State Geothermal Data and the US Geoscience Information Network

System Design and Progress Report

Background

USGIN, Interoperability and the National Geothermal Data System

Arizona Geological Survey 7/12/2011

The US Geoscience Information Network

- Partnership between the
  Association of American State Geologists (AASG)
  and the US Geological Survey (USGS)

- Objective is to make geoscience information easier to find, distribute, and analyze

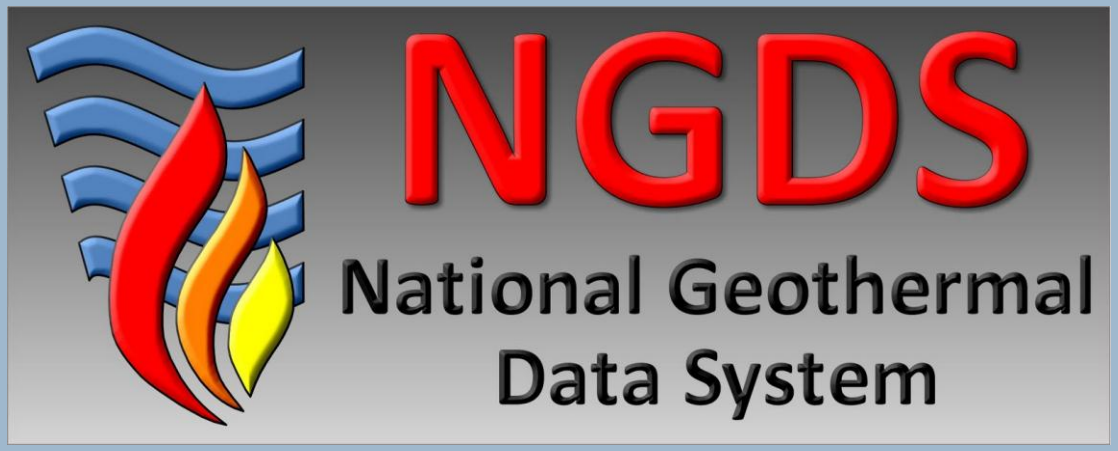
- Build a nation-wide network for geoscience information that is:
  - Web-based
  - Open-Source
  - Distributed
  - Interoperable

The US Geoscience Information Network

Distributed Network

- Data Clearinghouses are becoming obsolete
- Information is increasingly brought to us from disparate sources
- Constantly improving search capabilities allow us to find all this information
- Benefits of a distributed network:
  - Keeps information in the hands of the data providers
  - Allows for simpler update routines
  - Allows new information to be more rapidly conveyed to users

The National Geothermal Data System



DOE & USGS Data

Boise State University

National Assessment

USGS

University Data

Southern Methodist University

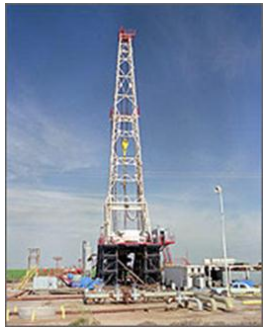
State Geological Survey Contributions to the NGDS

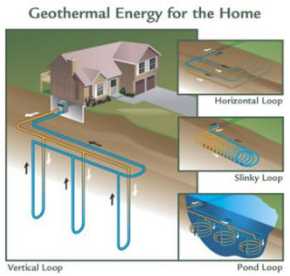
AASG - AZGS

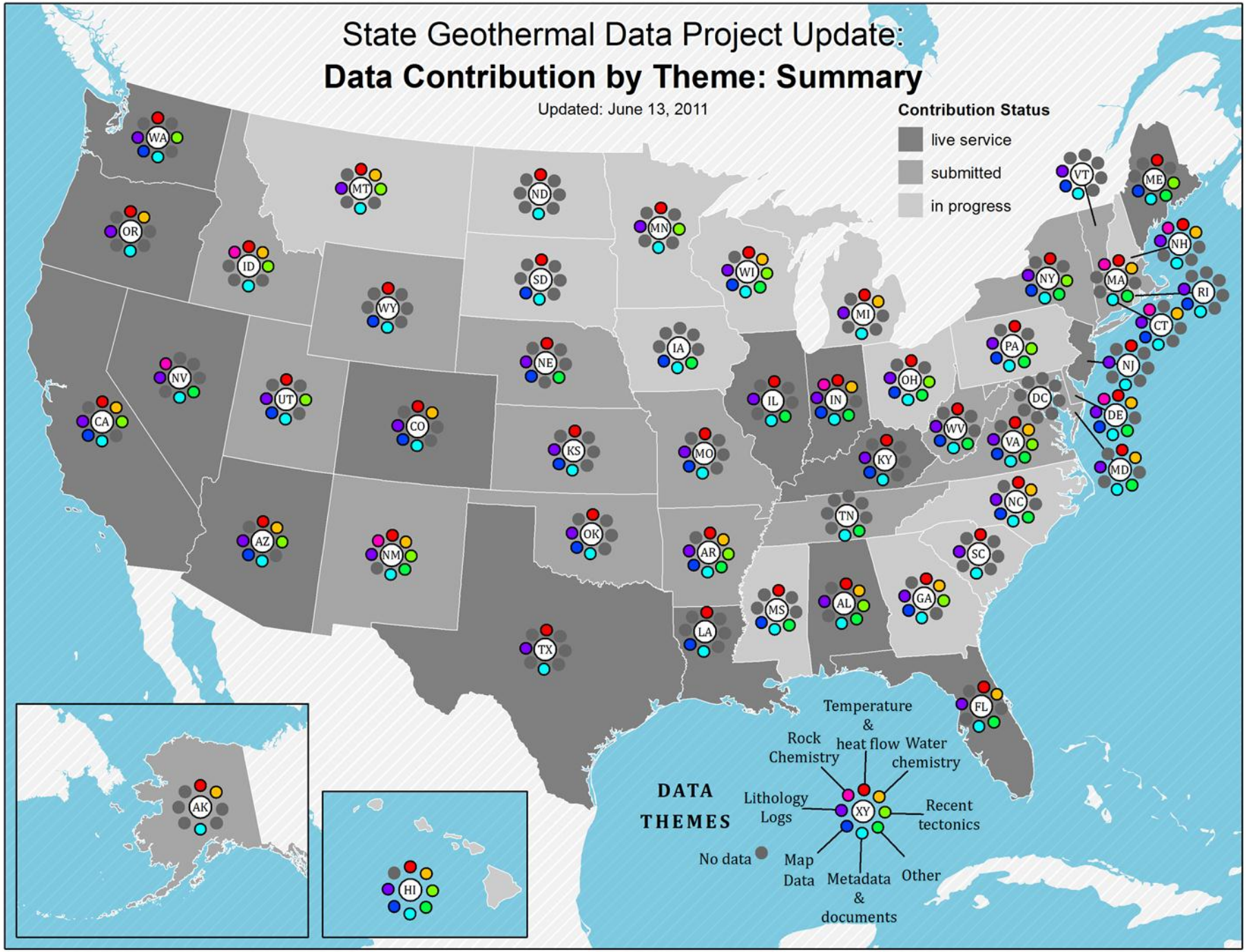
DOE Geothermal Technologies Program-funded projects

