Geosciences Information Network (GIN)

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AASG
Association of American State Geologists

Interoperability: the electrical utility

- Simple interface– put plug in wall, get electricity

Afghanistan 220 V 50 Hz
Andorra 230 V 50 Hz
Anguilla 110 V 60 Hz
Antigua 230 V* 60 Hz
Cayman Islands 120 V 60 Hz
Cyprus 240 V 50 Hz
Czech Republic 230 V 50 Hz
.....

ORGANIZATION: Unique missions of geological surveys - collect, archive, disseminate data

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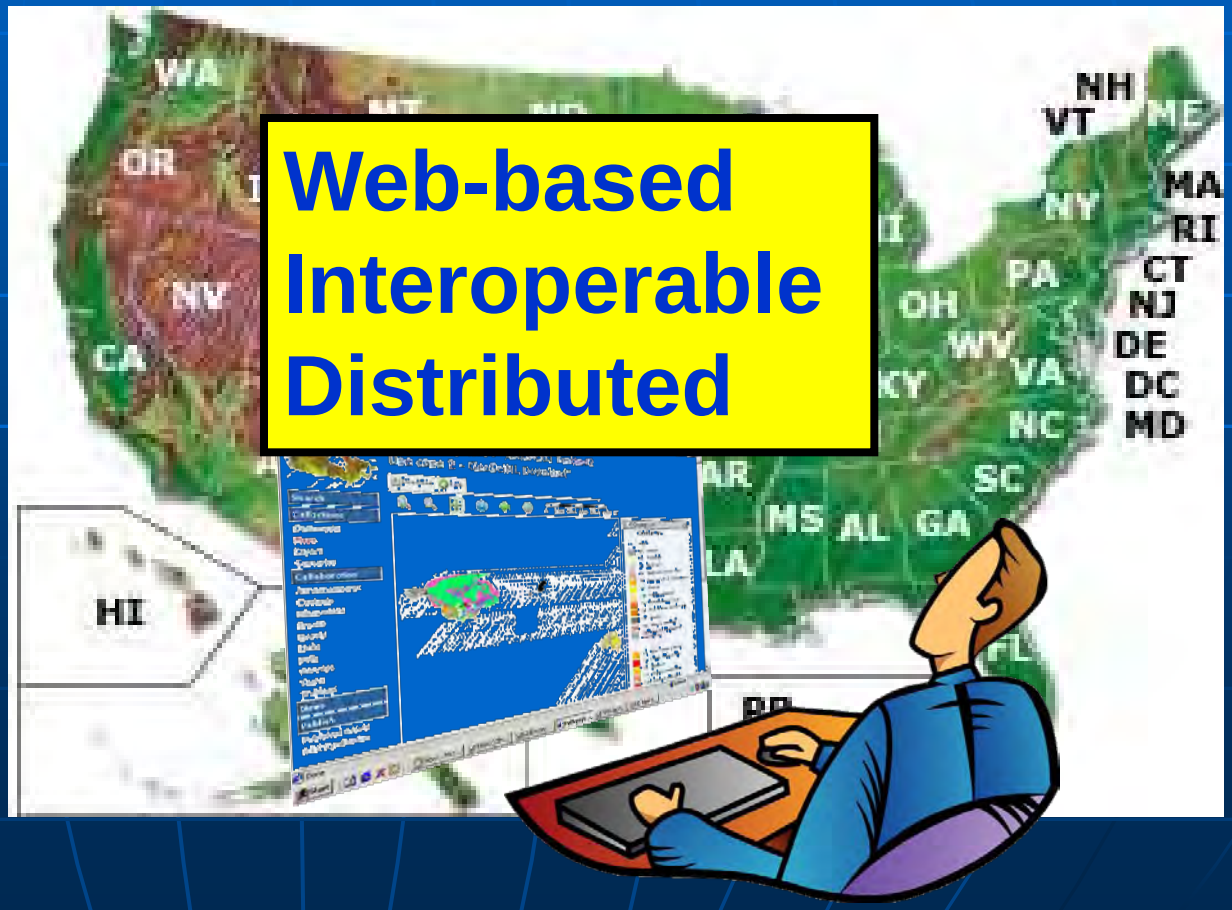
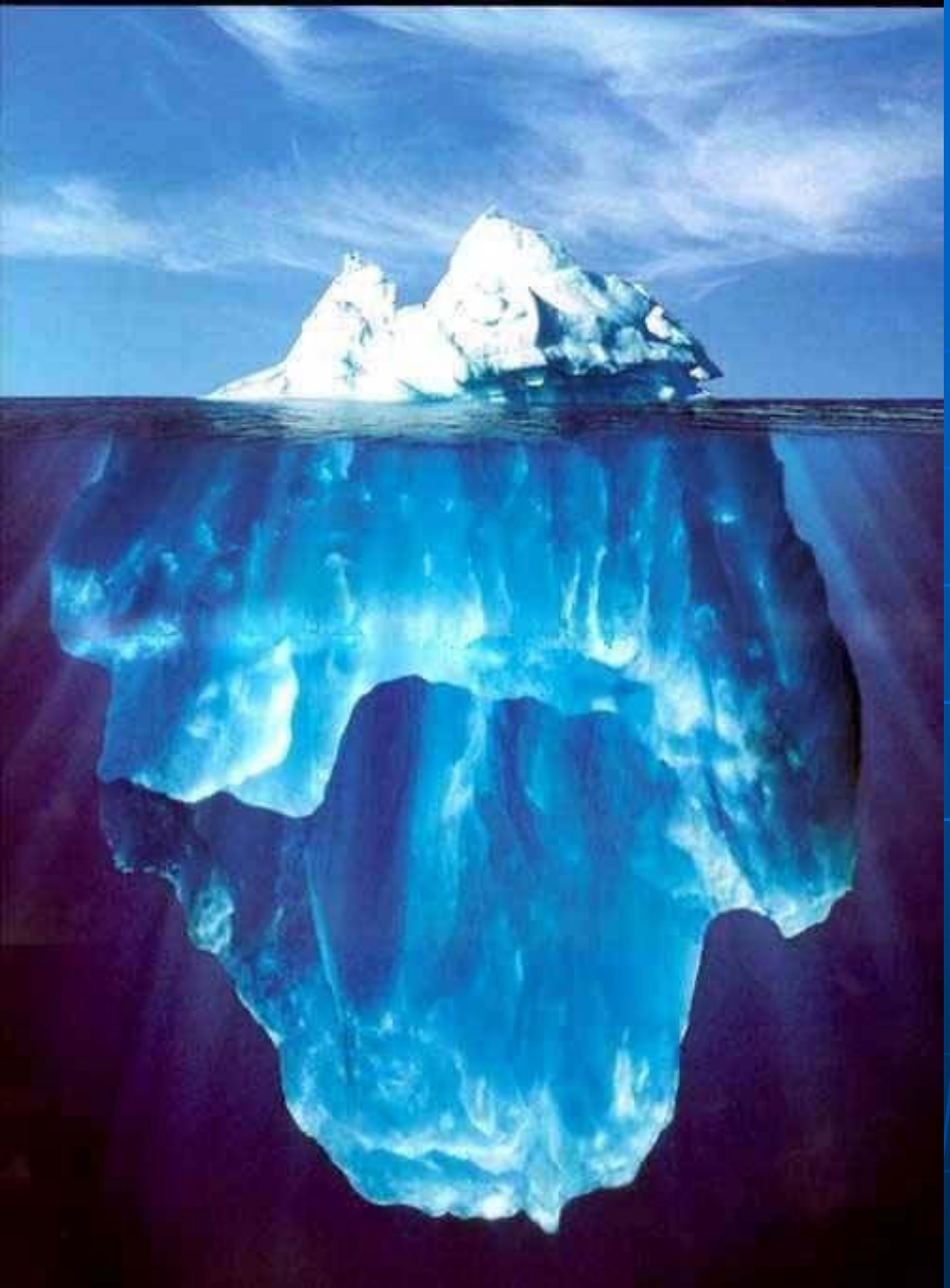


