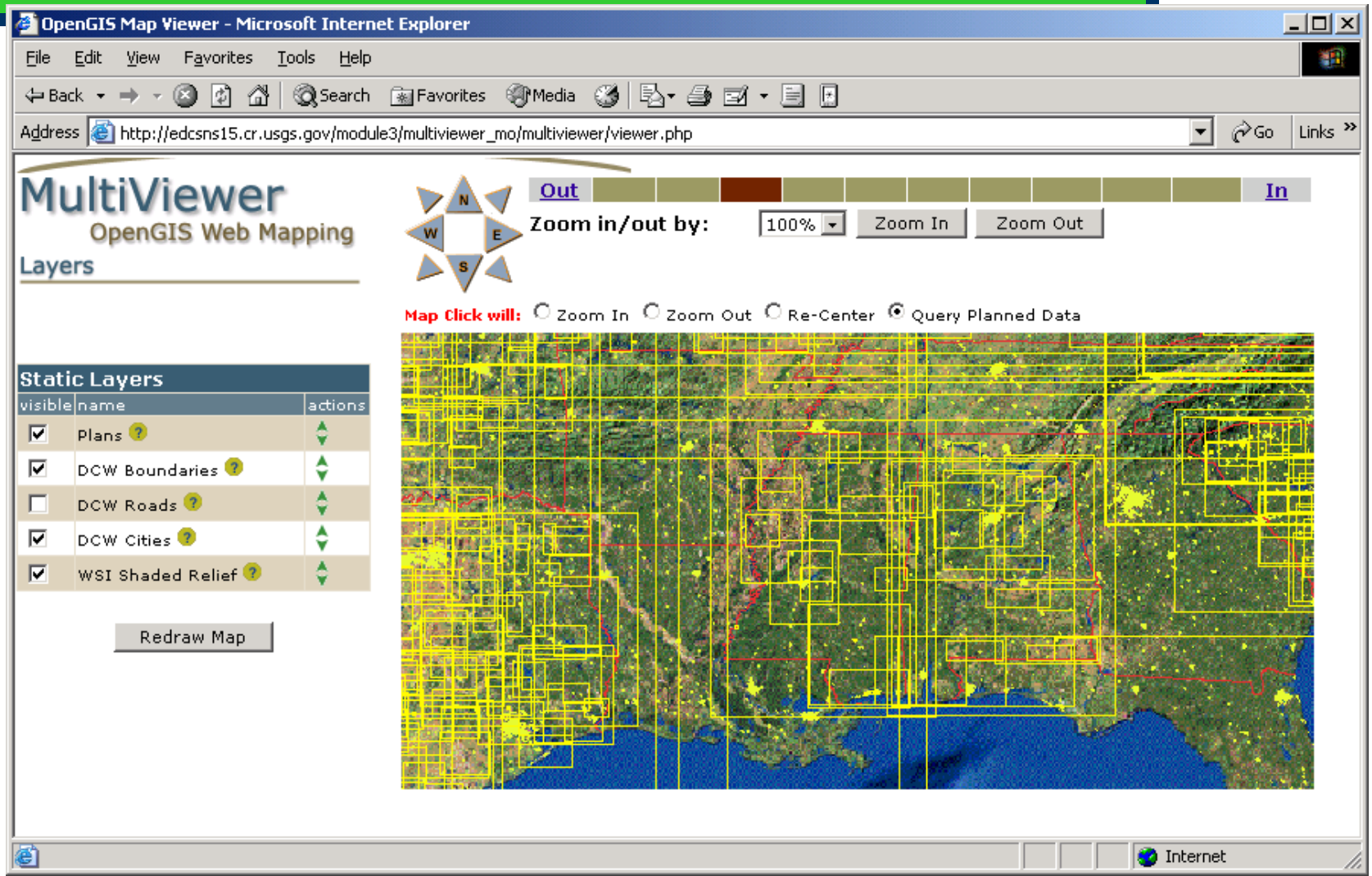
Planned Data Explorer



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4. Implement Framework data services at all participating organizations

- Project will include a Web Service prototyping phase to demonstrate service capabilities and interactions
- Participant organizations will be expected to develop and operate high reliability OGC Web Services for their Framework data prior to Portal construction

