

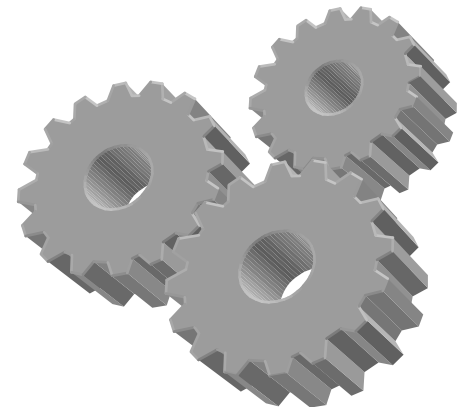


Emerging Technologies for Post-earthquake Reconnaissance

J. P. Bardet

Civil Engineering Department
University of Southern California

GEER Workshop
UC Berkeley
October 7-8, 2004



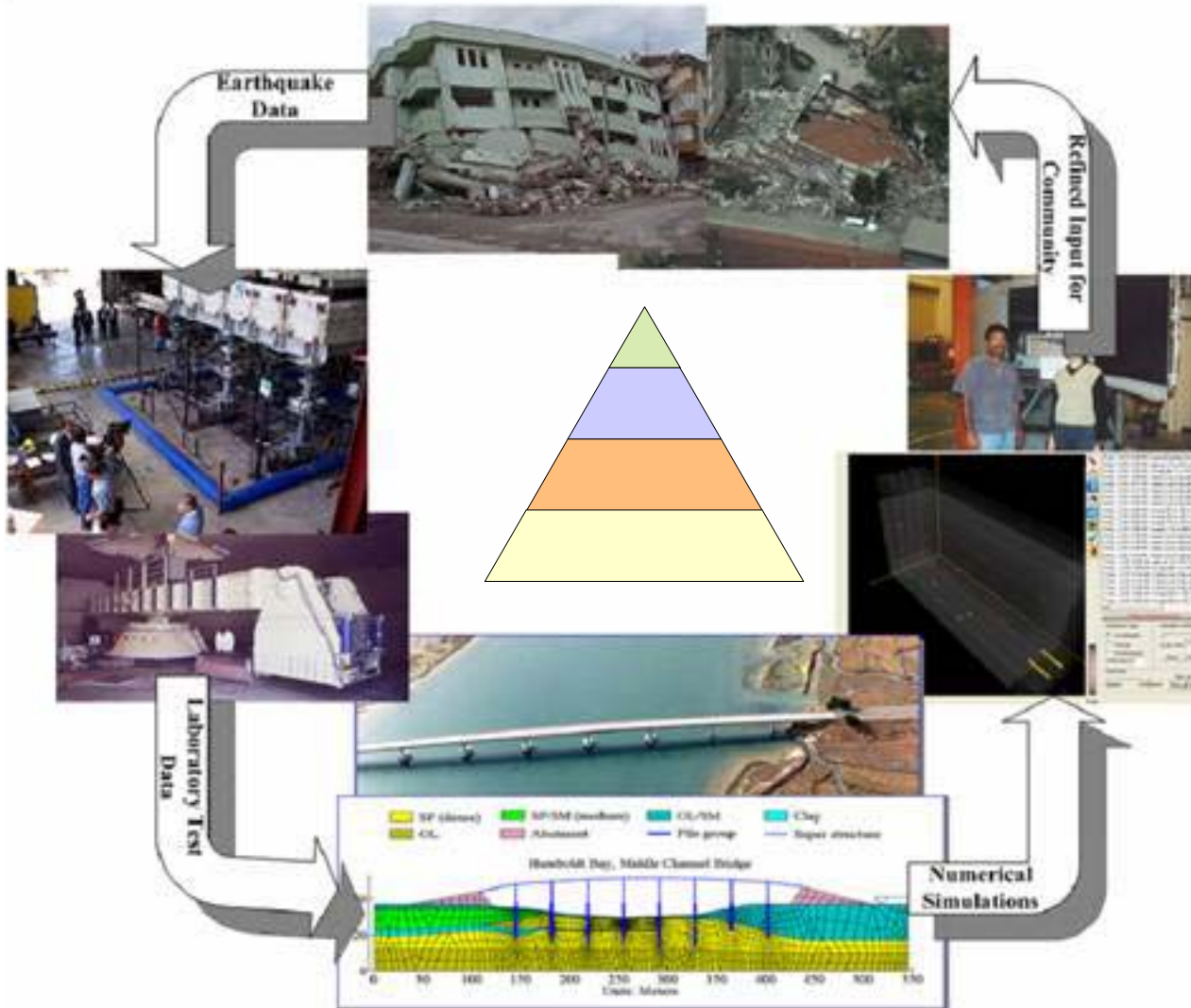


Acknowledgements

- Special thanks to Dr. Cliff Astill, National Science Foundation (Small Grant for Exploratory Research, SGER)
- Many collaborators from the U.S., Japan, Turkey, Taiwan, etc. too numerous to be listed here.



Post-earthquake reconnaissance and earthquake engineering



- Post earthquake reconnaissance will continue to impact the field of earthquake engineering, provided it documents scientifically the effects of earthquakes.



OUTLINE

1. Background: GEES
2. GPS/GIS/Video/Photo Tools
3. NEES Data and Metadata
4. Collaboratory?



Geotechnical Earthquake Engineering Server


<http://geoinfo.usc.edu/gees>

Geotechnical Earthquake Engineering Server Home Page - Microsoft Internet Explorer provided by Comcast High-Speed Internet

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Saturday, March 17, 2001




The Geotechnical Earthquake Engineering Server (GEES) intends to provide a highly efficient transfer of information and data among geotechnical researchers and practitioners. GEES is a project sponsored by the Siting and Geotechnical Systems component of the National Science Foundation's Earthquake Hazard Mitigation program.




[Mw 7.8 earthquake in Mexico on January 21, 2003](#)

The preliminary report of the National Science Foundation geotechnical reconnaissance team is now available (February 18, 2003).




[Mw 7.7 earthquake in India on January 26, 2001](#)

The preliminary report of the National Science Foundation geotechnical reconnaissance team is now available (March 1, 2001). It includes videos and a GIS/IMS database of photos.




[Mw 7.1 earthquake in Turkey on November 12, 1999](#)

The preliminary report of the National Science Foundation geotechnical reconnaissance team is now available (November 25, 1999)



[Ms 7.6 earthquake in Taiwan on September 21, 1999](#)

The preliminary report of the National Science Foundation geotechnical reconnaissance team is now available (October 8, 1999).



[Ms 7.8 earthquake in Turkey on August 17, 1999](#)

The preliminary report of the National Science Foundation geotechnical reconnaissance team is now available (September 3, 1999).

Internet



GEES post-earthquake reconnaissances

Earthquake name	Earthquake date	Arrival date of Reconnaissance team	Report release date	Days
Hyogoken-Nanbu, Japan	01/17/95	01/27/95	02/05/95	9
Kocaeli, Turkey	08/17/99	08/24/99	09/03/99	10
Chichi, Taiwan	09/21/99	09/29/99	10/08/99	9
Ducze, Turkey	11/12/99	11/17/99	11/25/99	8
Bhuj, India	01/26/01	02/12/01	03/01/01	17

- January 1995 report was one of the first earthquake reconnaissance reports on the Internet (Mosaic was released in 1993).
- Reports have evolved since 1995.



GEES - India

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since November 3, 1998.

This page was last updated on
Saturday, March 17, 2001



The Bhuj, India, Earthquake of January 26, 2001

This page was last updated on April 05, 2001

Preliminary Report of the India-US Geotechnical Earthquake Engineering Reconnaissance Team

Sponsored by the US National Science Foundation in collaboration with the Earthquake Engineering Research Institute (EERI) and the Mid America Earthquake (MAE) Center

- [Introduction](#)
- [Reconnaissance flight](#)
- Damage to towns and villages
 - [Anjar](#)
 - [Bhachau](#)
 - [Bhuj](#)
- [Damage to dams](#)
- Damage to ports
 - [Kandia](#)
 - [Navlakhi](#)
 - [Adani](#)
- Damage to bridges
 - [Surajbari bridges](#)
 - [Highway 8A bridge](#)
- Ground failure, liquefaction and cracking
 - [South of Chang dam and North of epicenter \(February 17, 2001\)](#)
 - [East of Lodai](#)
 - [Rann of Kachchh \(February 16, 2001\)](#)
 - [Rann of Kachchh \(February 18, 2001\)](#)
- [GIS database server of photos from post-earthquake reconnaissance](#)
- [Videos from earthquake reconnaissance](#)
- PowerPoint presentations
 - [Bardet's presentation](#)
 - [Bardet's presentation at EERI briefing on April 4, 2001](#)
 - [Singh's presentation in San Diego](#)

Additional Information

- [Main information](#)
- [Photos from the earthquake](#)
- [Useful links](#)

Internet



GIS-GPS-Photo

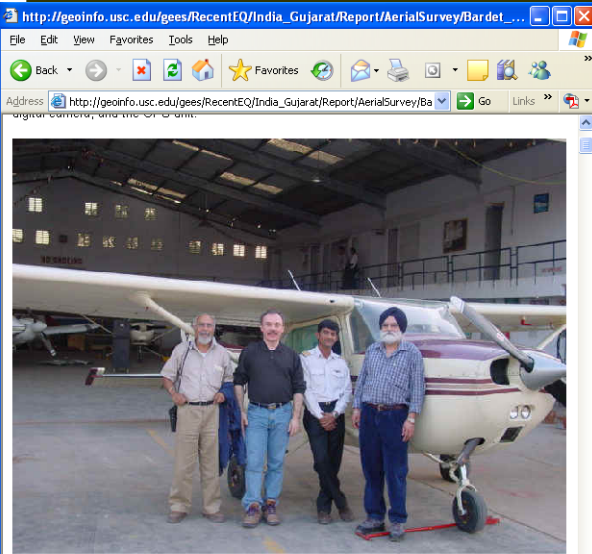


Figure 1. In Ahmedabad, the aircraft used for flight over, and the aerial survey reconnaissance team. From left to right, Colonel H. Singh, J. P. Bardet, Capt. Rajiv Nanavaty, and J. P. Singh (2/12/01 6:18:56 PM, N23.06806 E72.61980).