2,000 – 3,000 databases
1000's of collections

80,000+ geologic maps



Most of the technology exists

Challenges are cultural and organizational

Challenges to building community

Who sets the standards?
Who controls the system?
Who makes the decisions?

We agree on a data network that:

- is distributed (vs centralized)
- is interoperable
- uses open source standards and common protocols (OGC, GeoSciML)
- respects and acknowledges data ownership
- fosters communities of practice to grow
- facilitates development of new web services and clients

The network is voluntary, not imposed from above

MODULAR APPROACH

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Implementation Plan for the National Geological and Geophysical Data Preservation Program

by the Data Preservation Working Group of the National Cooperative Geologic Mapping Program Federal Advisory Committee

October 10, 2006

USGS Geologic Names Database - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://ngmdb.usgs.gov/Geolex/geolex.html

USGS

National Geologic Map Database

GEOLEX

- Search for lithologic and geochronologic units -

Search Criteria

HELP is available for using this database! There is a Quick Search version of this form.

1. Select any number Geologic Age(s) (Help) (definitions are available to help you):

ERA	PERIOD		EPOCH
CENOZOIC	Quaternary		Holocene
			Pleistocene
	Tertiary	late (Neogene)	Pliocene
			Miocene
		early (Paleogene)	Oligocene
			Eocene
			Paleocene
MESOZOIC	Cretaceous		Late
			Early
	Jurassic		Late
			Middle
			Early
	Triassic		Late
			Middle
			Early
	Permian		Late
			Early
			Late

Search | Clear Form Completely

2. Type of Unit (Help)
○ Lithologic ○ Geochronologic ◉ Both

3. Unit Name (type "Dakota Sandstone", "Dakota", "Dak", etc.) (Help)

4. Citation Title (Help)

5. Citation Author (e.g. Smith, J) (Help)

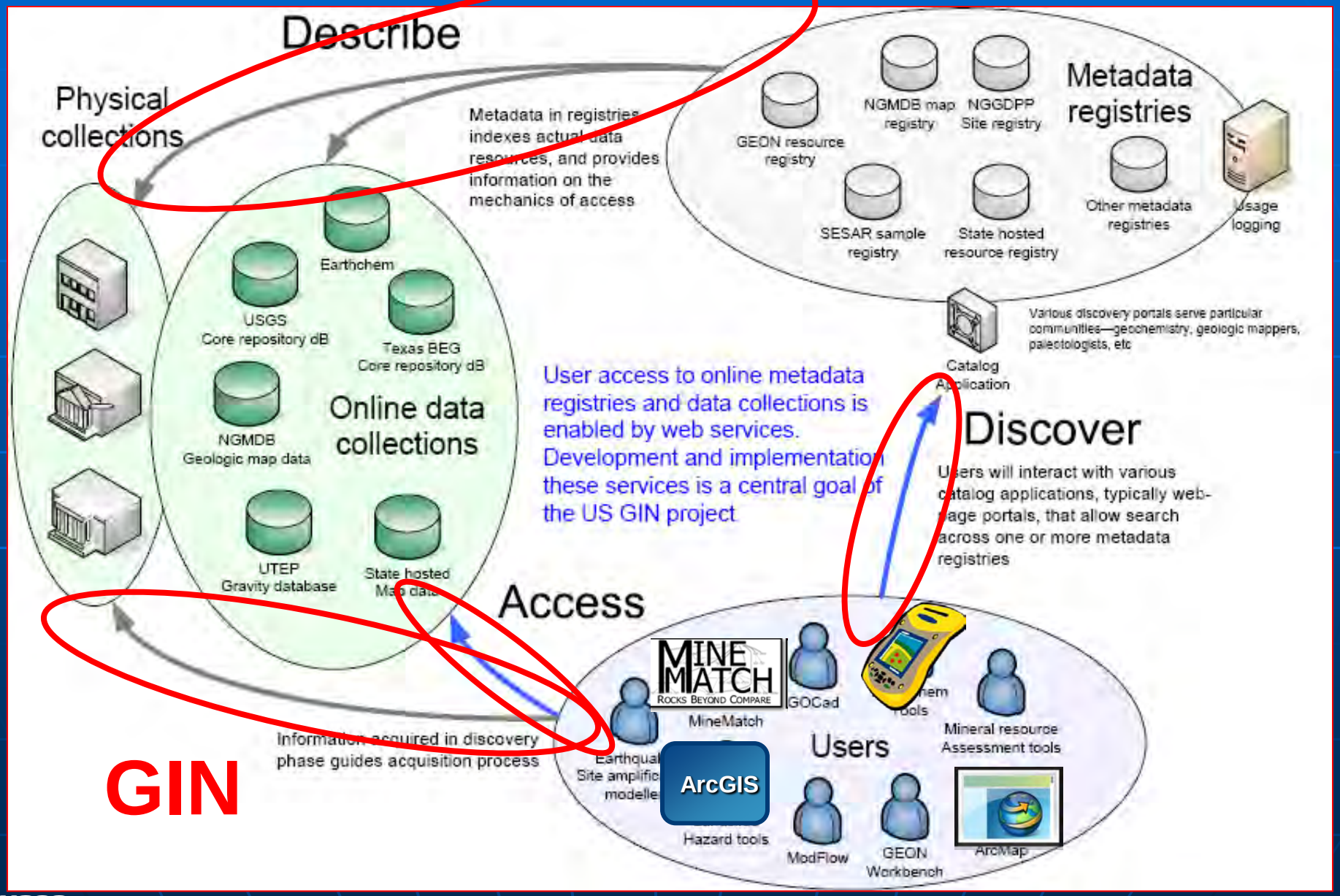
6. State, Territory or Country (Help)
- Select states from the map or list.
- The selected states will be highlighted in the list.