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Geospatial One-Stop Transportation Pilot (GOS-TP)

- OpenGIS Consortium (OGC) will assist in modeling process to define proper UML that conforms to ISO rules and can be implemented as GML
- Engage OGC members in implementing Web Feature Services to extend multiple available data systems (U.S. and Canada)
- Demonstrate a Web client application that can display and query multiple Framework data sources based on a common data model
- Approach to be followed for other themes

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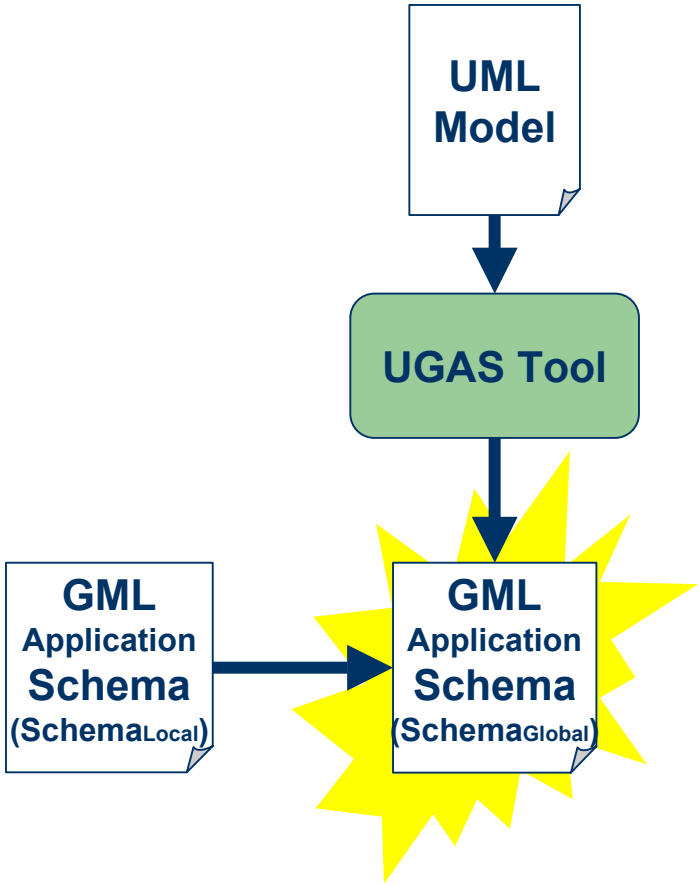
GOS-TP Goal & Objectives

- Implement a vertical slice of GOS, testing the assumptions made in the broader GOS objectives using the Road Transportation theme.
- Primary Objectives:
  - Test assumption that Unified Modeling Language (UML) model can be successfully translated to an encoding schema
  - Test assumption that Federal, State, Local, and/or Tribal data can be translated to a schema different from their local, native schema
  - Pilot a portal-based system implementing metadata, data access (including translation), and web mapping