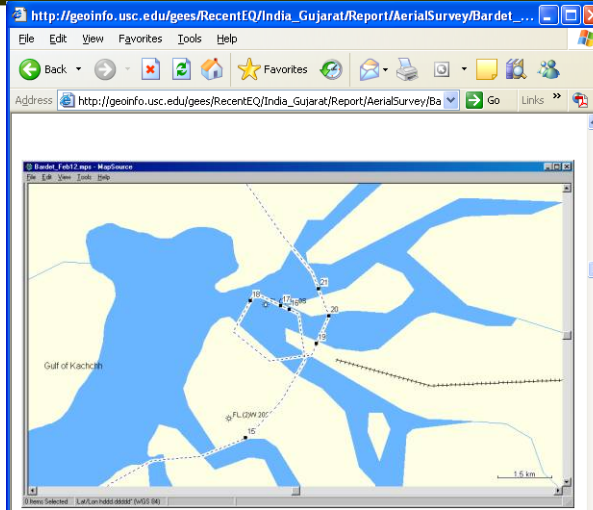
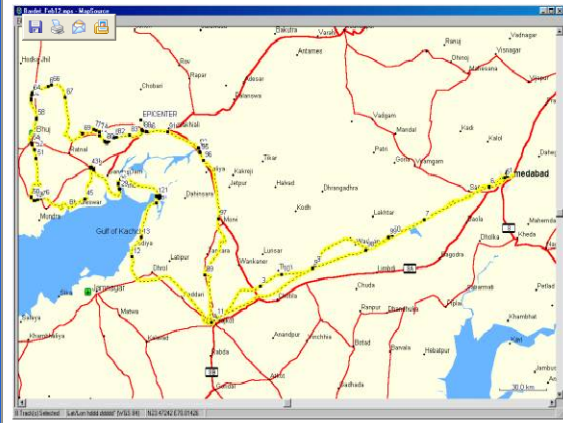


Figure 14. Closeup of tracklog and location of figures in the vicinity of Navalkhi port.



Figure 15. General view of Navalkhi port located in the Gulf of Kachchh, 25 km to the Southeast of Gandhidham (2/12/01 10:48:25 AM, N22.92851 E70.43793).

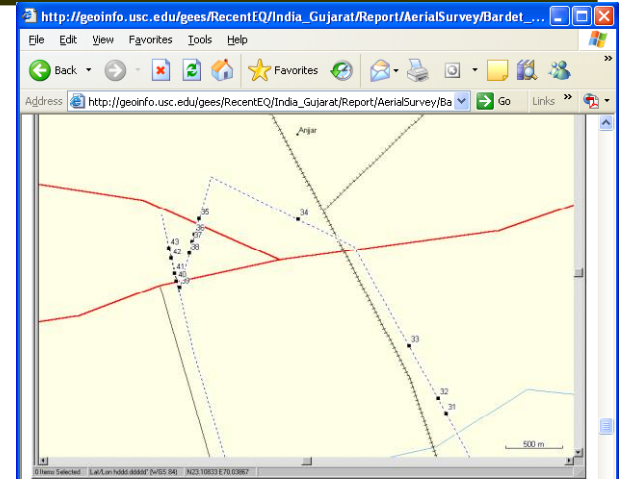


Figure 30. Closeup of tracklog and location of figures in the vicinity of Anjar.



Figure 31. Very few masonry buildings were left standing 2 km to the Southeast of the Anjar (2/12/01 11:14:50 AM, N23.10079 E70.05062).



Video

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This page was last updated on
Saturday, March 17, 2001

The Bhuj, India, Earthquake of January 26, 2001

This page was last updated on March 04, 2001

Videos from the India-US Geotechnical Earthquake Engineering Reconnaissance Team

Sponsored by the US National Science Foundation in collaboration with the Earthquake Engineering Research Institute (EERI) and the Mid America Earthquake (MAE) Center

Quicktime formats


- [Anjar \(50 MB\)](#)
- [Navlakhi Port \(20 MB\)](#)

http://geoinfo.usc.edu/gees/RecentEQ/India_G...

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Address http://geoinfo.usc.edu/gees/RecentEQ/In Go Links



Internet



Web-Report Generation using Excel

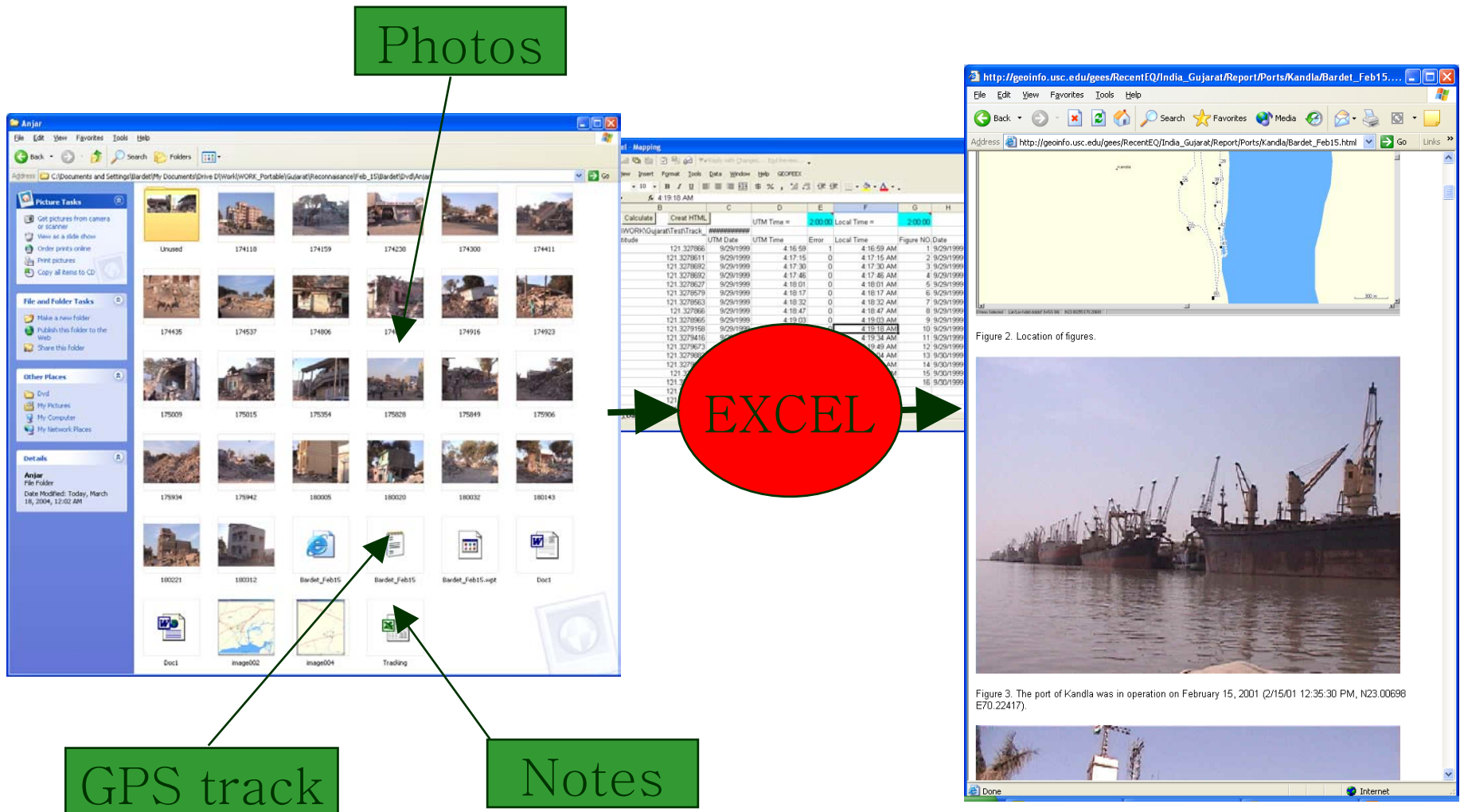


Figure 2. Location of figures.

Figure 3. The port of Kandla was in operation on February 15, 2001 (2/15/01 12:35:30 PM, N23.00698 E70.22417).



