Analytical and Computer Cartography Winter Quarter 2017

Lecture 16:
The NSDI and a Digital Earth

What is the NSDI?

National Spatial Data Infrastructure

". . .the technology, policies, standards, and human resources necessary to acquire, process, store, distribute, and improve the utilization of geospatial data."

What is the NSDI?

- Organizations and individuals cooperating
- Using electronic technology to help find and share geographic information
- Following mutually accepted standards
- Developing common base themes of data

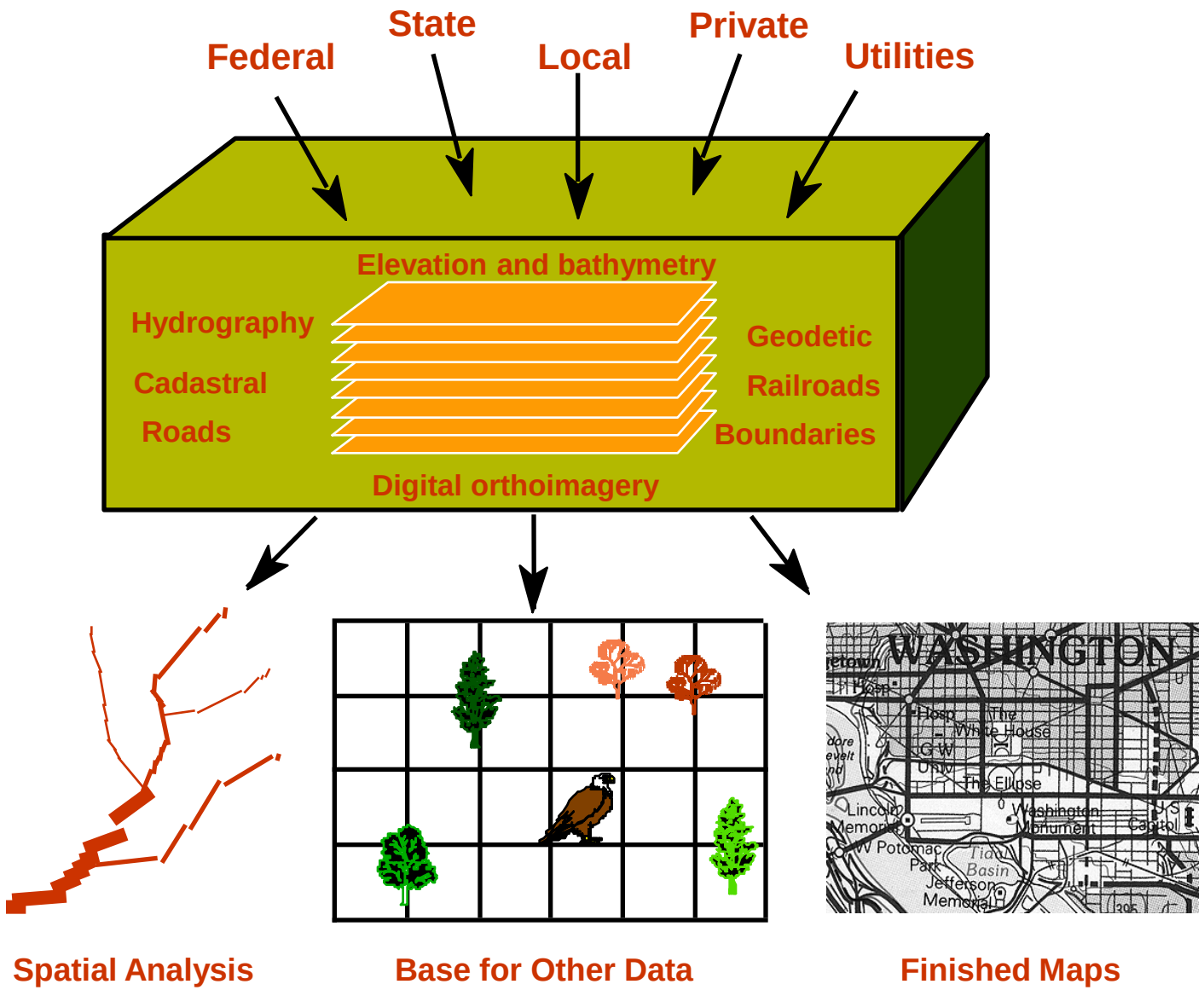
In reality….