State Contributions to the NGDS

- Review 3.5 million wells
- Data for 2.1 million wells
- 195,000 well logs
- 50,000 geothermal wells
- 750,000 BHT's
- 6 Tb existing digital data
- 77,500 scanned publications & maps
- Data on 2.5 million feet of core
- 600,000 sample logs







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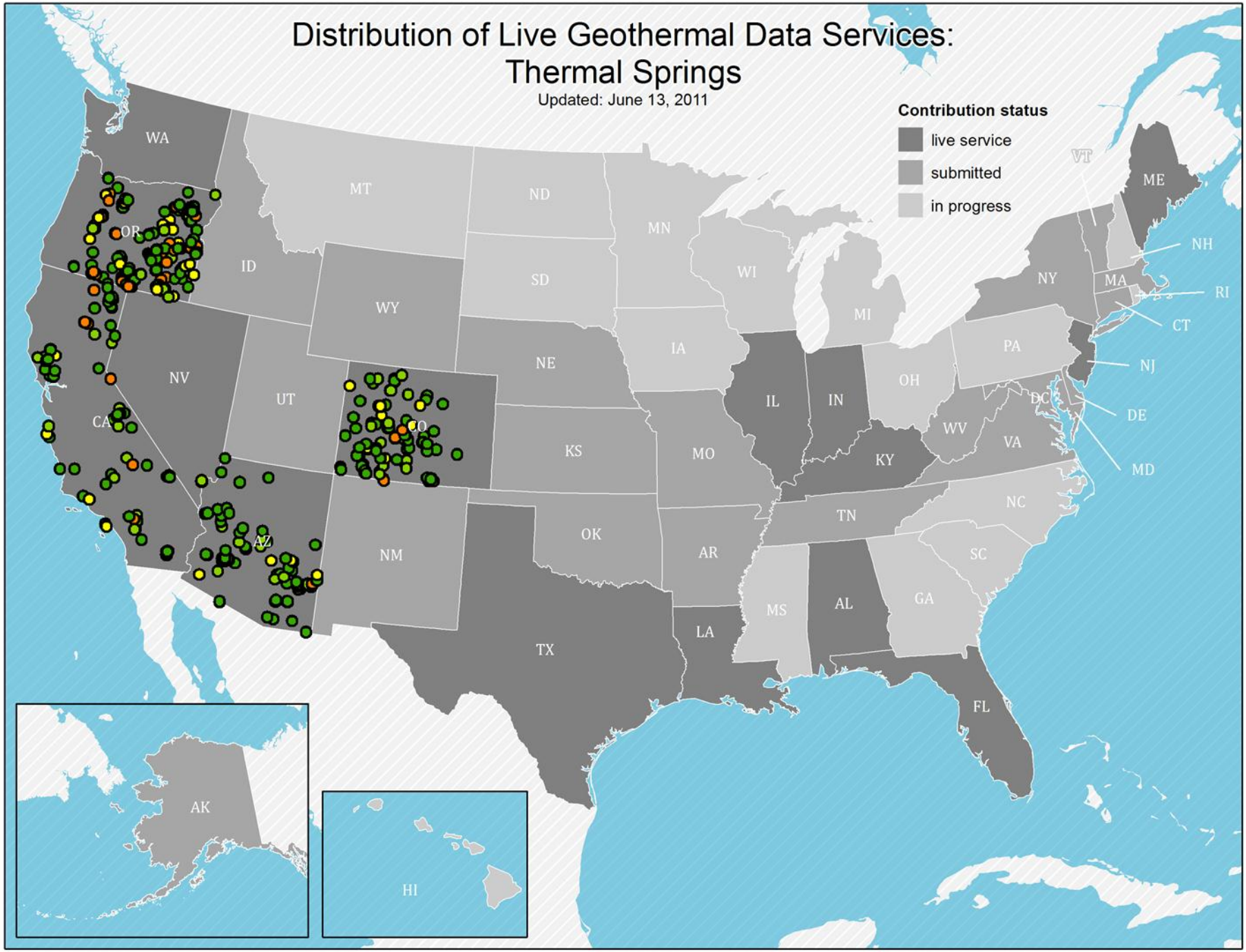