Canadian Lexicons

Done

start Quick Launch ZoneAlarm

System overview



Will 3,000 interoperable data bases become an 800-lb gorilla?

PARTNERS & COLLABORATORS:

ONE Geology

PETROWEB

ESRI

NSF

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AASG
Association of American State Geologists

MetaCarta

IUGS
International Union of Geological Sciences

CGI
Commission for the Management and Application of Geoscience Information

<GeoSciML/>

GEON

Microsoft

U.S. DEPARTMENT OF ENERGY

earthchem
Advanced Data Management In Solid Earth Geochemistry

GIN DEMO PROGRAM

NSF INTEROP GIN

- 3 year development of standards, services
- Demos in ~6 SGSs; ~$80K subcontracts

“Circuit Riders”

- Part trainer, part management consultant, part computer expert
- Write GeoSciML “wrappers”
- Guide server configurations
- Training, short courses
- $80K for demos across AASG

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AASG

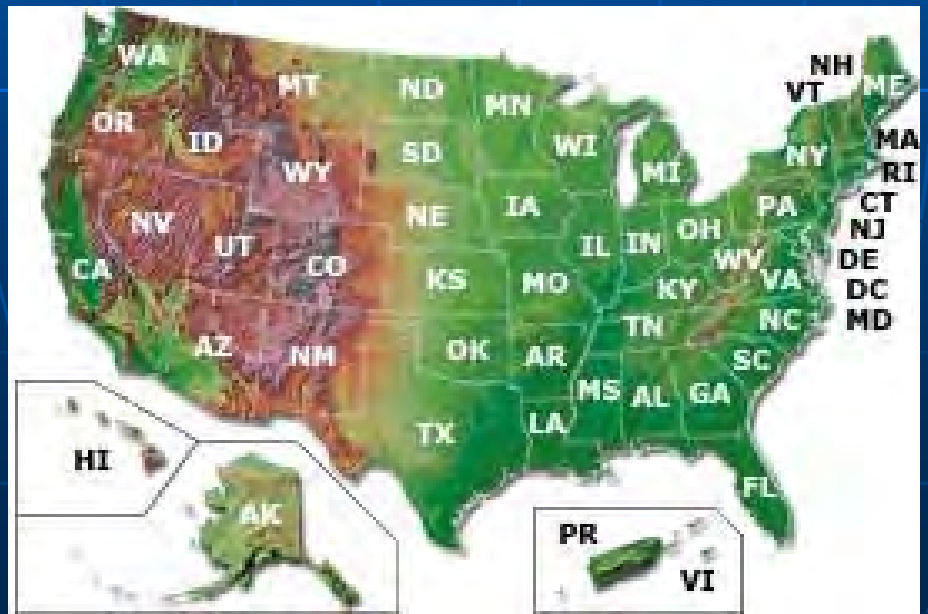
ADOPTION & DEPLOYMENT

- US Dept. of Energy (May, 2009)
  - National Geothermal Data System (NGDS)
  - Based on GIN
  - usd$5M, 5 years
  - Adopted by US Geothermal Technologies Program

U.S. DEPARTMENT OF ENERGY

NATIONAL DEPLOYMENT

- US DOE “Geothermal Data Development, Collection, and Maintenance”
- $20M, 1-5 awards
- AASG proposal in preparation



MS SciScope – geospatial data discovery

Welcome to SciScope!
SciScope is a tool by **Microsoft Research** to help geoscientists discover data from numerous data repositories with ease through a single, intuitive interface. Users can display multiple map layers related to the **scope** of their study and interact with geographical features on the map including dams, rivers, water bodies, geology, aquifer systems, ecological regions and river basins.

‘TIPPING POINT’

- Energy Industry Metadata Standards Working Group
  - End-to-end discovery, access, and exchange of upstream petroleum data

energistics
The Energy Standards Resource Centre

energistics
The Energy Standards Resource Centre

- 97 members
  - American Geological Institute (AGI)
  - Baker Hughes
  - BP
  - British Geological Survey (BGS)
  - Chevron
  - ConocoPhillips
  - Department of Interior (U.S. DOI-BLM-MMS)
  - Directorate General of Hydrocarbons (India) (DGH)
  - ExxonMobil
  - Ground Water Protection Council
  - Halliburton
  - IBM Corporation
  - IFP - Institut Francais du Petrole
  - Norwegian Petroleum Directorate (NPD)
  - Open Geospatial Consortium (OGC)
  - Pioneer Natural Resources
  - SAIC-Science Applications Intl. Corp.
  - Saudi Aramco
  - Schlumberger
  - Shell
  - Smith International
  - StatoilHydro ASA
  - TOTAL
  - Woodside Energy Inc.