- Data are hard to find
- Data are difficult to access
- Data are hard to integrate
- Data are not current
- Data are undocumented
- Data are incomplete

Two types of data

- Community-developed data sets usually derived for a single purpose but made available for potential re-use
- Data sets developed to a common content specification for high re-use potential. These are known as “Framework” data.

Framework Data



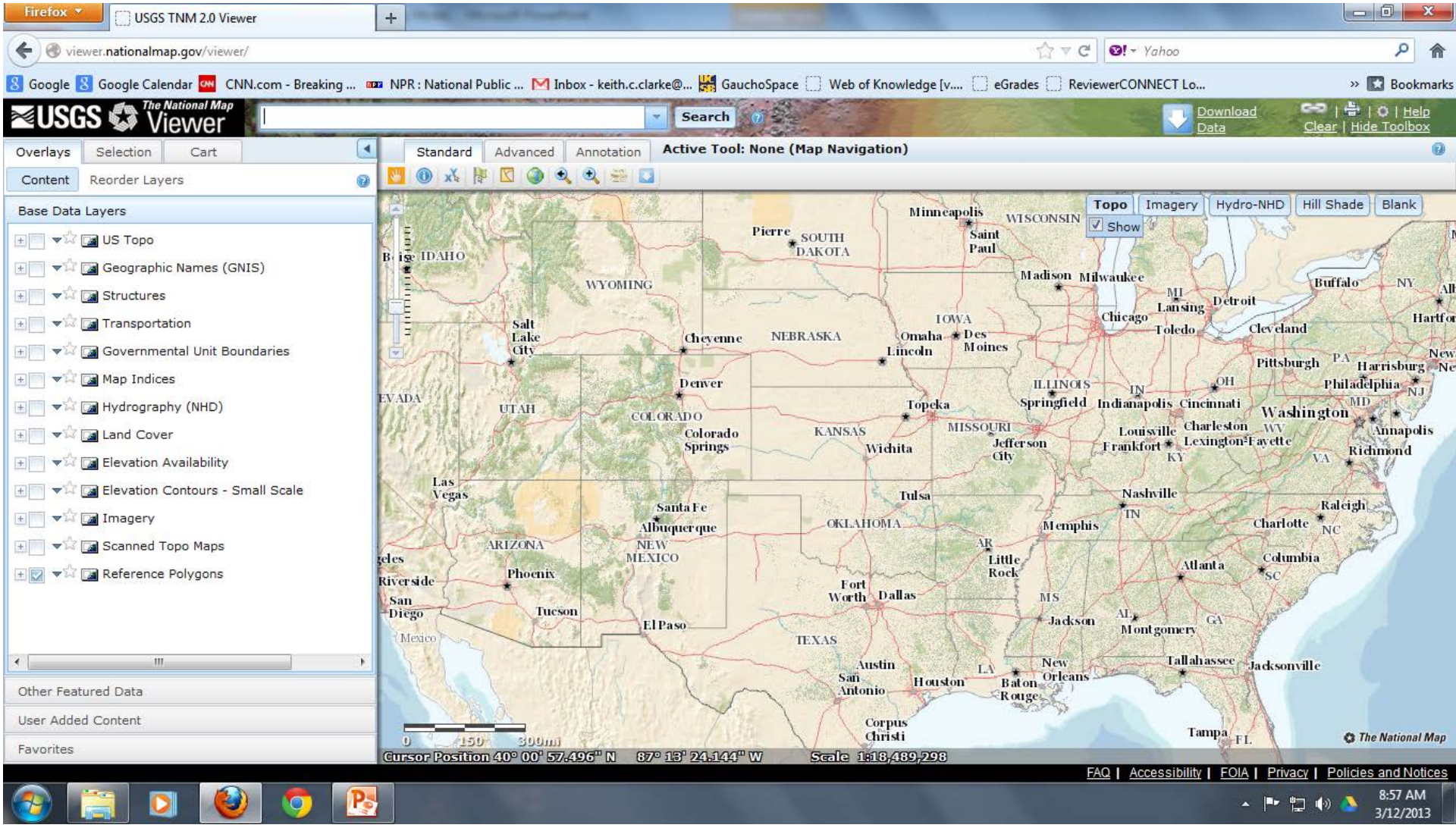
Metadata: Data about data

- Provides documentation of existing internal geospatial data resources within an organization *(inventory)*
- Permits structured search and comparison of held spatial data by others *(advertising, discovery)*
- Provides end-users with adequate information to take the data and use it in an appropriate context *(liability)*