GIS-IMS-Information integration

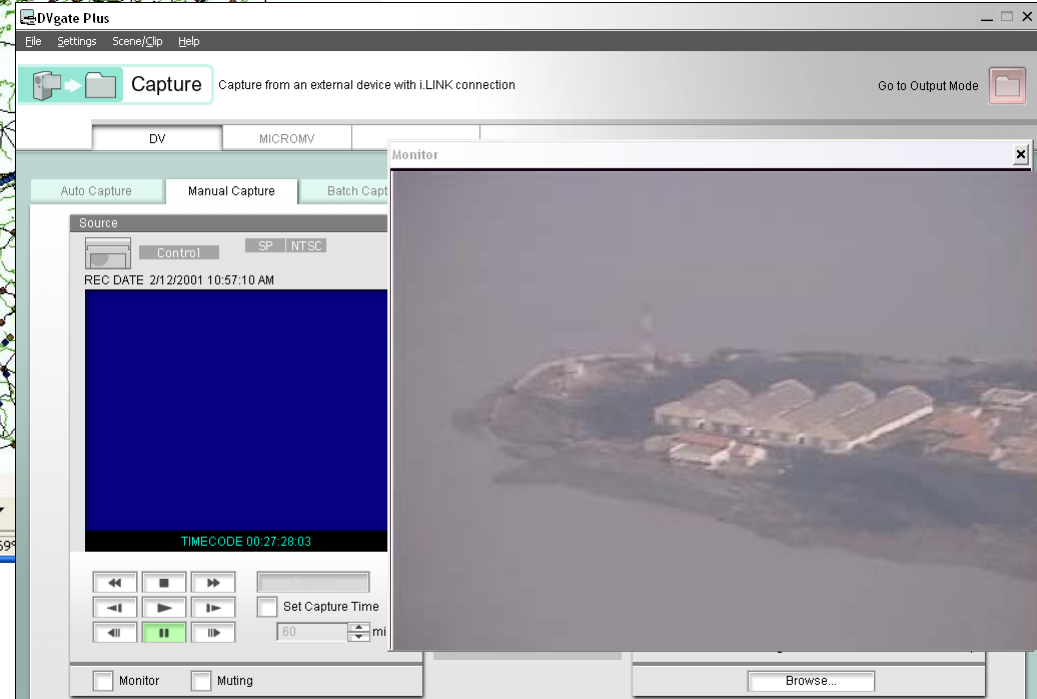
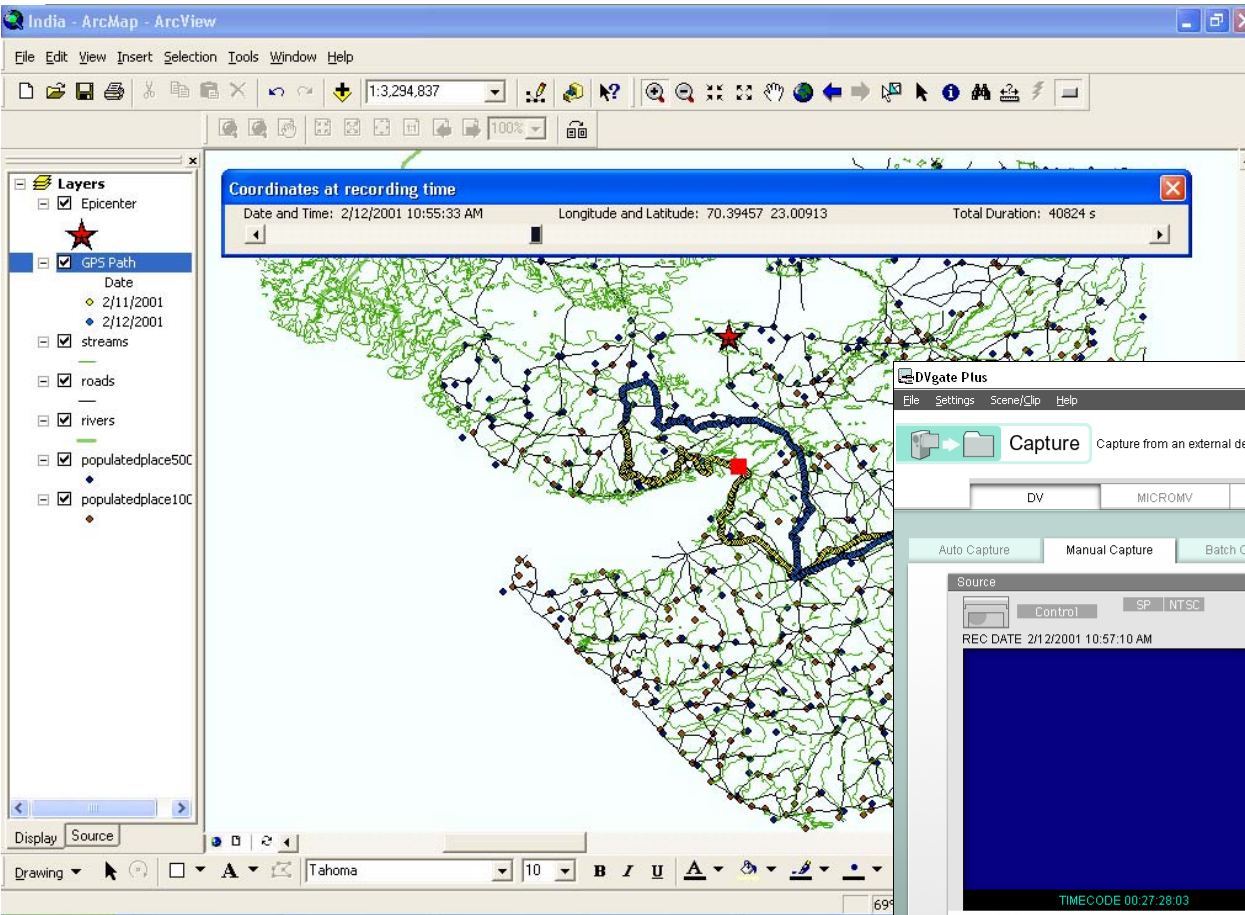
The screenshot shows two overlapping browser windows. The larger window in the background displays a GIS application titled "http://geoinfo.usc.edu/india/India_Toposapplet.html". The application interface includes a menu bar (File, Edit, View, Favorites, Tools, Help), a toolbar with navigation icons, and a legend on the left side. The legend lists several layers: Photos (with dates from 2/12/01 to 2/18/01), GPS track logs (with dates from 2/12/01 to 2/17/01), Epikenter (marked with a red star), Populated places, Roads, Streams Channels Inland Shore, Rivers, Marsh, and Road Map Opaque. The main map area shows a topographic map of India with various colored lines and markers representing the data layers. A scale bar at the bottom indicates 100 Kilometers.

The smaller window in the foreground is titled "Reconnaissance in India - Microsoft Internet Explorer provided by Comcast High-Speed..." and displays a photo gallery. The address bar shows "http://geoinfo.usc.edu/scripts/esrimap.dll?nameX=india1236546ca&Cmd=Id&WName=Gujara". The main content area features a photo titled "Photo From 2001 Earthquake Reconnaissance Efforts in India:" and a caption below it: "Photo taken By: J. P. Bardet (2/12/01 13:20:35 PM, E70.84578 N22.73153)".

M_w 7.7 Bhuj, India, Earthquake of January 26, 2001



Geo-referencing Videos in the field






Geo-referenced Video on the Web

ImageCat, Inc. - Microsoft Internet Explorer provided by Comcast High-Speed Internet

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites Media Print Mail

Address <http://www.imagecatinc.com/productsservices/geovideo.html> Go Links

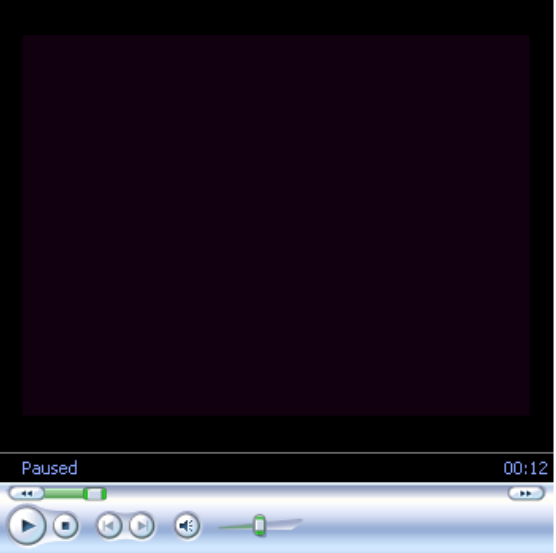


ImageCat, Inc.