Geosciences Information Network – (GIN)

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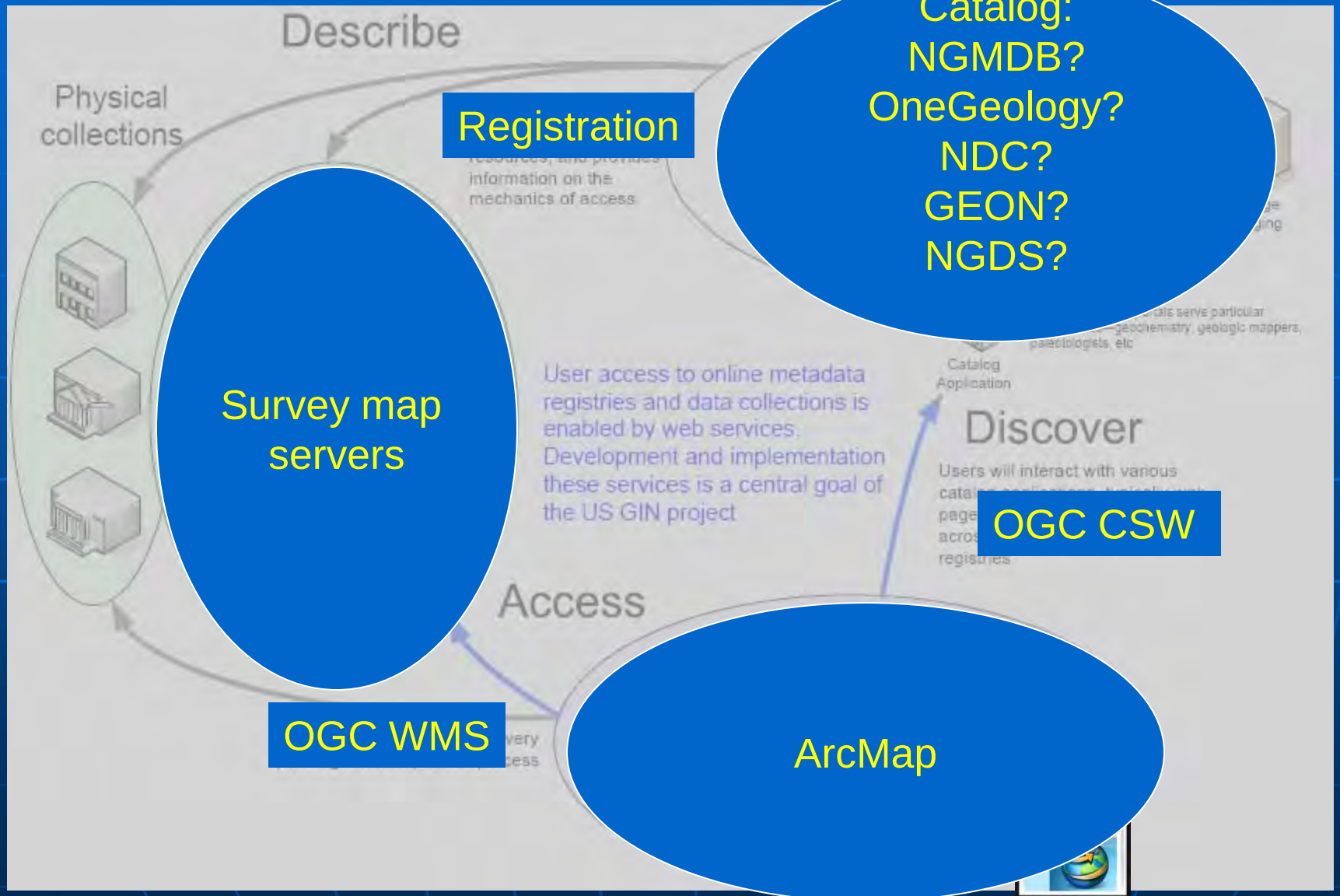
Geologic map service scenario



Defining GIN

- collections of service definitions, interchange formats, and vocabularies
- independent of hardware, operating system, or lower-level network protocols
- new technology will only require implementation of network elements in a new environment
- architecture allows for the use of multiple conventions for different user groups

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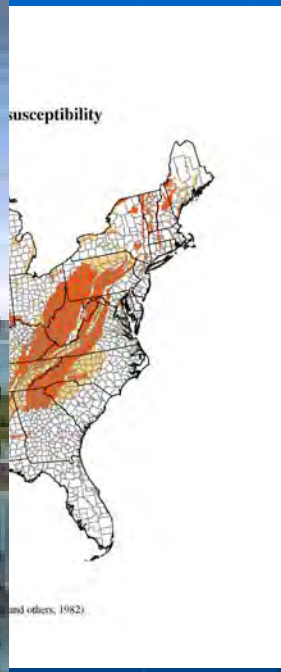
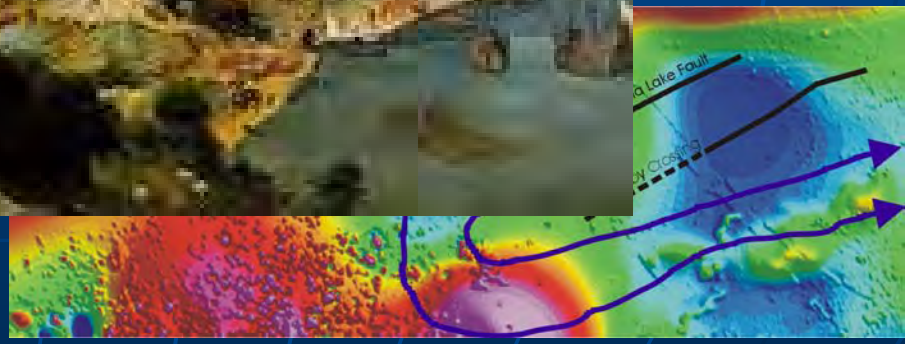
1000's of National and Regional Databases

- topograp
  orthoima
  hydrogra
- mineral r
- water
- geochem
- geophysi
  gravity, a
- earthqua
- biological
- vegetation/speciation maps