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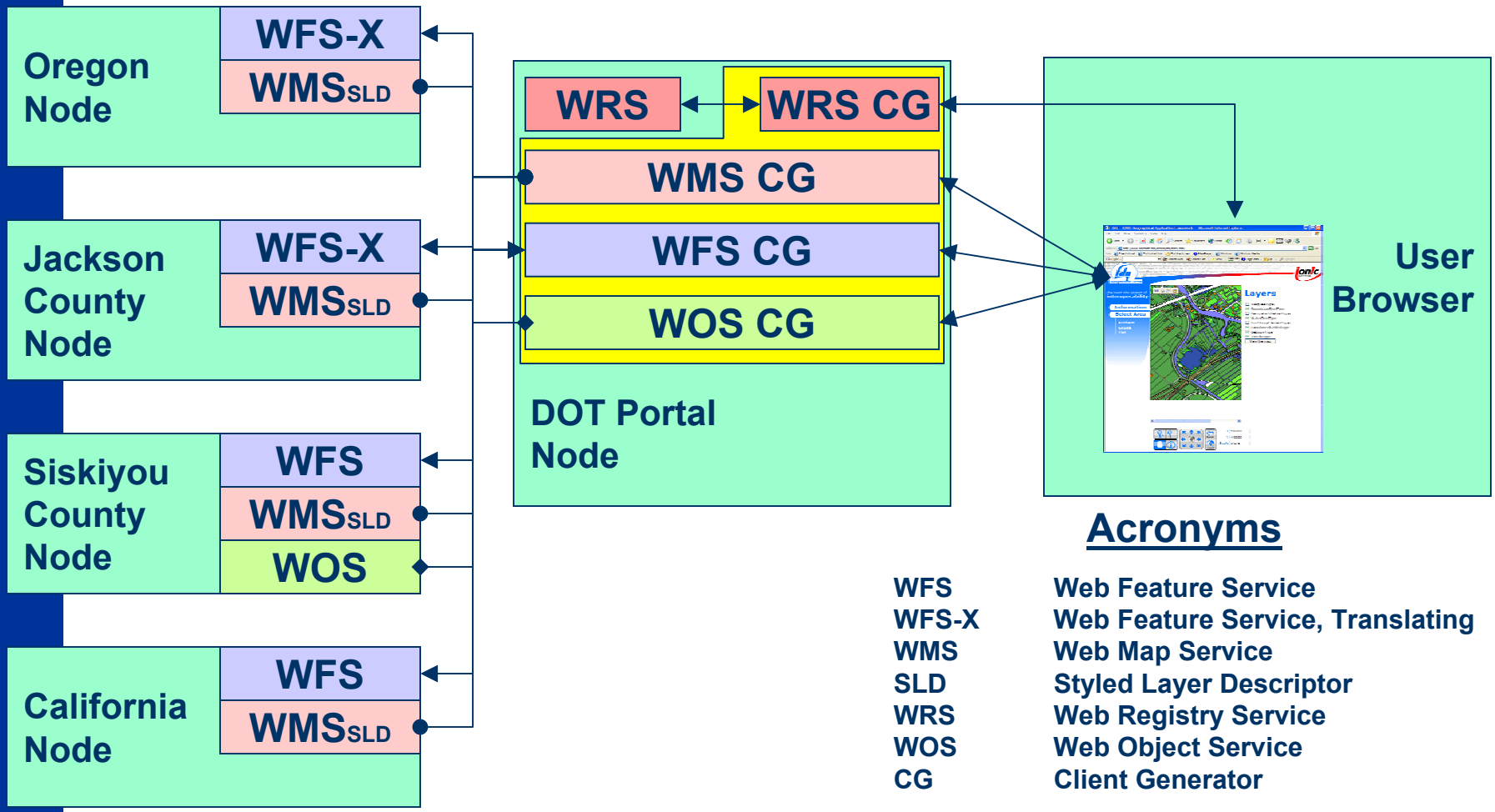
GOS-TP Technical Architecture



Acronyms

WFS	Web Feature Service
WFS-X	Web Feature Service, Translating
WMS	Web Map Service
SLD	Styled Layer Descriptor
WRS	Web Registry Service
WOS	Web Object Service
CG	Client Generator

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GOS Transportation Pilot Status

- The UML-to-GML Application Schema (UGAS) software will be on-line in its initial version early February.
- The node development work is underway and on schedule
- Anticipate IOC in late March FOC in late April.

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Task 5 Objectives

- Provide one point of access to Geospatial OneStop community data
- Support public and G2G transactions on common geospatial data resources
- Support basic user and application user access to online Framework data

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One-Stop Portal Concept

- Portal is an online access point for geospatial data, maps of data, and metadata about data
- Information is stored at data provider sites, not in Portal
- Portal utilizes open standards for interoperability
  - Geospatial web service specifications
  - Metadata and content standards
- Portal builds upon NSDI by providing direct access to data that is specific to task & location
  - Web-based user interface for human access
  - Application interface for GIS/DSS access

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Portal Implementation Plan

- Plan approved by GOS Board of Directors Oct 9
- Form Portal Team
- Define requirements for version 1 of Portal
- Launch OGC Interoperability Initiative to develop Portal
  - Multi-vendor solution
  - Integrate COTS components into standards-based framework
  - GOS agencies provide cost-sharing resources
- Demonstrate "alpha version" to GOS
- Install "beta version" at government facility