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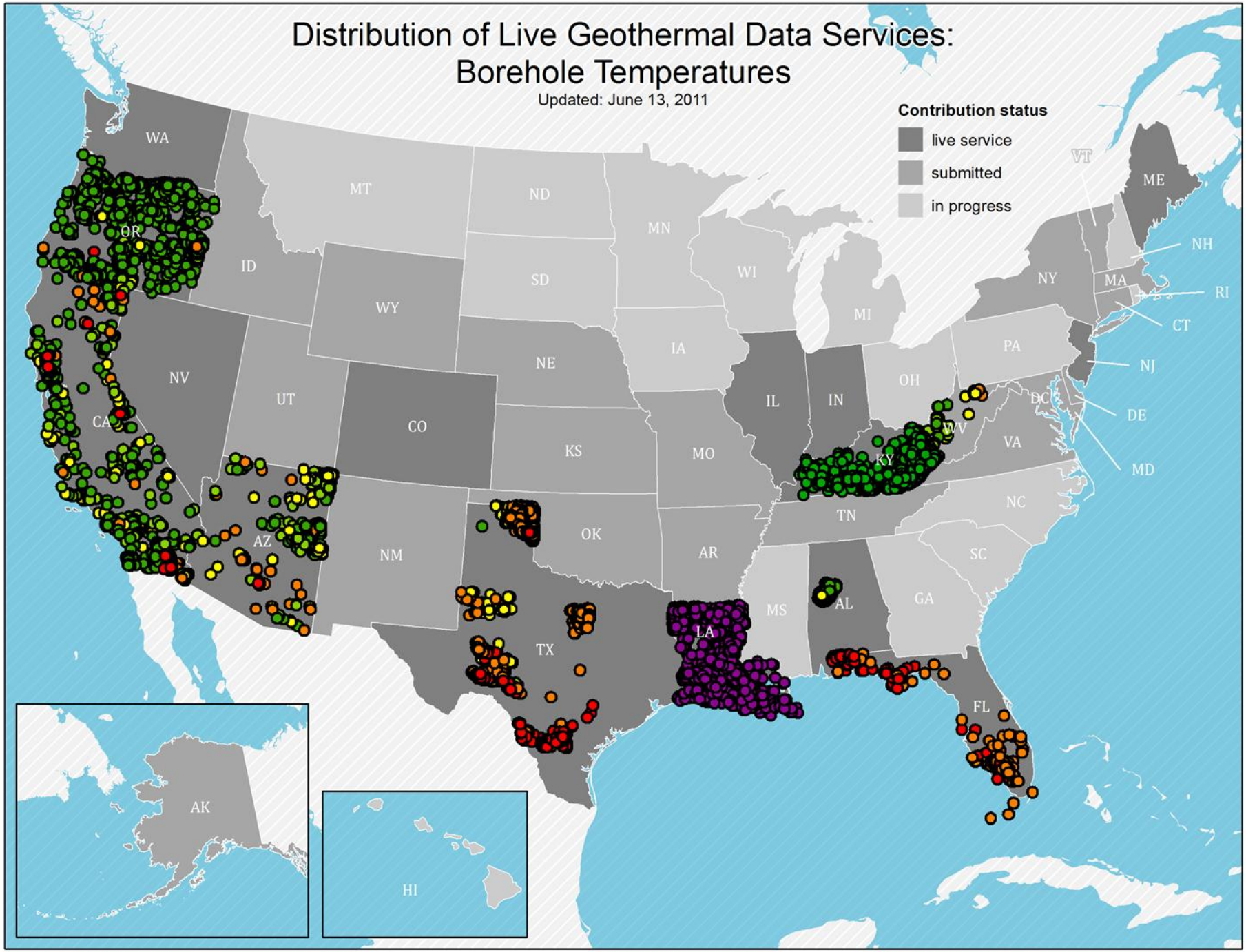

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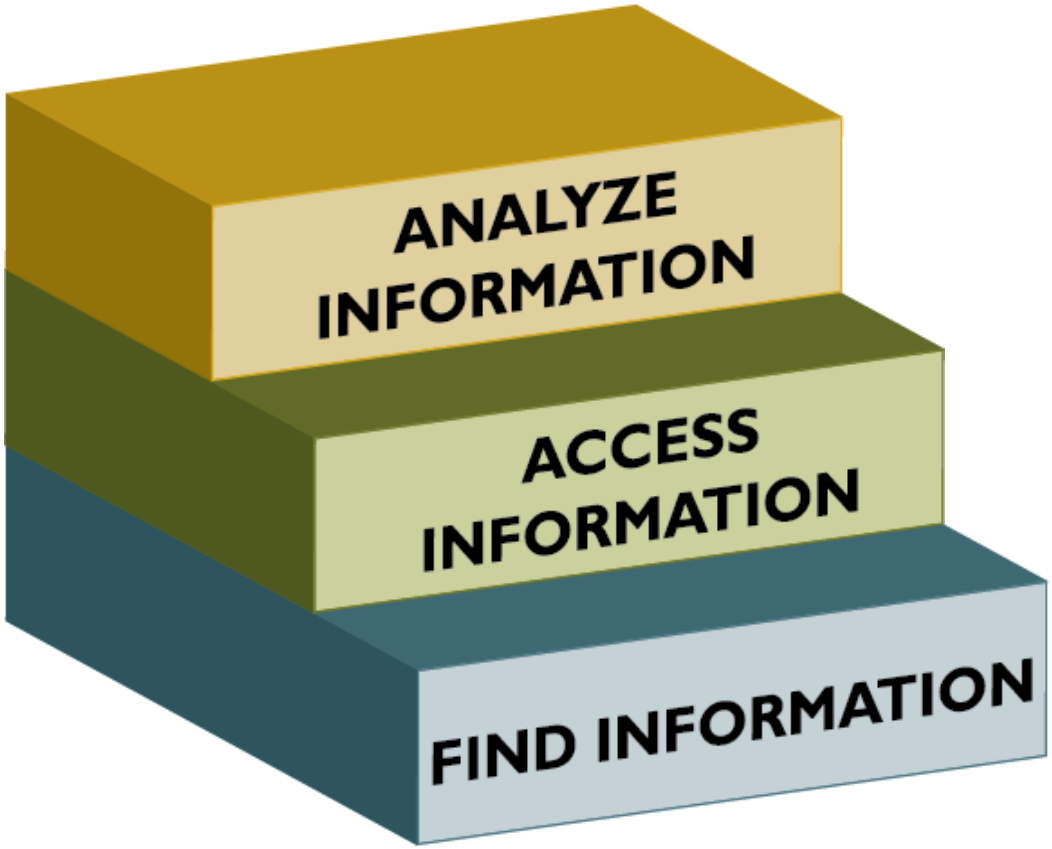
Interoperability… in Three "Easy" Steps