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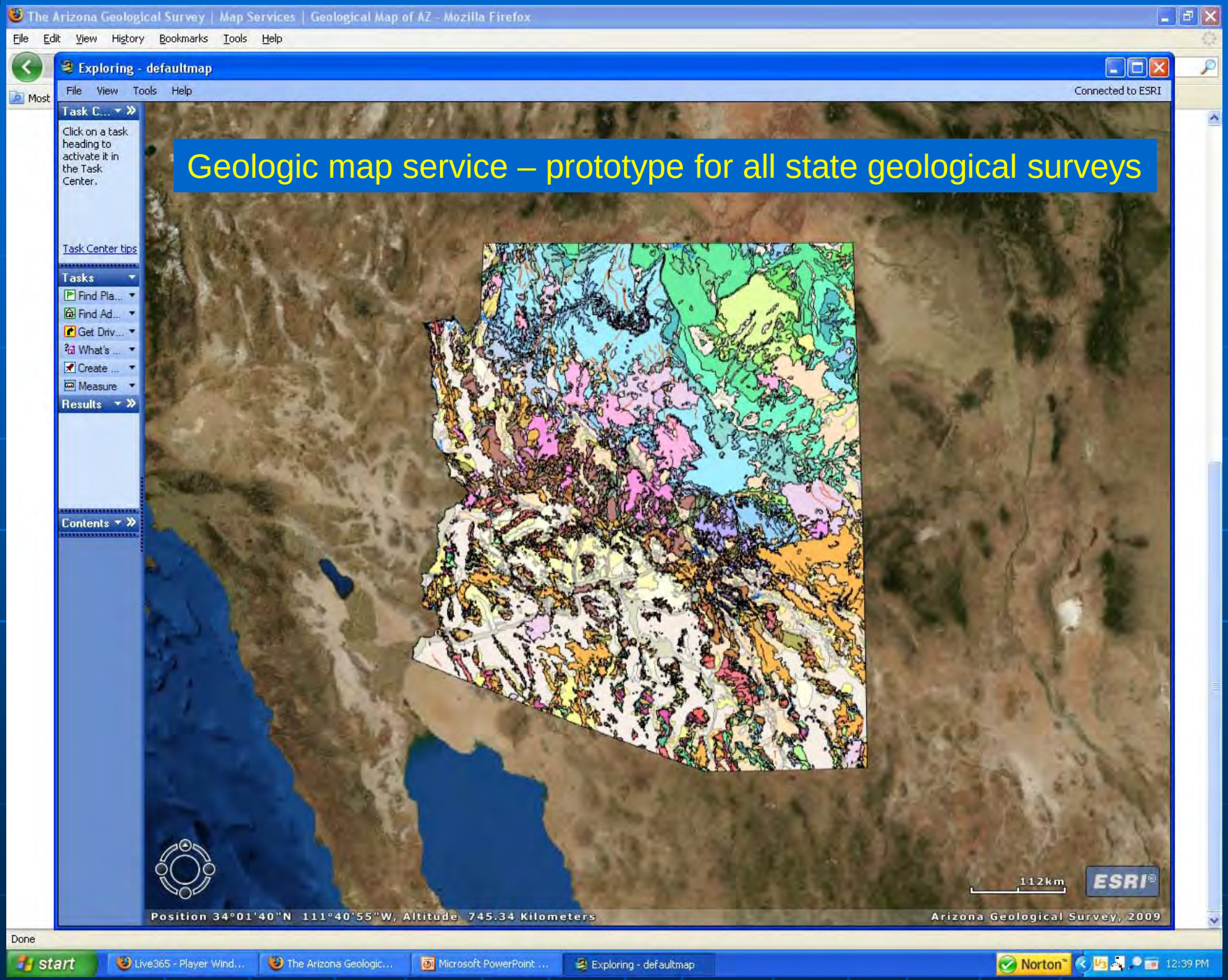
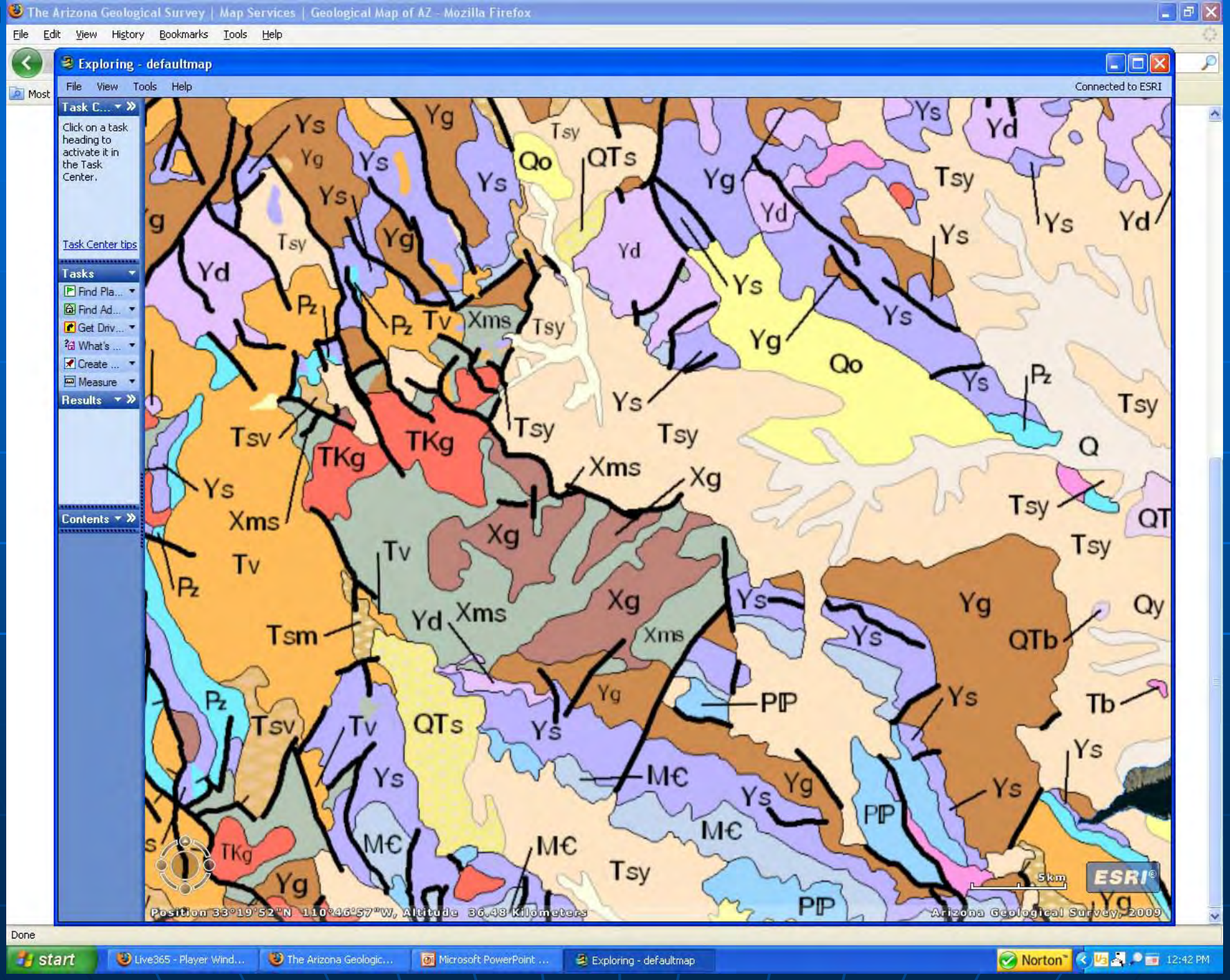

