### **GEON2 and OpenEarth Framework (OEF)**

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#### **Outline**

- Background
- OEF Goals and Motivations
- OEF Philosophy
- OEF Visualization and Architecture
- Project Plans







#### **GEON Portal**

GEOPHYSICS

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# **GEON1 vs. GEON2**

- GEON initially funded in 2002 to bring together 16 institutions develop an infrastructure for managing distributed collections of large, heterogeneous, multidisciplinary earth science datasets.
- GEON renewed this year focus in v.2 of GEON is to expand infrastructure to include open source software for integrating, analyzing, and visualizing these data sets.
  - OpenEarth Framework







#### **OpenEarth Framework Goals**

<u>Geologic</u> Integration:

- Data types topography, imagery, bore hole samples, velocity models from seismic tomography, gravity measurements, simulation results...
- Data coordinate spaces and dimensionality 2D and 3D spatial representations and 4D that covers the range of geologic processes (EQ cycle to deep time).







# Integration & Visualization of 3D/4D data



"For a given region (i.e. lat/long extent, plus depth), return a 3D structural model with accompanying physical parameters of density, seismic velocities, geochemistry, and geologic ages, using a cell size of 10km"



#### -Derived 3D volumetric model

- -Multiple isosurfaces with different transparencies
- -Slices through the volume
- –Variable gridding: data typically has lower resolution at greater depths

-2D surface dat maps, geologic

-2D surface data: Topography ("2.5D") Satellite imagery, street maps, geologic maps, fault lines, and other derived features etc.

-Bore hole or well data and point observations.







#### **OpenEarth Framework Goals**

Structural Integration:

- Data formats shapefiles, NetCDF, GeoTIFF, and other formal and defacto standards.
- Data models 2D and 3D geometry to semantically richer models of features and relationships between those features.
- Data delivery methods & Storage Schemes- local files to database queries, web services (WMS, WFS) and services for new data types (large tomographic volumes, etc.).







# **OEF Philosophy**

- OEF focused on integrating data spanning the geosciences.
- Open software architecture and corresponding software that can properly access, manipulate and visualize the integrated data.
- Open source to provide the necessary flexibility for academic research and to provide a flexible test bed for new data models and visualization ideas.













- Data Layer:
  - GEON Catalog (GEON register datasets)
  - 3<sup>rd</sup> Party Catalogs (Remote datasets









#### • Data Access Services:

- Manages and delivers stored data and metadata
- Provides access to data in a variety of formats via various sources.
- Hides storage and access details (location, authentication, protocols etc.)









- Data Modeling Services:
  - Provides on-demand and preprocessing operation on requested data.
  - Operations to subset, extract and derive data for area of interest.
  - Use recent access patterns to guide preprocessing to prepare data in anticipation of future need.









- Data Integration Services:
  - Designed to support rapid visualization of integrated datasets
  - operations to grid data, resample it at multiple resolutions and subdivide data to better support progressive changes to the display as the user pans and zooms









- Visualization Tools:
  - Run on the user's computer, dynamically query spatial and temporal data from the OEF services
  - Uses 3D graphics hardware for fast display
  - Open architecture supports multiple visualization tools authored throughout the community (e.g GEON IDV
  - New viz capabilities developed as necessary









#### **Example Application - Waiting for example** from Randy (?)...



Mt. St. Helens seismicity, 2004.

#### **Project Plans**

- Currently testing visualization toolkits and various libraries.
- Beginning development with a sample of heterogeneous data for a region of interest (Parkfield).
- Using these data as a test case, we will develop software to enable visualization the integrated information as well as to interactively access and manipulate the underlying data.









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