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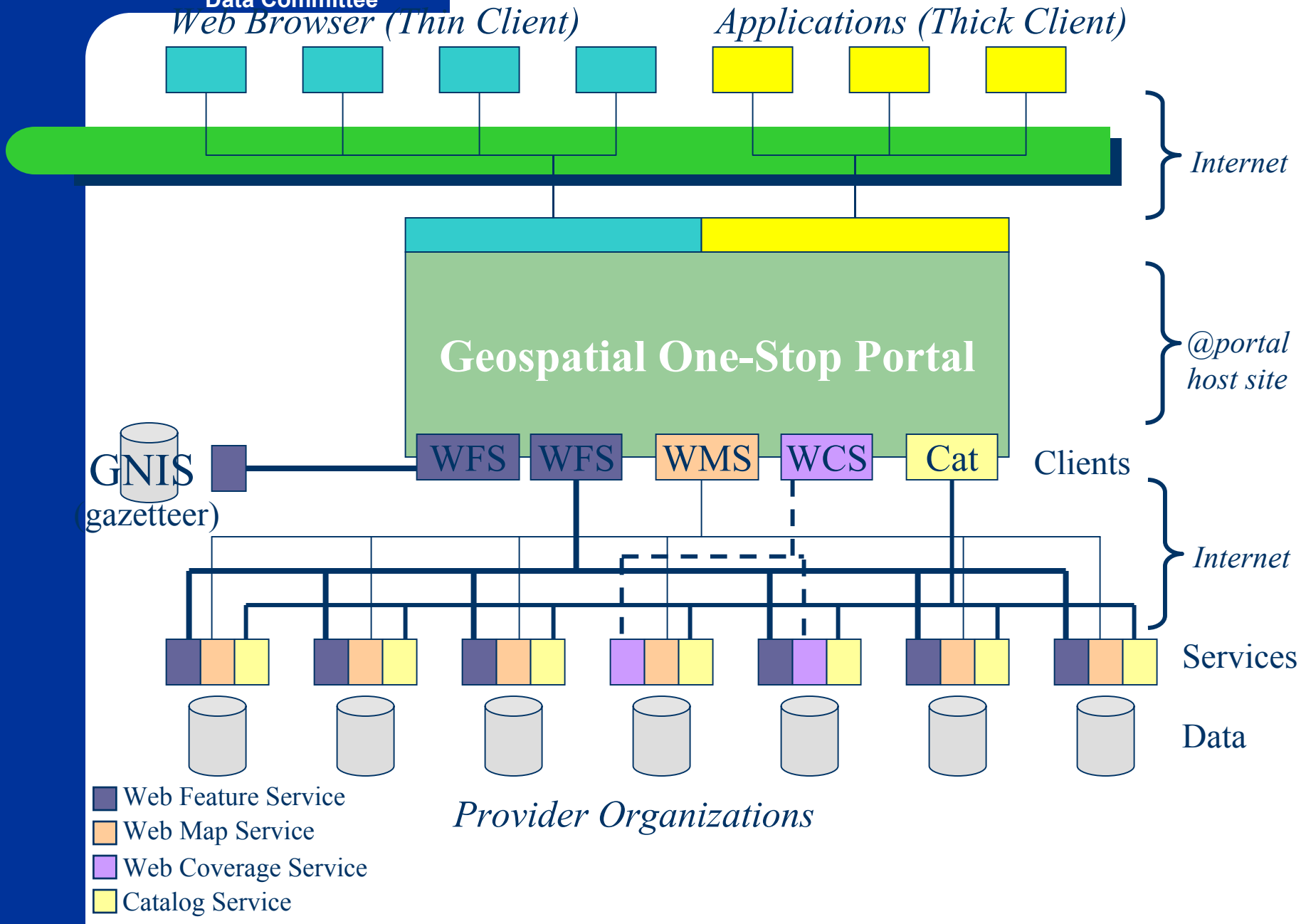
Portal Connectivity



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Portal Milestones

- Portal Management Team convened: 2002 Oct 11
- Call for Additional Requirements sent out: Nov 5
- CFAR responses due: Nov 22
- GOS-PI RFQ released by OGC: Dec 18
- RFQ responses received: 2003 Jan 22
- Participants selected: Jan 30
- Kickoff during OGC meeting: Feb 3-7
- Working alpha version demonstrated: May 9
- **Working beta version on Agency server: June 6**