- Clearinghouse-style "portal" mapping applications are dead …
  instead we want mash-ups that work
- Analyze: Provide data services in dataset-specific standardized schema
- Access: Provide resources themselves online using standard OGC protocols
- Find: Provide standardized metadata for resources that may or may not be available online



Metadata Implementation

USGIN Profile and Custom Software

USGIN Metadata Implementation

Why Google Is Not Enough

- Search Efficiency
  - Good with text, not so good with data
  - Steps in the right direction: KML and GeoRSS indexing
  - Another approach: provide textual descriptions of data sets that can be indexed. For example, ArcGIS Server REST endpoints
  - ArcGIS Online, GeoNode ???
- Query Complexity
  - Easier to answer complex questions with structured metadata

Find geo
scale <
Iron M

Find bo
penetrate
formation

Find locations for samples with uranium-lead geochronology data in a given area.

… For now, we're stuck with formal metadata …

USGIN Metadata Implementation

Metadata Creation and Inclusion in a Catalog

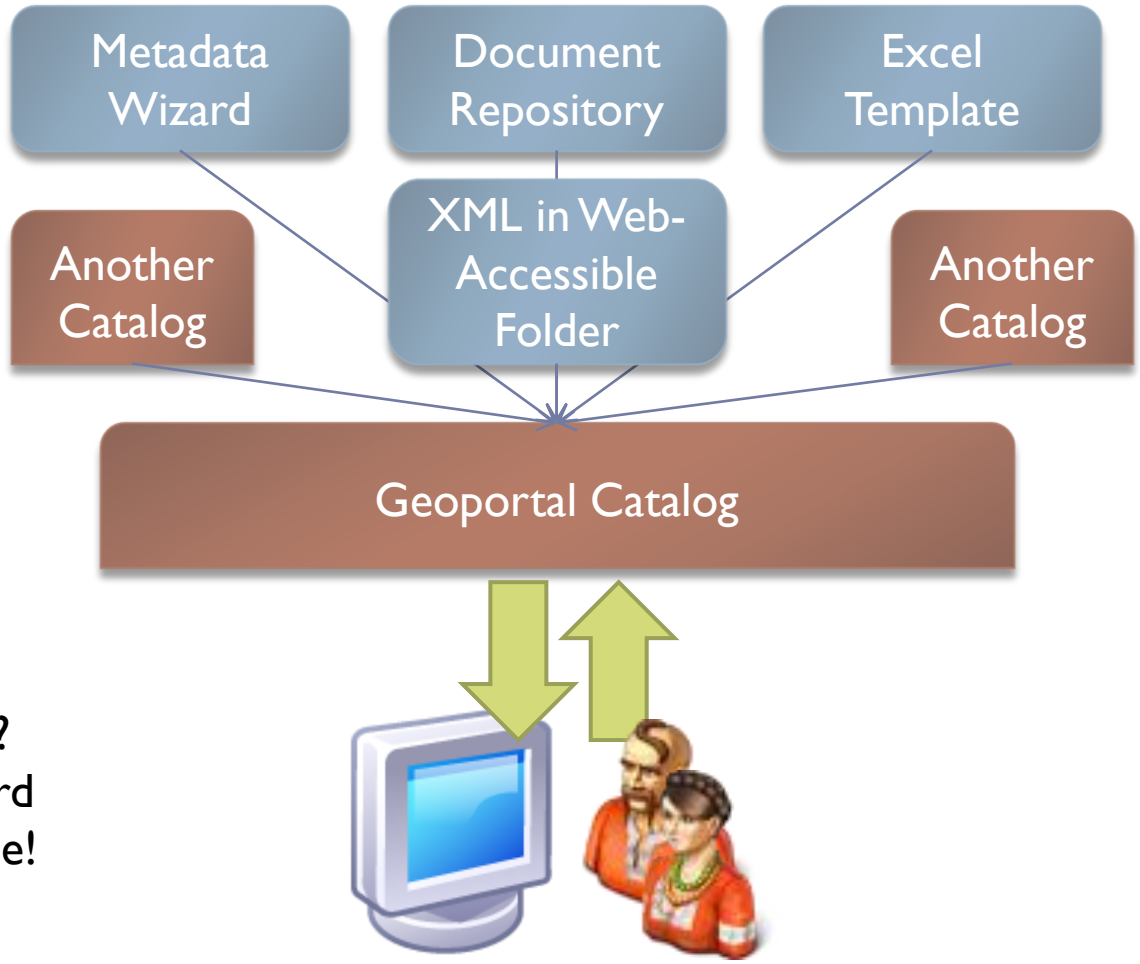
Four Options:

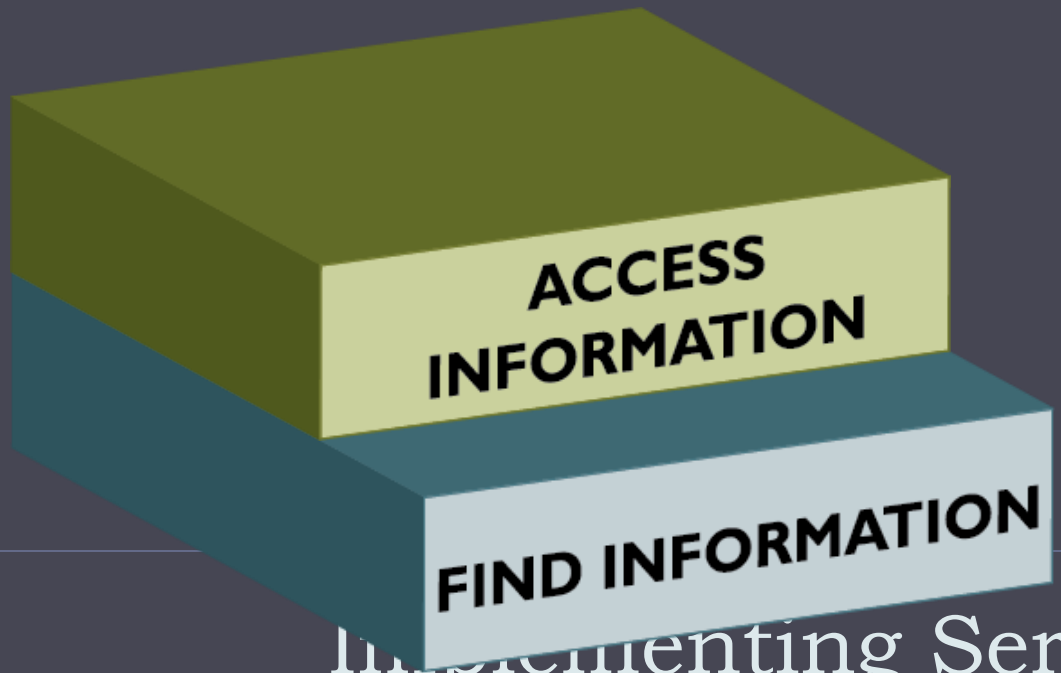
1. Write XML, upload to Catalog
2. Excel Sheet + Python
   - For bulk updates, ETL
3. Metadata Wizard
   - For offline resources or resources already online
4. Document Repository
   - For resources that need to be made available online

USGIN Catalog Implementation

Why a Geoportal Catalog?

- Allow a variety of metadata creation methods to be aggregated
- Allow distributed metadata records to be aggregated: harvesting between catalogs
- Provide a consistent interface for searching and retrieving metadata records: CSW
- Why ESRI's Geoportal Server?
  - Geonetwork was too hard
  - They made it open source!





Implementing Services

OGC Services Please!

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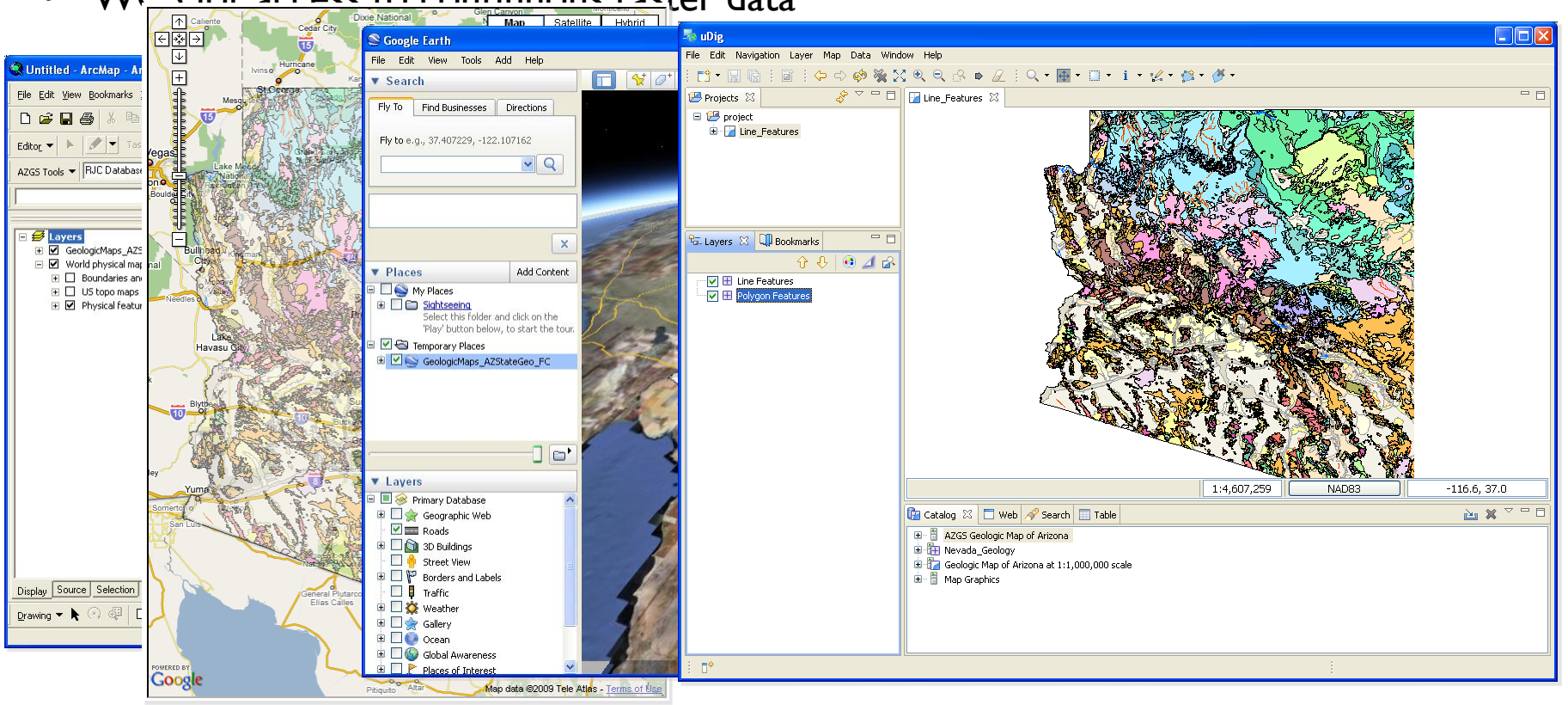
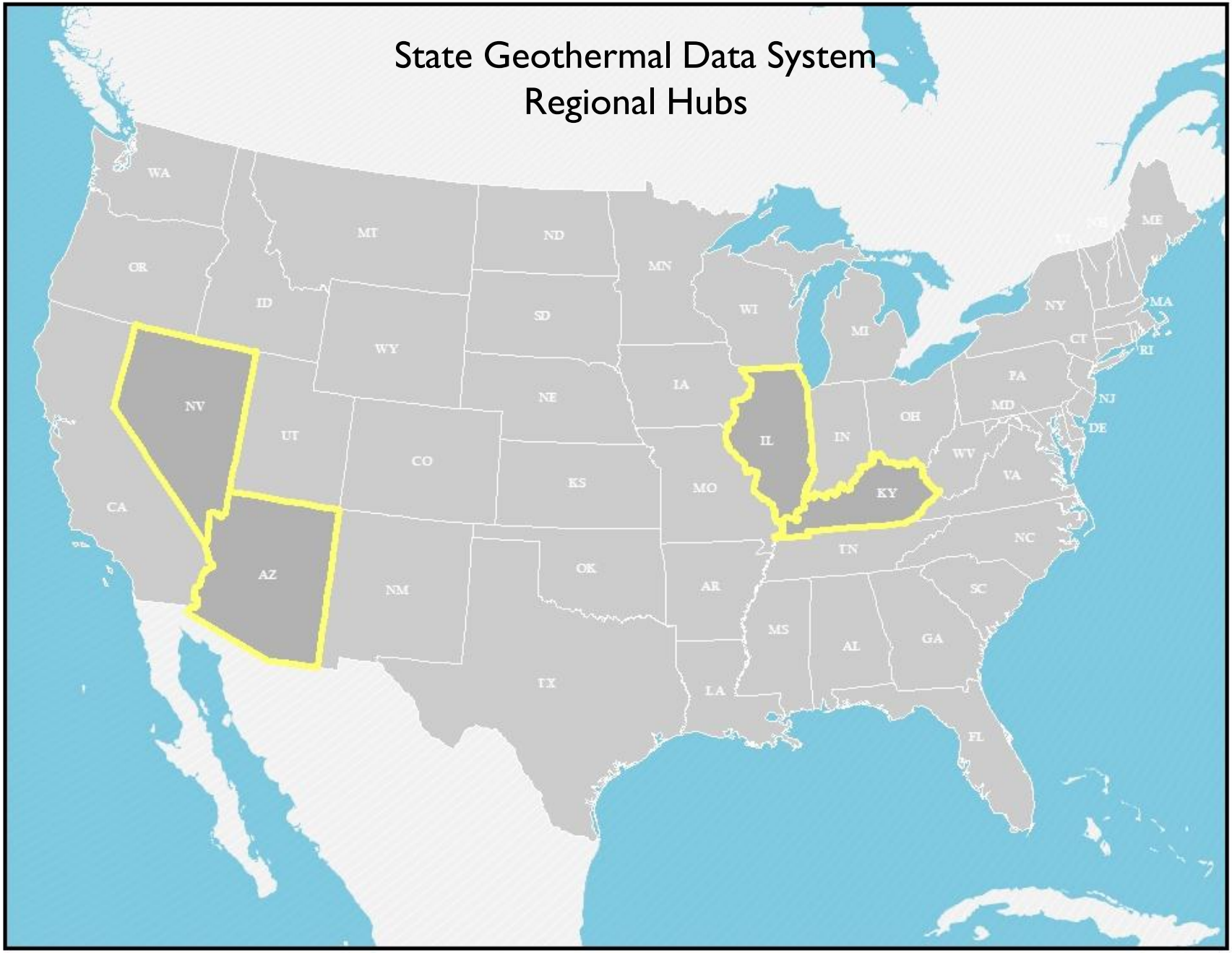
OGC Services -- Useful in Existing Applications