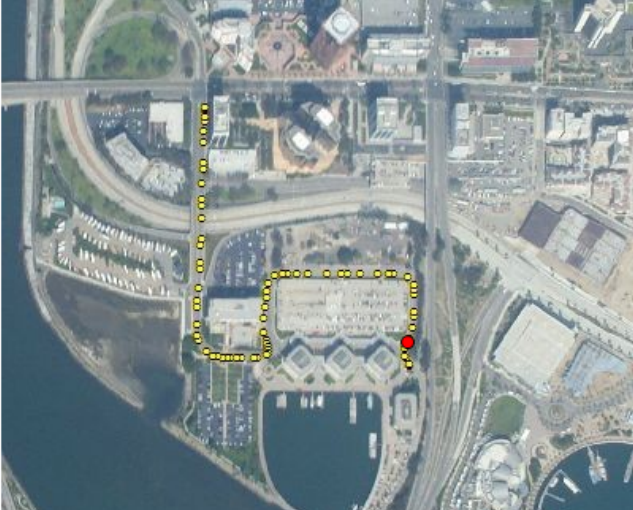
[Home](#) [About ImageCat](#) [News & Events](#) [Products & Services](#) [Reports / Publications](#)

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[Risk Assessment & Management](#)
[Earthquake Loss Estimation](#)
[Lifetime Vulnerability Analysis](#)
[GIS Products & Services](#)
[Remote Sensing Imagery](#)



Paused 00:12



Speed: 10.3 knots Heading: 33.7 degrees

Internet

The screenshot shows a Microsoft Internet Explorer browser window displaying the ImageCat, Inc. website. The browser's address bar shows the URL "http://www.imagecatinc.com/productsservices/geovideo.html". The website features a navigation menu with links to Home, About ImageCat, News & Events, Products & Services, and Reports / Publications. A section titled "Georeferenced Video" contains a video player that is currently paused at 00:12. To the right of the video player is a large aerial satellite image of a city area, with a yellow dashed line indicating a path or boundary. Below the image, the text "Speed: 10.3 knots Heading: 33.7 degrees" is displayed. The browser's status bar at the bottom shows "Internet".



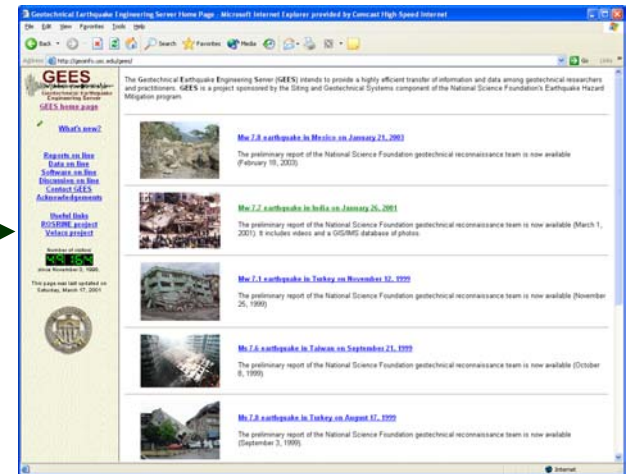
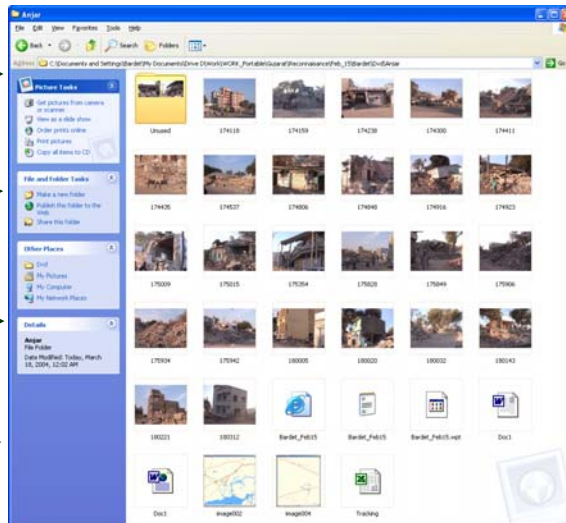
Need for Metadata Web Reporting

GPS

Photo

Video

Notes





Why new tools for post-earthquake reconnaissance?

- Capture perishable, relevant, quantitative and qualitative information after earthquakes
- Improve/accelerate dataflow from the field to the digital library and public
 - Integrate various data and tools:
 - Videos
 - Pictures
 - GPS (coordinates and time)
 - Voice
 - Electronic notebooks/PDA data
- Create a reverse dataflow from a command center to the field
 - Satellite imagery/remote sensing data
 - Other information
- Curate information for posterity

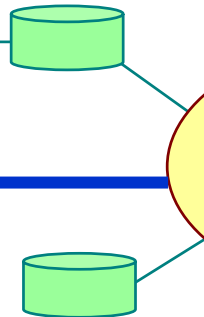


NEES George E. Brown, Jr., Network for Earthquake Engineering Simulation

Laboratory Facilities

- Equipment Site 1
- Equipment Site 2
- Equipment Site 3
- ⋮
- Equipment Site 15
- Other Site A
- Other Site B

Data Repositories & Computational Resources



NEESgrid

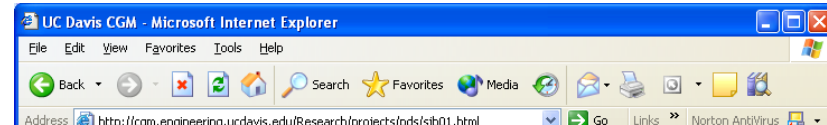


- Earth.Eng. Researchers
- Practitioners
- Emergency Communities
- K-14 Education

User Communities



The NEES Data Experience



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CGM Data Reports

Some of the reports can document information from which the available listing be downloaded appreciate a you have do manner, we documentat

Data reports

UC Davis CGM - Microsoft Internet Explorer

Address: <http://cgm.engineering.ucdavis.edu/Research/projects/pds/index.html>

Behavior of Piles in Laterally Spreading Ground During Earthquakes

Principal Investigator: Ross W. Boulanger (rwboulanger@ucdavis.edu)
 Bruce L. Kutter (blkutter@ucdavis.edu)

Graduate Researchers: Priyanshu Singh (psingh@subsurfaceconsultants.com)
 Scott J. Brandenberg (sjbrandenberg@ucdavis.edu)
 Dongdong Chang (ddchana@ucdavis.edu)

Sponsor: California Department of Transportation

Contract Number: 59A0162

Project Period: October 1999 - June 2001




Photo courtesy of [Name]

Acknowledgments

This model test was funded by Caltrans under the direction of Abbas Abghari. The contents of this report do not necessarily represent a policy of that agency or an endorsement by the state government. The authors would like to acknowledge the suggestions and assistance of Abbas Abghari, Angel Perez, Dan Wilson, Tom Kohnke, Chad Justice, Tom Coker, Bill Shuis, Kiran Manda, Michael White, David Stevens and Hideo Nakajima.

Test Name	Test Date	Test Description
PDS01	April 2000	Three single piles with various diameters and a two-pile group. Lateral spreading of a moderately overconsolidated nonliquefiable clay crust overlying a medium-thick deposit of liquefiable sand overlying dense sand. Crust at 2° slope. Three Kobe motions. Centrifugal acceleration = 38.1g
PDS02	August 2000	Six-pile group (2x3) with a large embedded pile cap. Lateral spreading of a moderately overconsolidated nonliquefiable clay crust overlying a medium-thick deposit of liquefiable sand overlying dense sand. Crust at 4° slope. Two Kobe motions. Centrifugal acceleration = 38.1g

UC Davis CGM - Microsoft Internet Explorer

Address: <http://cgm.engineering.ucdavis.edu/Research/projects/pds/sjb01.html>

[Center for Geotechnical Modeling](#) Project Name: [Behavior of Piles in Laterally Spreading Ground During Earthquakes](#)

SJB01 - Centrifuge Data Report

UCD/CGMDR-01/02 "Behavior of Piles in Laterally Spreading Ground During Earthquakes - Centrifuge data report for SJB01."
 S.J. Brandenberg, P. Singh, R. W. Boulanger, and B. L. Kutter.

Data report pdf file [cgmldr0102.pdf \(6.9 MB\)](#)

General layout of the model test: [sjb01 layout.pdf \(9 KB\)](#)

Raw Data Files in Prototype Units

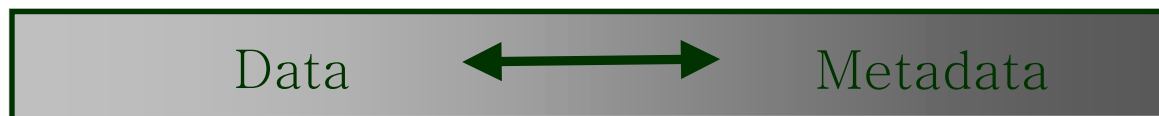
Shaking event	File Description	Data file in PRN format - prototype units.
SJB01_01	Step Wave	sjb01_01.zip (481 KB)
SJB01_02	Small Santa Cruz Motion	sjb01_02.zip (807 KB)
SJB01_03	Med. Santa Cruz Motion	sjb01_03.zip (900 KB)
SJB01_04	Large Santa Cruz Motion	sjb01_04.zip (752 KB)
SJB01_05	Large Kobe Motion	sjb01_05.zip (904 KB)
SJB01_06	Large Kobe Motion	sjb01_06.zip (921 KB)
SJB01_Santa Cruz	Events 02, 03 & 04 in sequence.	sjb01_santacruz.zip (2.4 MB) Note: This file contains the records for events 02, 03, & 04 in sequence. This sequential listing can be useful for tracking certain measurements across the 3 main events.
SJB01_Kobe	Events 05 & 06 in sequence.	sjb01_kobe.zip (1.7 MB) Note: This file contains the records for events 05, & 06 in sequence. This sequential listing can be useful for tracking certain measurements across the 3 main events.

Digital Photos



Metadata and Data

- Metadata = data about data
- Metadata has different meanings depending on expertise domains
- In Earthquake Engineering, metadata document the process of data generation so that one can understand how data were obtained
- Metadata models glue together various data
- Fuzzy distinction between data and metadata?