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3 Classes of Information
(as seen by GOS Portal)

- Primary: Created for, or of direct interest to, GOS.
  Applicable standards:
  - Framework *(usually)*
  - Metadata
  - Web Services (WMS, WFS, WCS)
- Secondary: Accessible through the GOS Portal.
  Applicable standards:
  - Metadata
  - Web Services (WMS)
- Tertiary: Discoverable through the GOS Portal.
  Applicable standards:
  - Metadata

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Web Service Standards

- OGC Web Services
  - Web Map Service (WMS) - pictures of geospatial data
  - Web Feature Service (WFS) - vector data
  - Web Coverage Service (WCS) - gridded/continuous data
- Cost factors:
  - **OGC-compliant server software**
  - Server hardware & networking
  - Operational reliability & performance
  - **Integration of state/local/tribal data**

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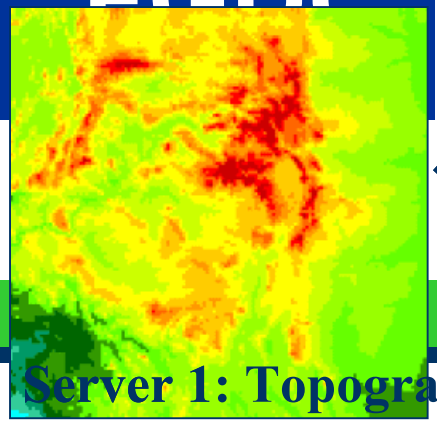
Web Map Service (WMS)

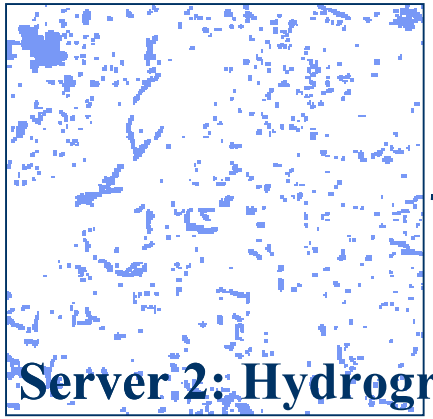
- Mature, well-established specification
  - Version 1.0 issued 2000-04
  - Version 1.1.1 issued 2001-12
  - ISO CD 19128 corresponds to v1.1.1
  - Server & client support in many vendor products & freeware
- Scope: geographic data rendered as images ("maps"), not actual data values
- Operations:
  - GetCapabilities - send XML description of server holdings
  - GetMap - produce map of desired area
  - GetFeatureInfo (opt.) - describe feature at point