- WMS for providing a symbolized portrayal of vector data
- WFS for full access to attributes and to download vector data
- WCS for access to continuous raster data




State Geothermal Data System
Regional Hubs
WA
OR
CA
ID
NV
MT
WY
UT
AZ
CO
NM
ND
SD
NE
KS
OK
TX
MN
IA
MO
AR
LA
WI
IL
MS
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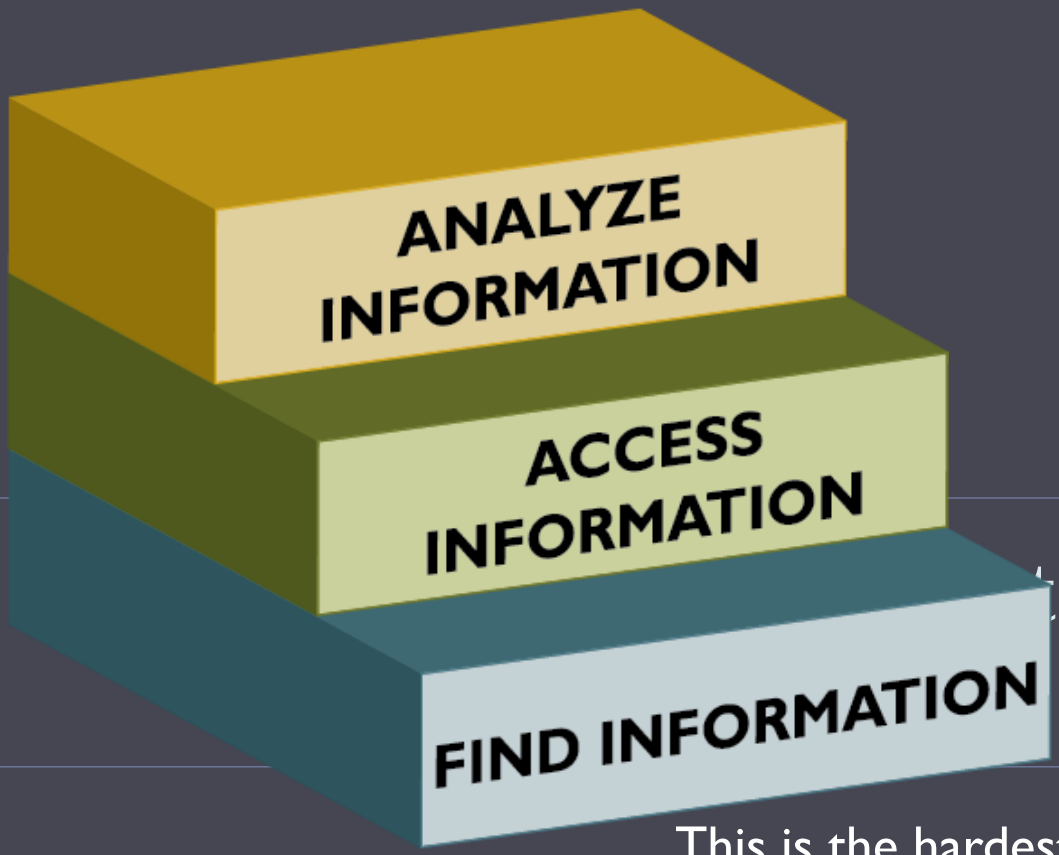