Data Language: XML and XML Schemas

- The eXtensible Markup Language (XML) (<http://www.w3.org/XML/>) has become a standard for exchanging data.
- XML is a meta-markup language that consists of a set of rules for creating semantic tags used to describe data
 - `<element attribute= ...></element>`.
- XML
 - wide acceptance from the computer industry, Microsoft, AutoCAD, IBM and Oracle.
 - widely used for defining data models.
 - object-oriented structure and readability extensibility.
 -
- XML Schemas (<http://www.w3.org/XML/Schema>)
 - provide a means for defining the structure, content and semantics of data models.
 - components such as type definitions and element declarations.
 - used to assess the validity of well-formed attributes, and may specify default values for attributes and attribute types.
- The schema-validity assessment checks the constraints on attributes, and can be used to model the constraints imposed on data models.



Metadata Languages: RDF

- RDF = Resource Description Framework (<http://www.w3.org/RDF/>)
- developed by the World-Wide Web Consortium (W3C),
- Metadata interoperability across different communities.
- RDF provides a Syntax and Schema specification.
- RDF key concepts
 - graph data model
 - URI (Uniform Resource Identifier)-based vocabulary and node identification
 - data types
 - Literals
 - XML serialization syntax
 - expression of simple facts and entailment.
- RDF extends the XML model and syntax for describing resources.
- RDF utilizes the XML namespaces and allows to identify uniquely a set of properties.

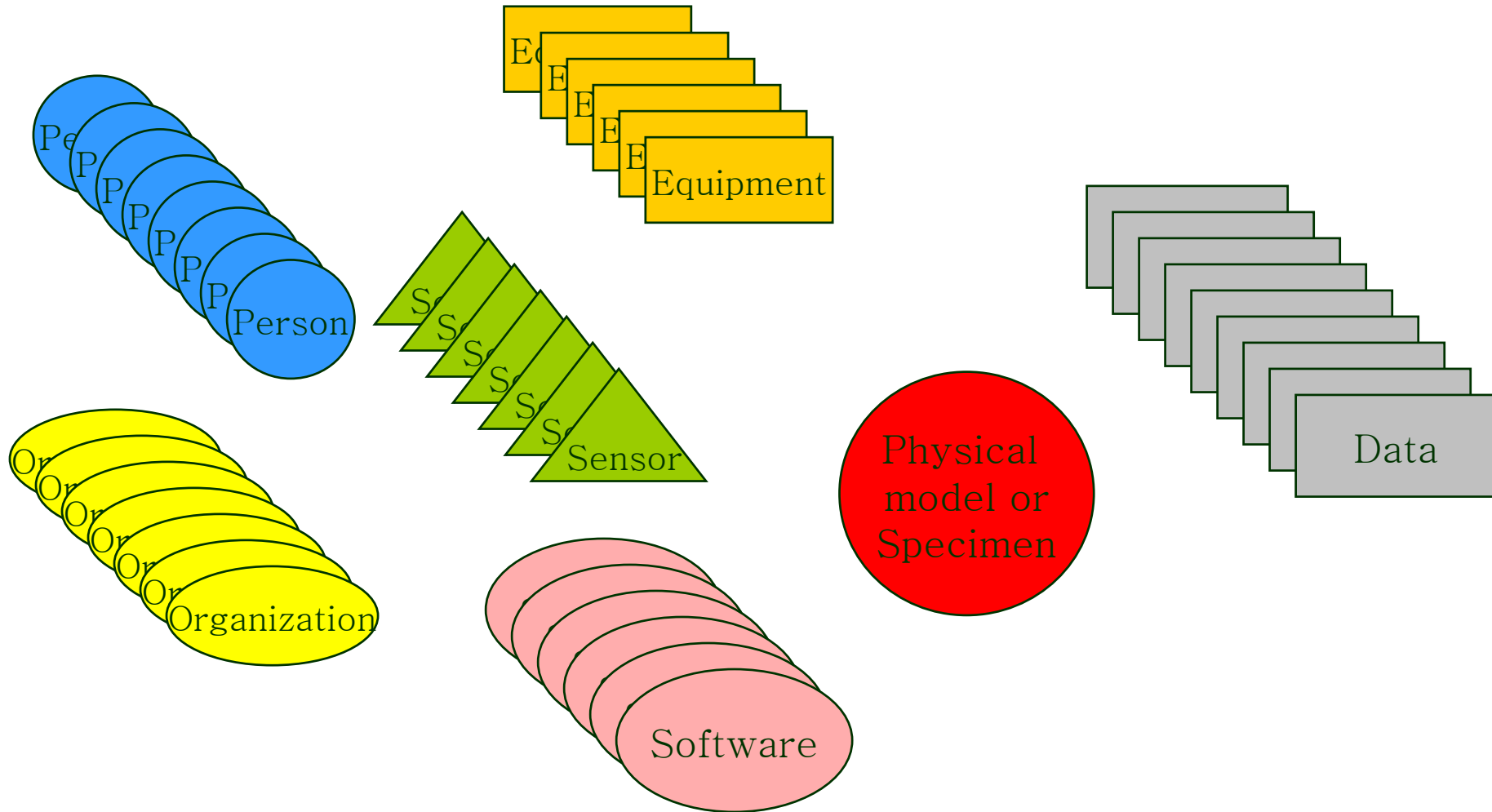


Metadata Languages: OWL

- Ontologies define a common vocabulary for researchers who need to share information in a technical domain.
- Machine-interpretable definitions of basic concepts in a domain and relations among them.
- Originated in Artificial-Intelligence, ontologies have become common on the World-Wide Web to categorize information on large Web sites (e.g., Yahoo!) and products for sale (e.g., Amazon.com).
- Many disciplines now develop ontologies which domain experts can use to share and annotate information
 - SNOMED in Medicine
- OWL (Web Ontology Language) is for processing the content of information instead of just presenting information to humans.
- OWL facilitates greater machine interpretability of Web content than XML and RDF by providing additional vocabulary and a formal semantics.



How to define and relate NEES objects





Metadata modeling using Protégé

The screenshot displays the Protégé software interface for metadata modeling. The main window is titled "Prompt" and shows the "Person" class selected in the "Subclass Relationship" view. The "Person" class is defined as a subclass of "owl:Thing".

The "Person" class is defined with the following properties:

- Name: Person
- Property: rdfs:comment

The "Person" class is also defined with the following asserted constraints:

- owl:Thing (NECESSARY & SUFFICIENT)
- address ≤ 1 (NECESSARY)
- email ≥ 0 (NECESSARY)
- firstName = 1 (NECESSARY)
- homePage ≤ 1 (NECESSARY)
- lastName = 1 (NECESSARY)
- phone ≥ 0 (NECESSARY)
- title ≥ 0 (NECESSARY)

The "Person" class is also defined with the following properties:

- address
- email
- firstName
- homePage
- lastName
- phone
- title

The "Person" class is also defined with the following constraints:

- Disjoints

The interface includes a menu bar (Project, Edit, Window, OWL, Wizards, Code, Help, Prompt), a toolbar, and a status bar at the bottom with "Logic View" and "Properties View" options.



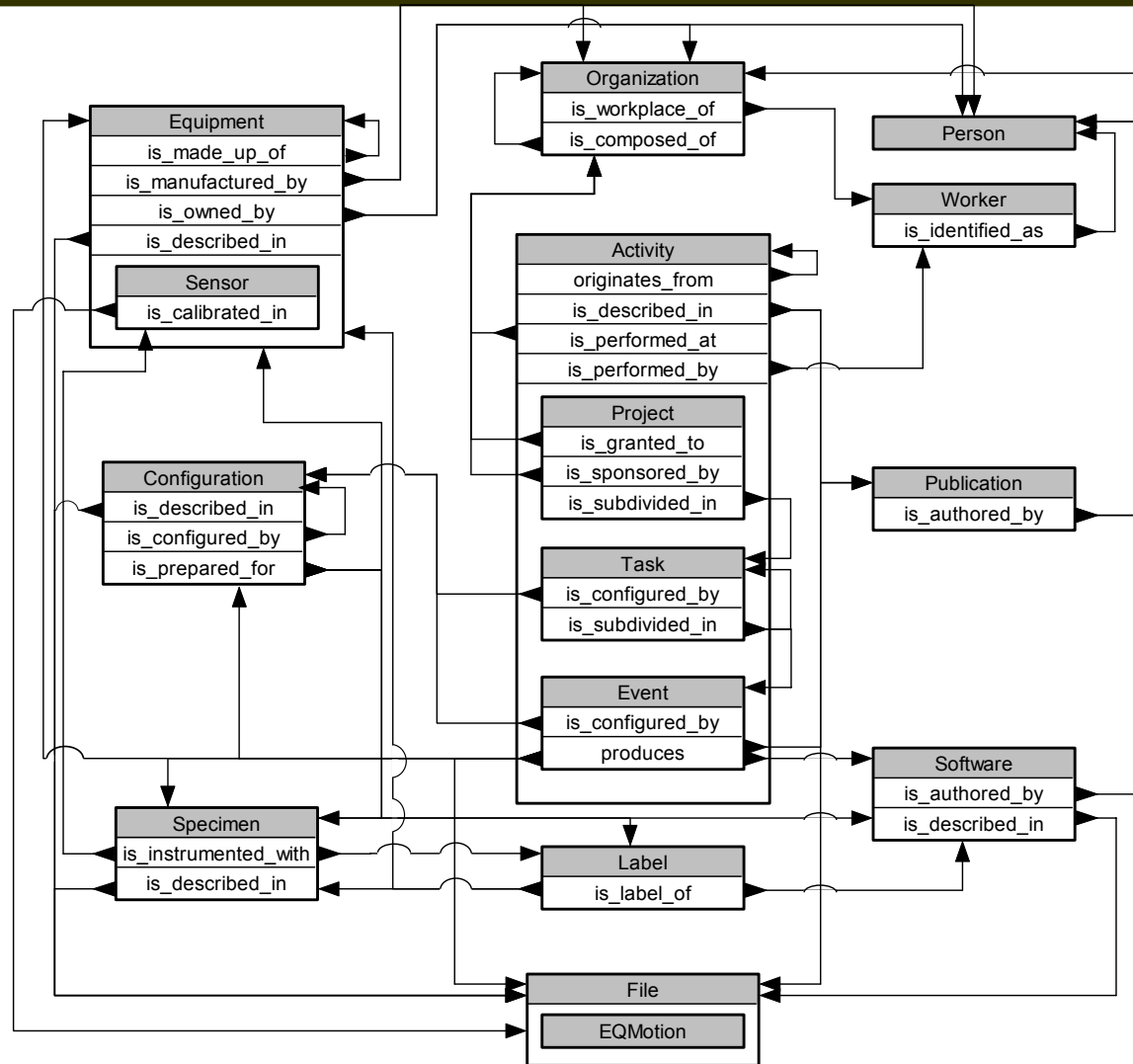
NEES Metadata Attributes and Relationships