The Arizona Geological Survey | Map Services | Geological Map of AZ - Mozilla Firefox
File Edit View History Bookmarks Tools Help
Exploring - defaultmap
File View Tools Help
Connected to ESRI
Task C...
Click on a task heading to activate it in the Task Center.
Task Center tips
Tasks
Find Pla...
Find Ad...
Get Driv...
What's ...
Create ...
Measure
Results
Contents
Geologic map service – prototype for all state geological surveys
112km
ESRI
Position 34°01'40"N 111°40'55"W, Altitude 745.34 Kilometers
Arizona Geological Survey, 2009
Done
start
Live365 - Player Wind...
The Arizona Geologic...
Microsoft PowerPoint ...
Exploring - defaultmap
Norton
12:39 PM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Task C...
Click on a task heading to activate it in the Task Center.
Task Center tips
Tasks
Find Pla...
Find Ad...
Get Driv...
What's ...
Create ...
Measure
Results
Contents
Ys
Yg
Yd
Tsy
Qo
QTs
Pz
Tv
Xms
TKg
Tsv
Xg
Tsm
QTs
M€
PIP
Q
QT
Qy
QTb
Tb
5km
ESRI
Position 33°19'52"N 110°46'57"W, Altitude 36.48 Kilometers
Arizona Geological Survey, 2009
Done
start
Live365 - Player Wind...
The Arizona Geologic...
Microsoft PowerPoint ...
Exploring - defaultmap
Norton
12:42 PM

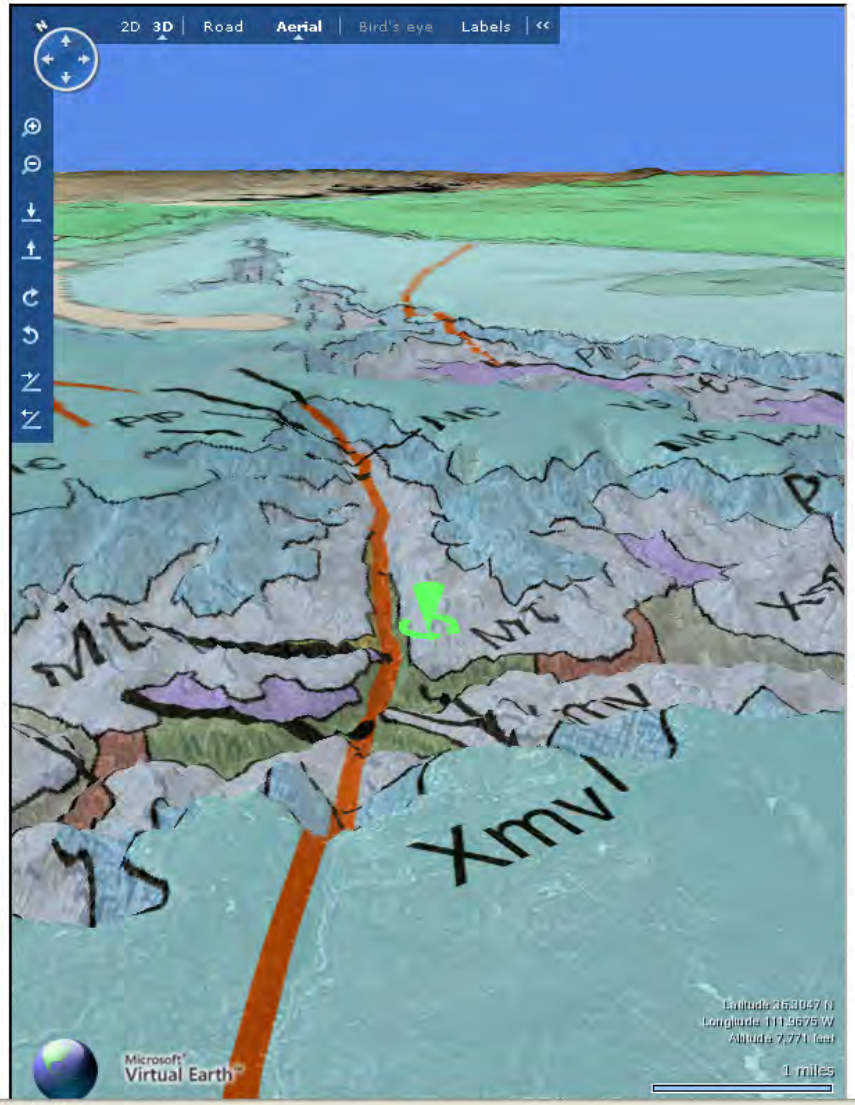
The Arizona Geological Survey | Geologic Map of Arizona (1:1,000,000 scale) | - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://www.azgs.az.gov/services_azgeomapve.shtml

Most Visited

Geologic Map of Arizona (1:1,000,000 scale). From: Richard, S.M., Reynolds, S.J., Spencer, J.E., and Pearthree, P.A., comps., 2000, Geologic Map of Arizona: Arizona Geological Survey Map M-35, 1 sheet, scale 1:1,000,000. (**please allow a few moments for the map to load**)