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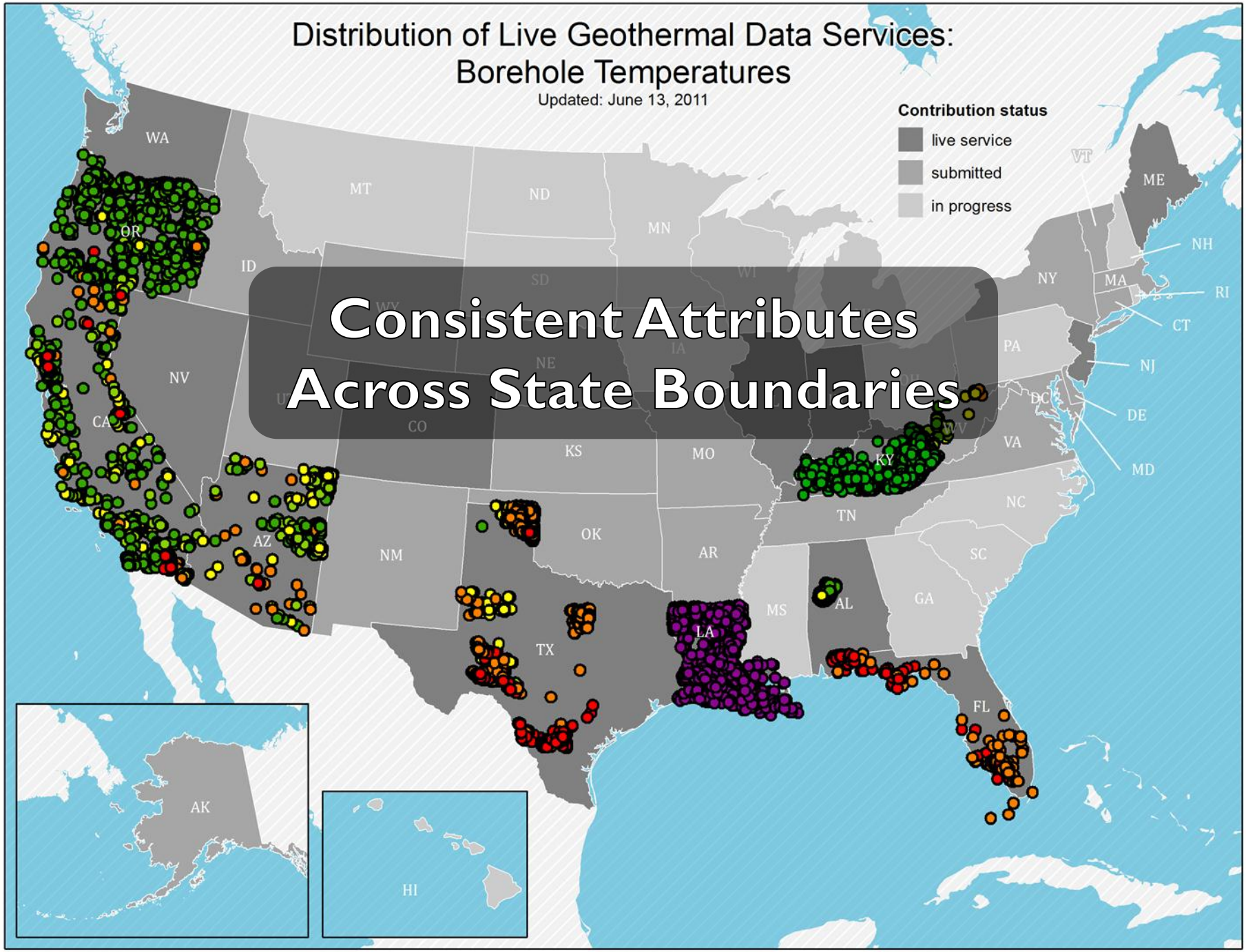
This is the hardest part.