Attribute	Brief definition	Data type	Used by Class(es)
<i>acknowledgements</i>	acknowledgements in a Project	String	Project
<i>address</i>	mailing address for Person and Organization	String	Person, Organization
<i>contractID</i>	a contract number different NEESCode		Project
<i>description</i>	a descriptive text, consisting of a few sentences and corresponding to name.	String	File, Specimen, Equipment, Sensor, Configuration, Organization, Software, Activity, Organization, Publication
<i>email</i>	email address		Person
<i>endDate</i>	date of planned completion for Task and Project	Date	Project, Task
<i>endDateTime</i>	date and time of actual completion for Event	DateTime	Event
<i>fileType</i>	type of file	String Enumeration	File
<i>firstName</i>	first name of a Person	String	Person
<i>homePage</i>	web page	URI	Person, Organization, Software
<i>keyWords</i>	key words characterizing a Project and/or Publication	String	Publication, Project
<i>lastName</i>	last name of a Person	String	Person
<i>maxValue</i>	maximum value of time series in earthquake motion file	Float	EQMotion
<i>name</i>	a short description like a figure caption or a section heading, usually complemented by <i>description</i> .	String	File, Organization, Configuration, Activity, Specimen

Class calling	Attribute	Point to instances of
Publication, Software	<i>is_authored_by</i>	Person, Organization
Sensor	<i>is_calibrated_in</i>	File
Organization	<i>is_composed_of</i>	Organization
Task, Event, Configuration	<i>is_configured_by</i>	Configuration
Configuration, Specimen, Software, Equipment, Project, Task, Event	<i>is_described_in</i>	File, Publication
Worker	<i>is_identified_as</i>	Person
Project	<i>is_granted_to</i>	Organization
Specimen	<i>is_instrumented_with</i>	Sensor, Label
Label	<i>is_label_of</i>	Specimen, Equipment, Sensor, Software
Equipment	<i>is_made_up_of</i>	Equipment
Equipment	<i>is_manufactured_by</i>	Organization, Person
Equipment	<i>is_owned_by</i>	Person, Organization
Project, Task, Event	<i>is_performed_at</i>	Organization
Project, Task, Event	<i>is_performed_by</i>	Worker
Configuration	<i>is_prepared_for</i>	Label, Specimen, Equipment, Sensor, Software
Project	<i>is_sponsored_by</i>	Organization
Project, Task	<i>is_subdivided_in</i>	Task, Event
Organization	<i>is_workplace_of</i>	Worker
Project, Task, Event	<i>originates_from</i>	Project, Task, Event
Event	<i>produces</i>	File, Software, Specimen, Equipment, Publication, Configuration