Map Unit Legend

Q	Quaternary Surficial deposits, undivided (0-2 Ma)
QTb	Holocene to middle Pliocene Basaltic rocks (0-4 Ma)
QTv	Holocene to middle Pliocene Volcanic rocks (0-4 Ma)
Qr	Holocene river alluvium (0-10 ka)
Qy	Holocene Surficial Deposits (0-10 ka)
Qm	Late and Middle Pleistocene Surficial Deposits (10-750 ka)
Qo	Early Pleistocene to latest Pliocene surficial deposits (0.75-3 Ma)
QTs	Early Pleistocene to late Miocene basin deposits (0.75-10 Ma)
Tvy	Pliocene to middle Miocene Volcanic rocks (2-12 Ma)
Tsy	Pliocene to middle Miocene deposits (2-16 Ma)
Tby	Pliocene to late miocene Basaltic Rocks (4-8 Ma)
Tb	Late to middle Miocene Basaltic Rocks (8-16 Ma)
Tsv	Middle Miocene to Oligocene Volcanic and Sedimentary rocks, undivided (11-32 Ma)
Tsm	Middle Miocene to Oligocene

Contacts

Contacts between Late Tertiary and Quaternary sedimentary units are shown with grey lines while contacts between other units are shown in black.

Faults

Quaternary faults

Fault, high-angle or dip unknown

Low-angle fault; tics on hanging-wall side

Detachment fault; double tics on hanging-wall side

Transferring data from dev.virtualearth.net...

start | Live365 - Player Wind... | The Arizona Geologic... | Microsoft PowerPoint ... | Norton | 3:20 PM

GIN is partnering with the global Earth science community

AASG & USGS
National Geoinformatics System
OneGeology-Europe – 21 nations
Marine Metadata Interoperability Initiative
US DOE National Geothermal Data System (NGDS)
US DOE Geothermal Technologies Program
Energy Industry Metadata Standards Working Group - Energistics

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WWW

- http – hypertext transfer protocol (& ftp, etc)
- html – hypertext mark-up language
- url – universal resource locator
- browser – *built by others*

GIN

- Open source standards – Open Geospatial Consortium
- data interchange tool – GeoSciML
- distributed data catalogues (National Geologic Map DB; National Data Catalogue, etc)
- Web services & applications – *built by others*

Geologic map services

Arizona's statewide geologic map

- viewed using a web browser
- viewed and queried using either Google Earth, MS Virtual Earth, or ESRI's ArcGIS Explorer
- data published as KML, ArcGIS, WMS and WFS web services for use in other client applications
- Google Earth access via KML service
- ArcGIS users connect to ArcGIS service or Open Geospatial Consortium (OGC) Web Map Service (WMS) or Web Feature Service (WFS)
- WMS and WFS services accessed by any client that implements the OGC interfaces for these services (e.g. Quantum GIS, Manifold…)
- Many WFS clients can save data as shapefile or other GIS-compatible formats

TECHNOLOGY : GeoSciML developed with NCGMP-NGMDB support

IUGS
International Union of Geological Sciences

CGI
Commission for the Management and Application of Geoscience Information

<GeoSciML/>

GIN – a history

- 2000 – present: NGMDB supports US participation in IUGS-CGI GeoSciML development

- 2007:
  - USGS-AASG Workshop (NSF $)
  - GIN Steering Committee approved by AASG, USGS
  - National Geoinformatics System will adopt GIN
  - NSF INTEROP proposal submitted

- 2008:
  - 3-yr NSF funding
  - USGS building National Digital Catalog
  - Marine Metadata Interoperability (MMI) partnership
  - OneGeology-Europe collaboration

GIN – a history

- 2009:
  - DOE National Geothermal Data System (NGDS) – *GIN powered (*$5M*)*
  - DOE Geothermal Technologies Program – *GIN powered*

In progress –

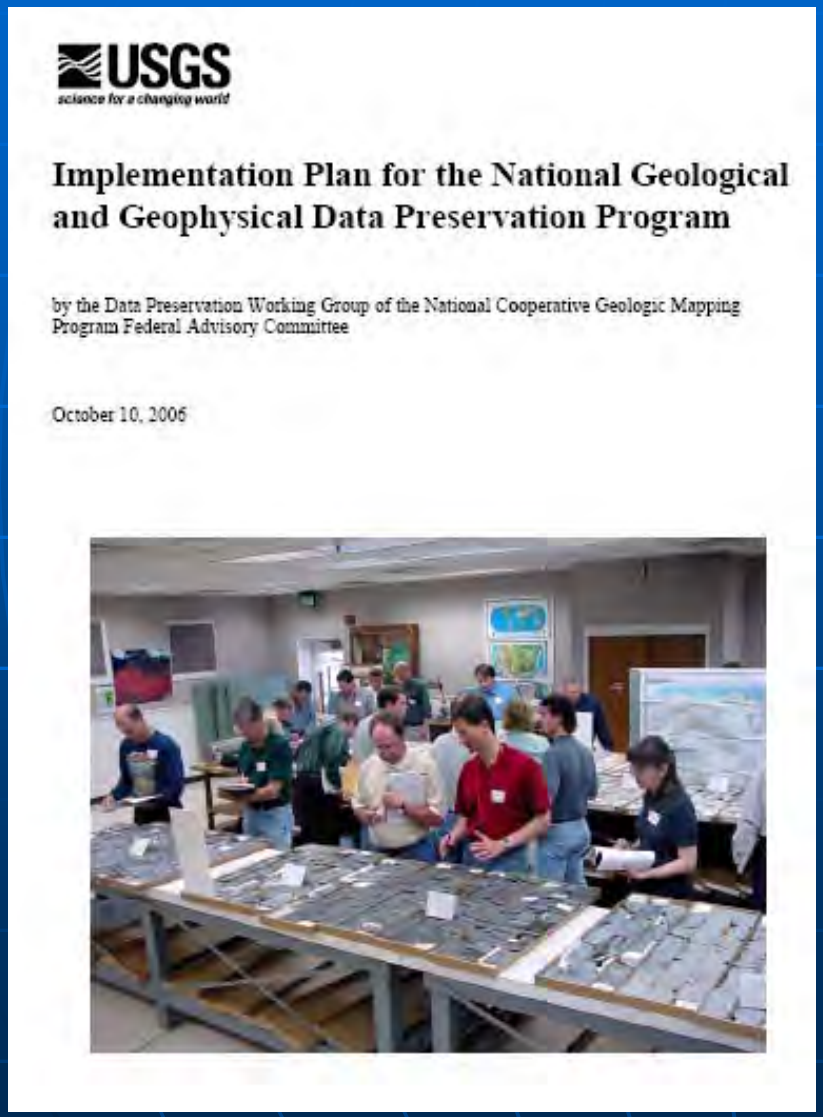
DOE Geothermal Data Collection, Assessment, & Maintenance ($20M)