Interoperable Web Mapping

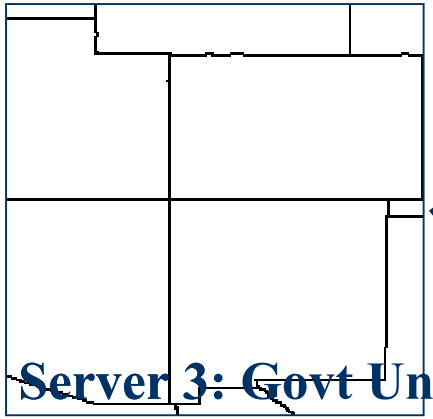


Server 1: Topography

GetMap

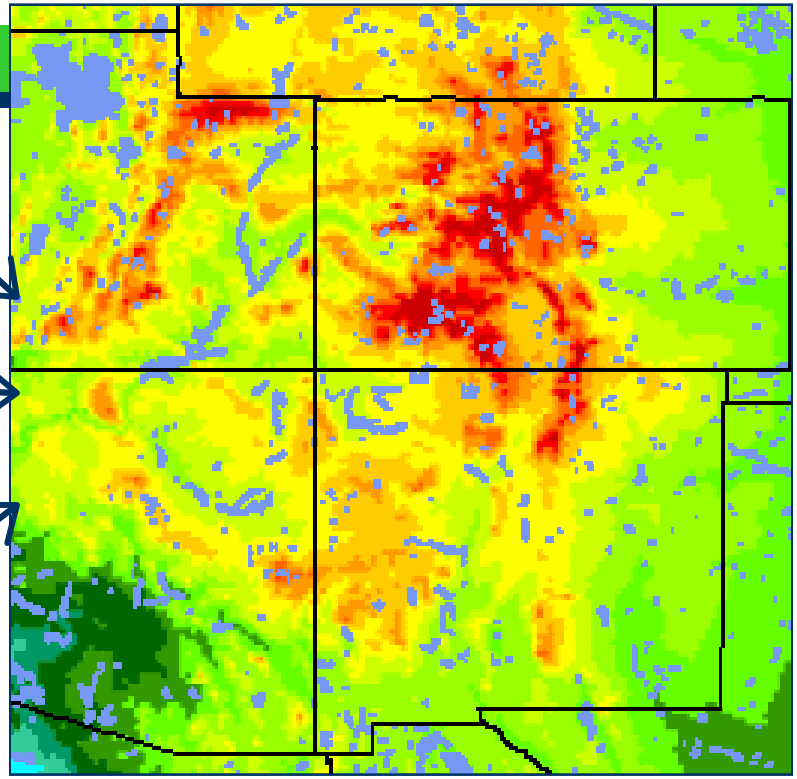


Server 2: Hydrography



Server 3: Govt Unit Boundaries

Viewer Client: Combined Map



Catalog Service

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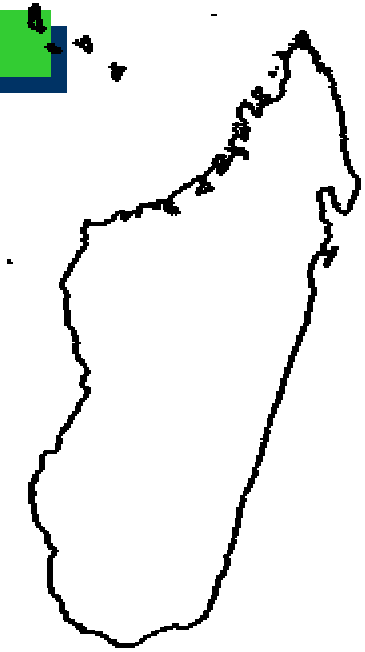
Web Feature Service (WFS)



- WFS 1.0 approved 2002-09
- Scope: storage & retrieval of geographic vector feature data (point/line/polygon)
  - Hydrography, Transportation, Government Units, Cadastral, Geodetic Control
- XML data encoding format: Geography Markup Language (GML)
- Filter Specification: Restrict WFS output based on user criteria
- Operations:
  - GetCapabilities
  - DescribeFeatureType
  - GetFeature
  - Transaction *(optional)*
  - LockFeature *(optional)*