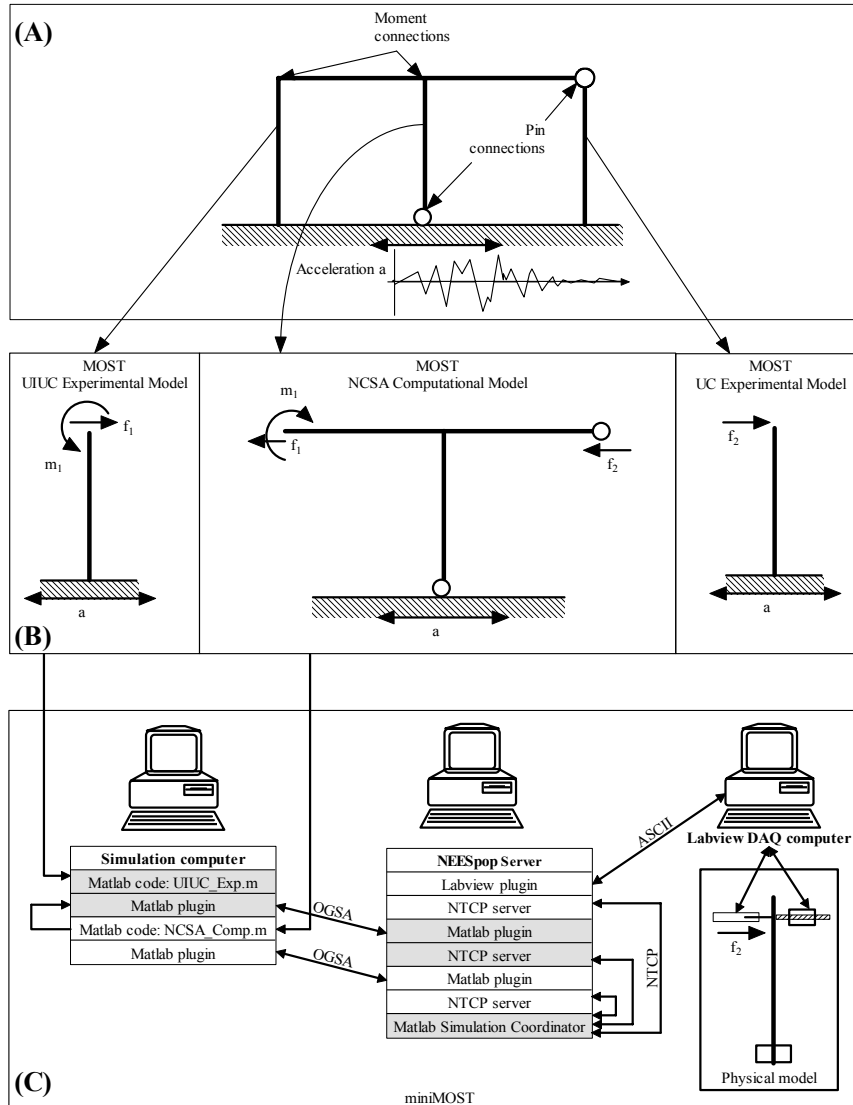


NEES Metadata Relationships



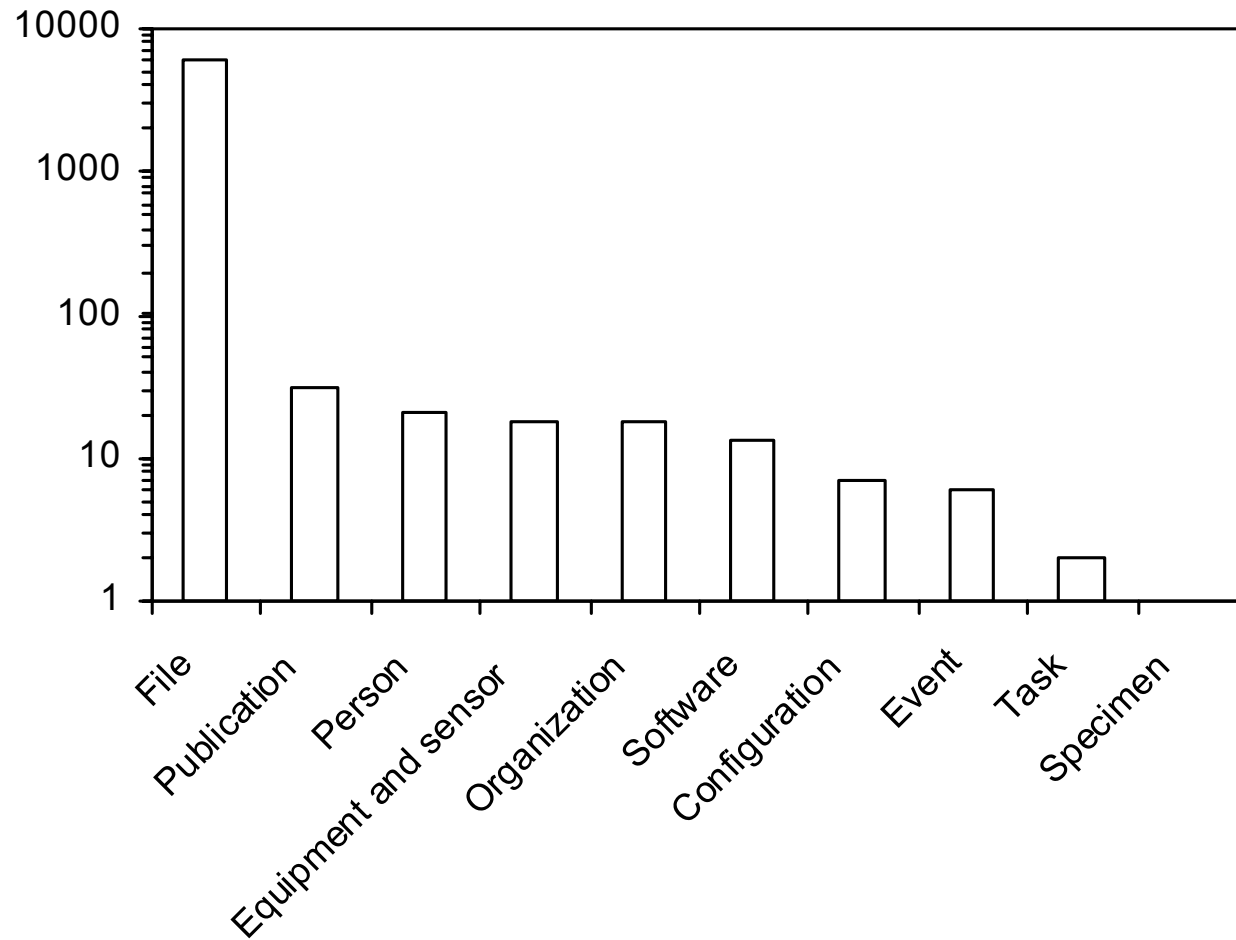


NEES miniMOST Experiment





NEES objects for miniMOST





NEES miniMOST

Display Slot

D name

Direct Instances V C [Icons]

- Drawing of base plate
- Drawing of L-shape anti spinner
- Drawing of test beam
- Folder of files for Matlab simulati...
- Folder of files generated by DAQ ...
- List of parts to be manufactured & ...
- Log file generated by DAQ comp...
- Matlab code NCSA_Comp_Site...
- Matlab code UIUC_Exp_Site.m1...
- Metadata file generated by the DA...
- NEESpop_requirement
- Parts of miniMOST experiments
- Photograph of NI PCI-6036E
- Photograph of actuator
- Photograph of beam anchorage u...
- Photograph of cable SH6868EP
- Photograph of computer used in ...
- Photograph of load cell
- Photograph of LVDT and signal c...
- Photograph of NI BNC connectio...
- Photograph of NI PCI-7342
- Photograph of NI stepper motor c...
- Photograph of overall setup for r...
- Photograph of SHC68 cable
- Photograph of strain gage glued ...
- Photograph of the beam displac...
- Photograph of the Omega meter
- Photograph of the overall setup o...
- Plane view of test setup
- Results file generated by DAQ co...
- Side view of actuator and beam
- Top view of actuator and beam

Photograph of the overall setup of miniMOST (type=File, name=Mini_MOST.jpg)

Name SameAs DifferentFrom

Mini_MOST.jpg

rdfs:comment

Annotations

Property	Value	Lang
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Name

Photograph of the overall setup of miniMOST

Description

The photograph shows the test beam, the actuator, and the LVDT sensor covered by a plexiglass enclosure

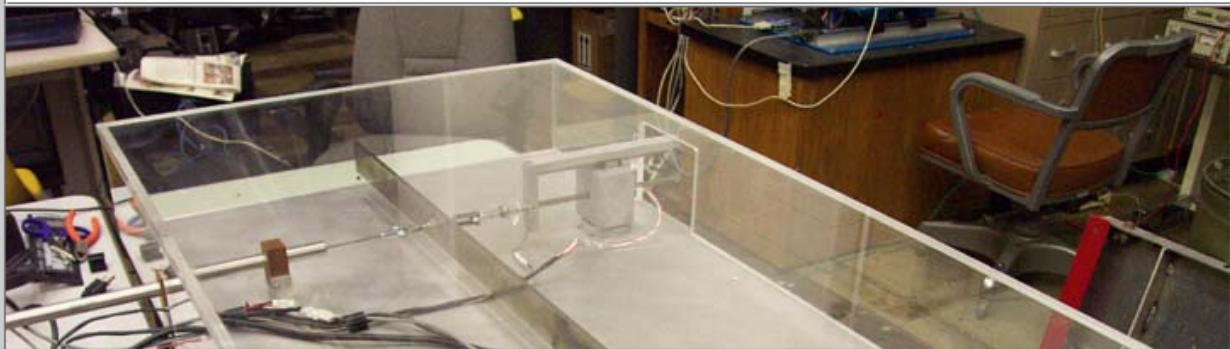
FileType

Photo

StartDateTime

URI

http://gees.usc.edu/NEES/MetadataModel/miniMOST/miniMOST/UIUC/figures/Mini_MOST.jpg





NEES miniMOST Web report

NEES Metadata Model Example - Microsoft Internet Explorer

Address: http://gees.usc.edu/NEES/MetadataModel/Examples/Case2/Index.html

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Project Title:
miniMOST-new

Description: The main purpose of the mini-MOST experiment is to show the capability of major NEESgrid service components using a small-scale physical experiment setup. The Multi-site Online Simulation Test (MOST) was conducted in July 30, 2003. MOST consisted of performing collaboratively tests and simulations at three different locations, each test/simulation modeling different parts of a frame. Compared to MOST, miniMOST uses small (mini) portable equipment, which can be easily moved to various places. However, the software involved in this experiment is similar to what was used for the MOST experiment and provides the same level of functionality and services. Therefore, miniMOST is a platform for students and researchers to become familiar with the NEESgrid software and to gain first-hand experience before conducting full-scale experiment. Moreover, the Mini-MOST experiment can also be utilized for the purposes of educational demonstration and software installation debugging.

Objectives: 1. Demonstrate NEESgrid capabilities using small-scale version of MOST 2. Initiate earthquake engineers to the capabilities of the NEES collaborative

Start Date: 02-01-04
End Date: 10-30-04

Keyword(s):

- NEESgrid
- Multi-site Online Simulation Test
- miniMOST

Detail of project can be accessed through task(s):

NEES Metadata Model Example - Microsoft Internet Explorer

Address: http://gees.usc.edu/NEES/MetadataModel/Examples/Case2/Index.html

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Detail of project can be accessed through task(s):

- [Task 1: Setting up a miniMOST experiment](#)
- [Task 2: Carrying out miniMOST experiments](#)

The project was granted to

- [Washington University in St Louis](#)

The project was sponsored by

- [National Science Foundation](#)

The project was carried out at the following site(s):

- [Department of Civil and Environmental Engineering, University of Illinois at Urbana-Champaign](#)
- [Washington University in St Louis](#)

The following persons were involved in the project:

- [Shirley Dyke](#) *principal investigator*
- [Erik A. Johnson](#) *senior investigator*
- [Rupa Purasinghe](#) *senior investigator*
- [Joy Pauschke](#) *NEES program director*
- [Jerome Lynch](#) *senior investigator*
- [JoAnn Browning](#) *senior investigator*

Acknowledgements:

This work was supported primarily by the George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES) Program of the National Science Foundation as a subaward to the University of Washington in St Louis from the Award Number CMS-0117853.

Publication(s):

- [Nakata, N., Yang, G., and Spencer, B. F., 2004, "System Requirements for Mini-MOST Experiment MUST-Sim facilities, University of Illinois, Urbana-Champaign](#)
- [NEESgrid, 2003, "The MOST experiment, July 30 2003," University of Illinois, Urbana-Champaign.](#)

NEES Metadata Model Example - Microsoft Internet Explorer

Address: http://gees.usc.edu/NEES/MetadataModel/Examples/Case2/Index.html

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Setup of physical model

Description: The miniMOST specimen is a cantilever beam. It is setup on a base plate as described in Giraldo and Myers (2004). The actuator is mounted on a L-shaped anti-spinner bracket.