Energy Industry Metadata Standards Working Group (with Energistics) – *GIN powered?*

Microsoft® Research
WorldWide Telescope

New project: archive historical aerial photography into the Earth component of WorldWide Telescope

MODULAR APPROACH



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Implementation Plan for the National Geological and Geophysical Data Preservation Program

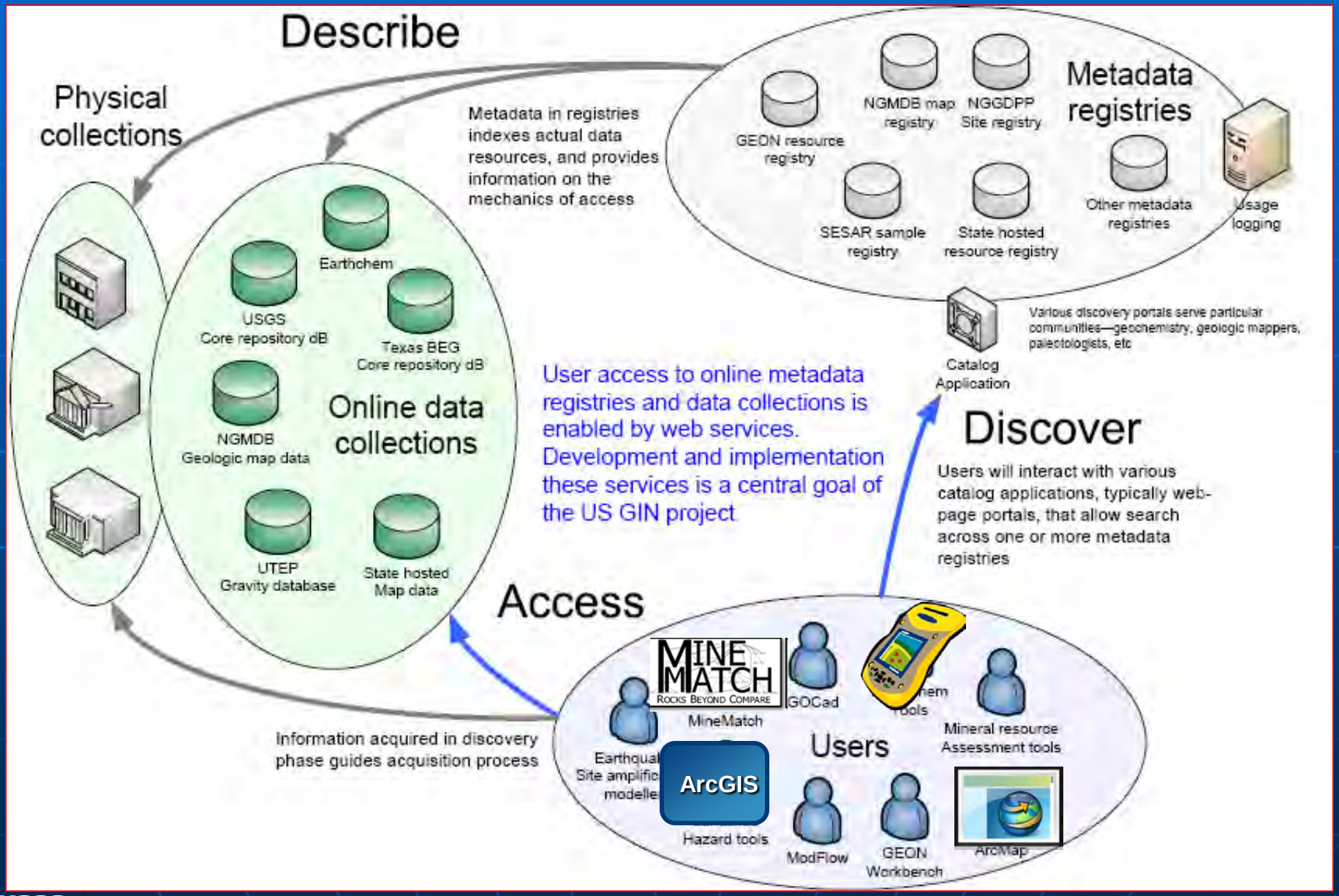
by the Data Preservation Working Group of the National Cooperative Geologic Mapping Program Federal Advisory Committee

October 10, 2006

USGS
National Geologic & Geophysical Data Preservation Program

- -$1M per year
- -National inventory
- -Metadata catalogue
- -National Digital Catalogue

System overview



GIN milestones

- **TECHNOLOGY** : GeoSciML developed with NCGMP-NGMDB support
- **ORGANIZATION**: AASG-USGS agreement to build GIN
- **LINKING ACADEMIA**: National Geoinformatics System will be compatible
- **GEOLOGICAL SURVEYS GLOBALLY**: OneGeology will be compatible
- **INDUSTRY ADOPTION:** ESRI ArcGIS Geology Data Model compatibility; Schlumberger-Metacarta; PetroWeb; Microsoft
- **DEVELOPMENT & DEMOS**: NSF funding; demos in SGS's

GIN milestones

- **INTEGRATE SERVICES**: Marine community vocabulary services
- **GLOBAL RESOURCES**: OneGeology-Europe joint development
- **NATIONAL DEPLOYMENT**: DOE adopts GIN for NGDS
- **AASG FULL DEPLOYMENT**: DOE adopts GIN for GTP: $20M
- **GLOBAL SYSTEM**: Petroleum industry adopts GIN

Brainstorming results: get workable services out to users

Start simple; not perfect
Usable
Proof of concept

CSW – Web catalog service
WMS – Web map service
WFS – Web feature service

What services next?
- GeoSciNet
  - Borehole lithology
  - EarthChem
  - Mineral occurrences
  - NatCarb
  - Others

Setting user community priorities