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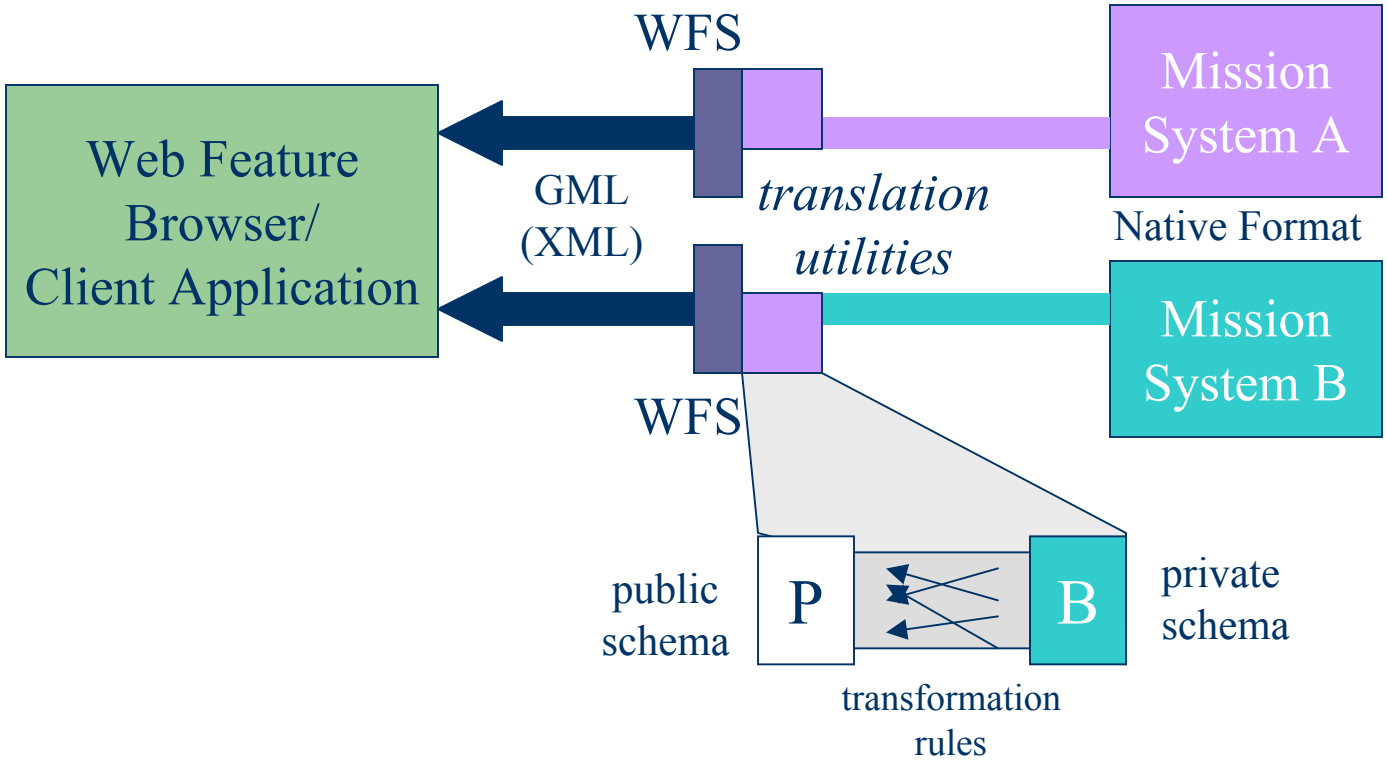
OGC Web Feature Service



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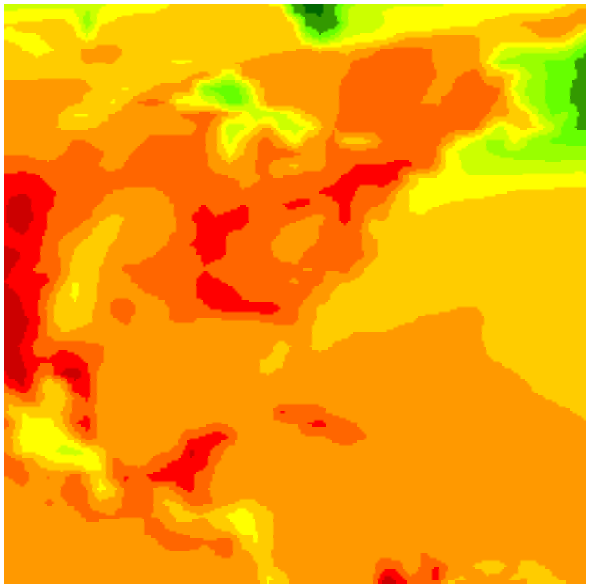
Web Coverage Service (WCS)

- Draft v0.7 released 2002-04; vote for adoption 2003-02
- Scope: Retrieval of gridded, swath, TIN or other "coverage" data in binary or other formats (HDF, GeoTIFF, NITF, NetCDF, etc.)
  - Elevation, Orthoimagery
- Operations:
  - GetCapabilities
  - GetCoverage



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Proposed Strategy/Sequencing

Publish FGDC metadata for existing theme data	Feb 2003 (OMB deadline)
Prototype WMS/WFS with draft (pre-standard) Framework data corresponding to assigned theme(s)	March 2003
Prototype Web Feature/Coverage Service with draft (pre-standard) Framework data	Sept 2003
Framework standard approved	Oct 2003
Operational WMS with Framework Data	Dec 2003
Operational WFS/WCS with Framework Data	June 2004

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