Configured Equipment:

- [HSI Size 23 Non-Captive Linear Actuator](#)

Configured Specimen:

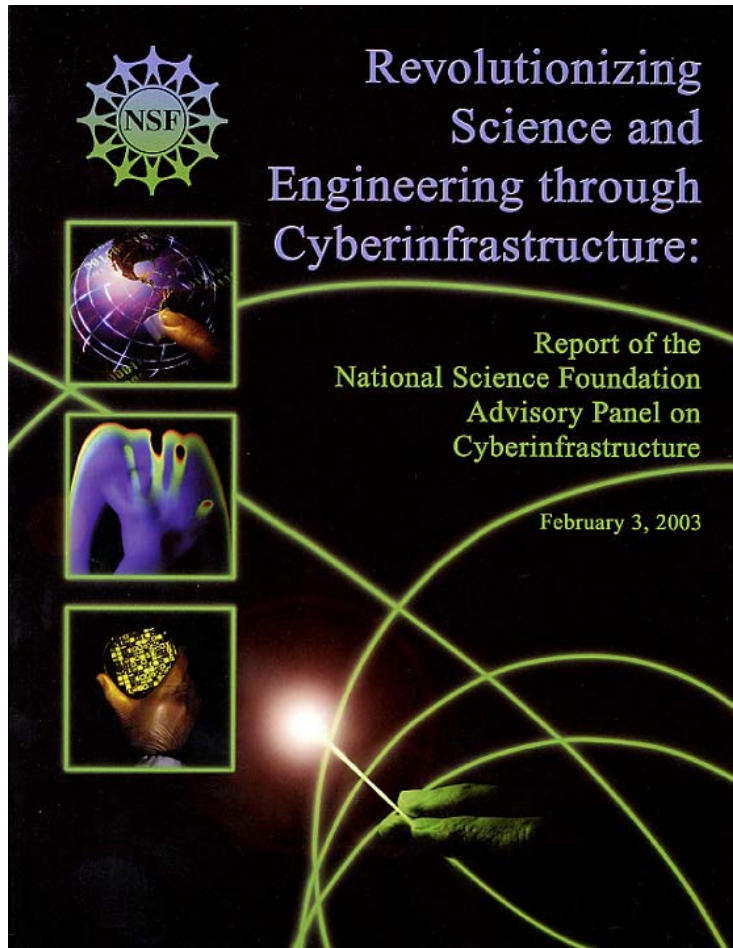
- [Test beam of miniMOST experiment](#)

File(s) Describing the Configuration:

Name	Date Created	Description
AutoCAD1 drawing of miniMOST		This AutoCAD file requires AutoCAD to be opened.
AutoCAD2 drawing of miniMOST		This AutoCAD file requires AutoCAD to be opened.
Drawing of base plate		The base plate is made of aluminum. It is 48 inch long, 30 inch wide, and 0.375 inch thick.
Drawing of L-shape anti spinner		The L-shape anti spinner is used to prevent the actuator from spinning, when the motor rotates.
Drawing of test beam		The test beam is made of steel. It is 45 inch long, 2 inch high, and 0.25 inch thick.
List of parts to be manufactured and purchased for miniMOST.		This excel workbook lists (a) the parts to be manufactured by the machine shop, (b) the parts to be purchased by the machine shop, and (c) the sensors to be purchased.
Plane view of test setup.		The plane view shows the linear actuator, the LVDT, the test



The Atkins Report

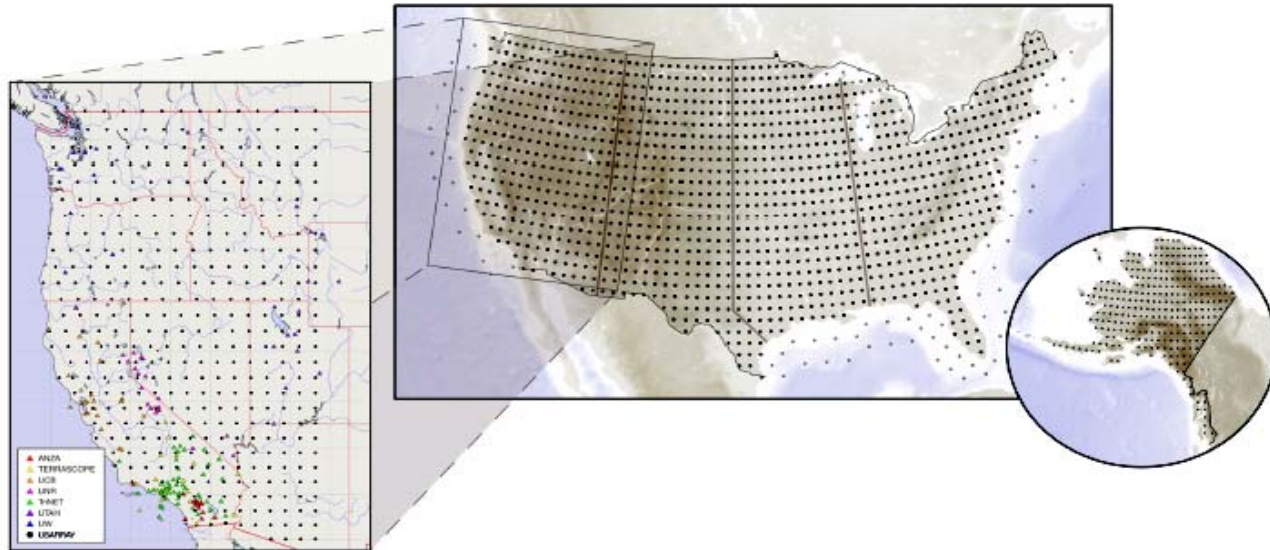


Vision:

- to provide an integrated system of hardware and software resources and services that
- enables scientists and engineers to explore important research and education opportunities *that otherwise would not be possible.*



Collaboratory: Earthscope



- **Explore the underlying geologic structures of north America.**
- **Generate basic scientific understanding of the evolution of the north American continent.**
- **Combined with new satellite and GPS systems, EarthScope will provide a dynamic picture of forces and processes that shape the earth, including those that control earthquakes and volcanic eruptions**
- **EarthScope will enhance the fundamental understanding necessary for improved experimentation, simulation and prediction through NEES.**

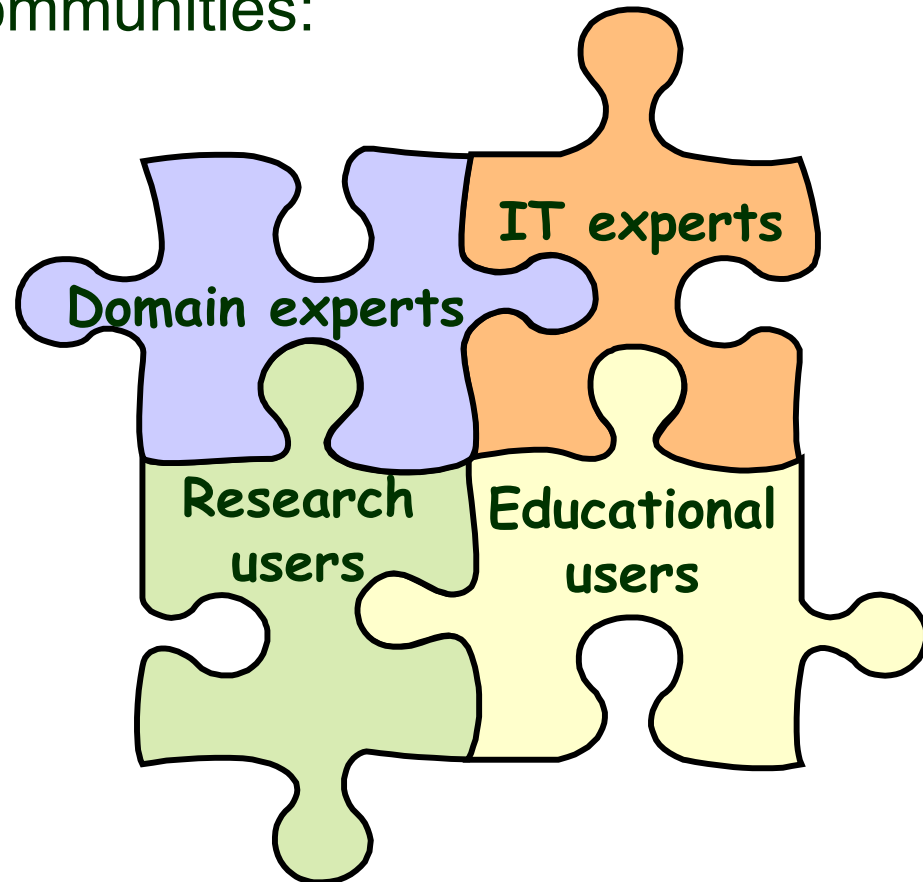


Lessons Learned From NEES

CyberInfrastructure is fundamentally a “human problem.”

Projects must engage all key communities:

- IT experts
 - ✓ Know what is possible
 - ✓ Can exploit IT advances
- Domain experts
 - ✓ Know what's appropriate
 - ✓ Can help avoid pitfalls
- Researchers and educational users
 - ✓ Understand priorities
 - ✓ Ultimately determine if infrastructure is usable





Conclusions/ Discussion Topics (1/2)

- Post-earthquake reconnaissance reports have evolved since 1994.
- Have we sufficiently preserved the information/data collected from past earthquakes? Can our students re-experience what we discovered in the field?
- The volume of information collected from earthquake reconnaissance will increase drastically in the future. How will we cope with it?
- Recommendation: Develop metadata/data models that capture time-stamped and geo-referenced events from various tools and ingest them into comprehensive data sets for immediate use by field researchers and later on for digital libraries.



Conclusions/ Discussion Topics (2/2)

- Field investigators need more efficient reconnaissance tools with transparent data logging.
- Recommendations:
 - Improve/simplify tools for post-earthquake reconnaissance
 - Create a communication center/digital library with downloadable information needed by earthquake reconnaissance, e.g., maps, GPS maps, PDA, laptop tools
 - Create a reverse dataflow from a command center to the field
- Coordinate post-earthquake reconnaissance with NEES data repository, other collaboratory and digital library.
- What about a GEER collaboratory?