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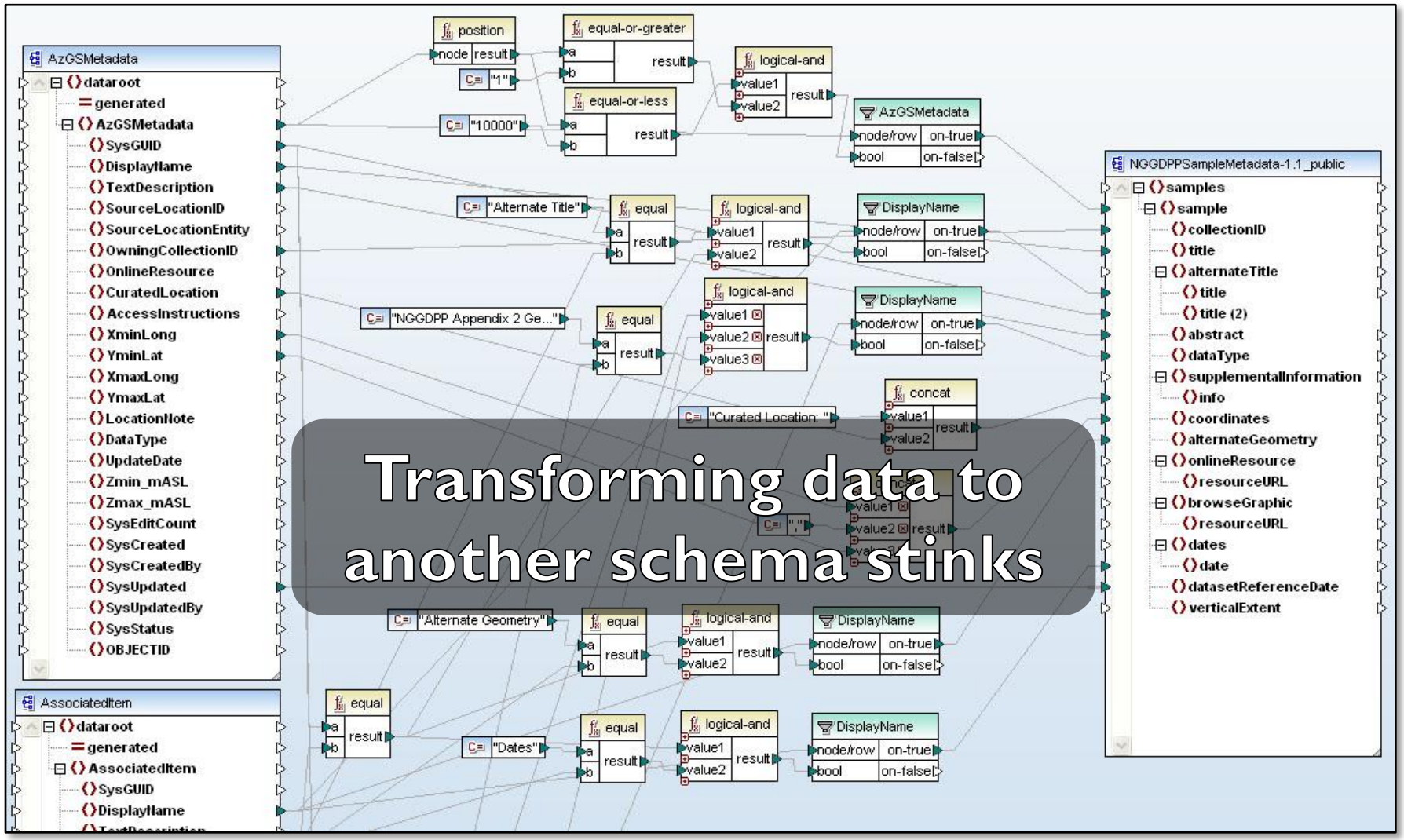
Implementing Content Models

People will argue indefinitely about Data Modeling

Implementing Content Models

- Active Fault
- Alteration description
- Aquifer temperature map
- Borehole lithology log
- Borehole temperature data
- Crustal Stress data
- Developed geothermal system feature
- Direct use feature
- Drill stem test
- Earthquake hypocenter
- Enhanced geothermal system feature
- Aqueous chemistry
- Geologic map
- Geologic Unit geothermal characterization
- Geothermal map
- Gravity data
- Heat flow measurement
- Hot spring description
- Isopach map
- Metadata
- Permeability
- Production statistics record
- Resource suitability map
- Rock chemistry
- Thermal conductivity measurement
- Well header
- Volcanic vent description

Implementing Content Models

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A 10742395 A
B 17568363 E
B 17568362 E

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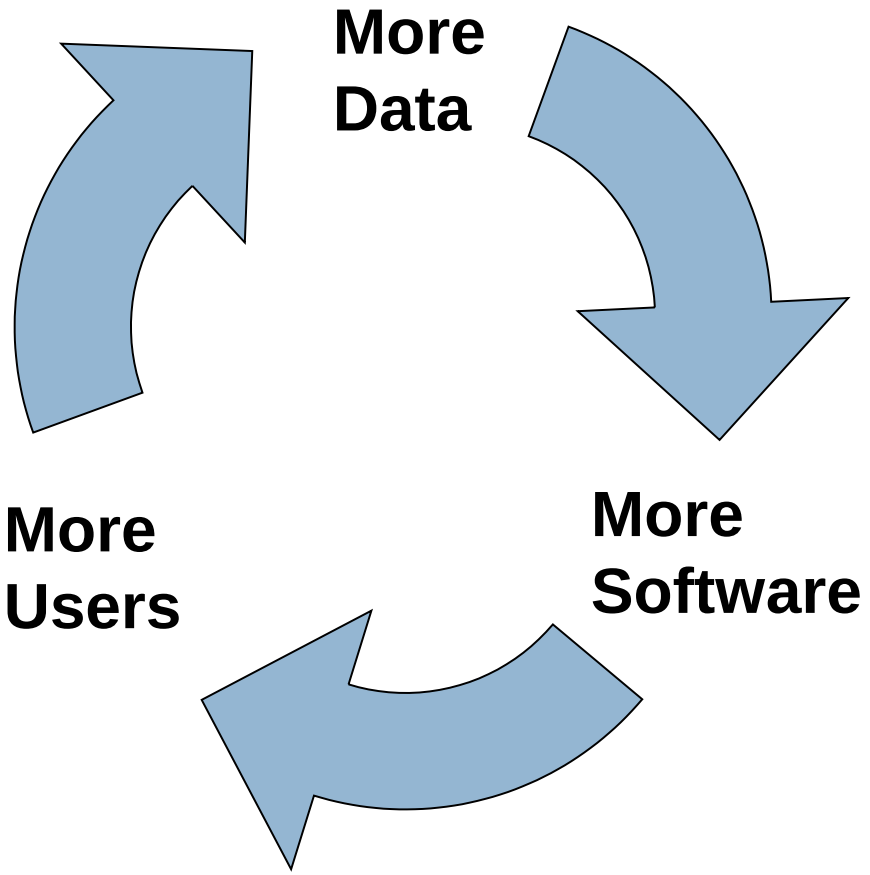
Building the System: Social Engineering

- Starting a bootstrapping process
- Use of existing protocols means lots of software is already available
- Striving to provide simple transformation tools to ease the barrier to entry
- The more the merrier!



Thank You

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