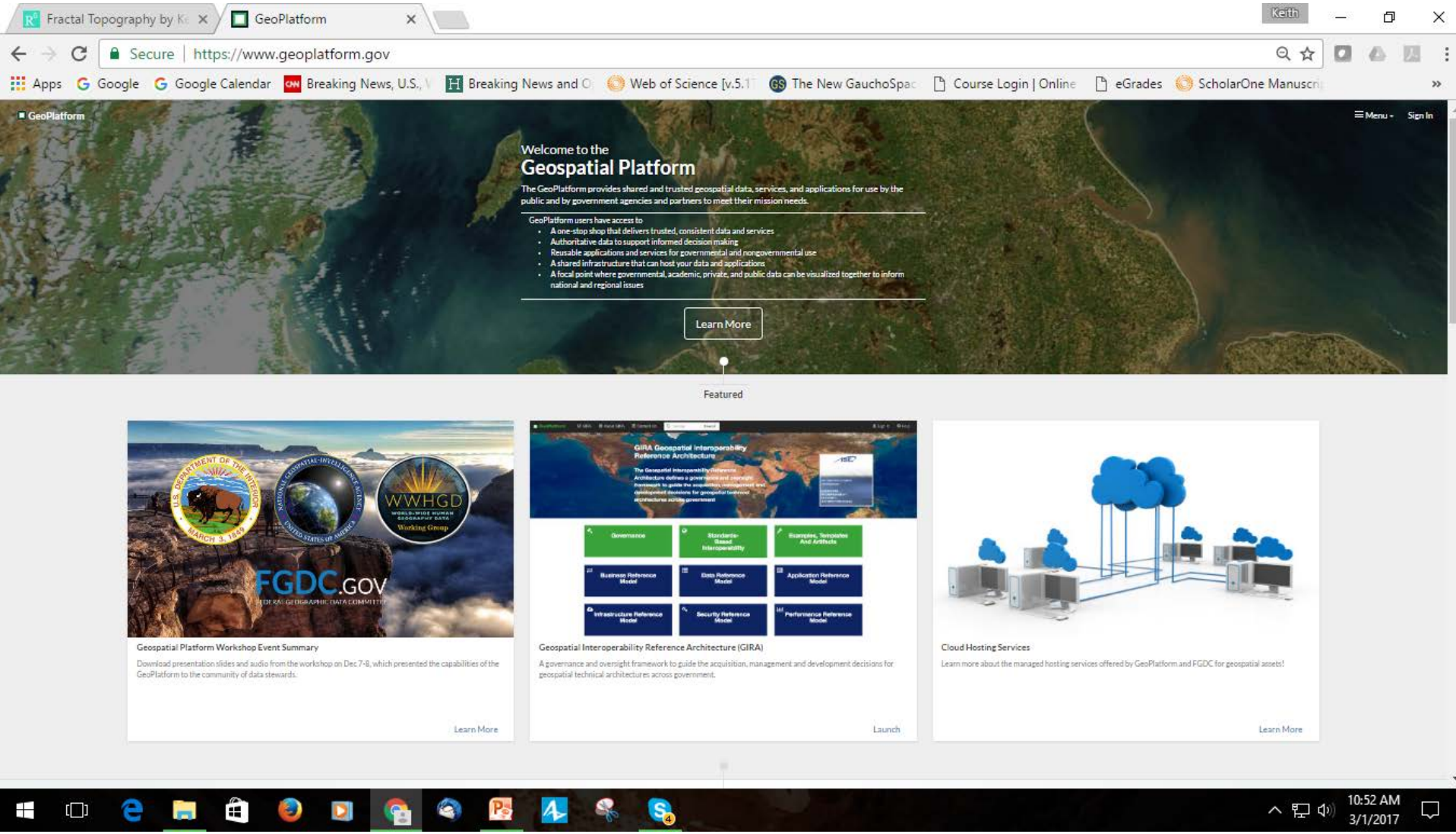
Clearinghouses provide...

- Discovery of spatial data
- Distributed search worldwide
- Uniform interface for spatial data searches
- Advertising for your data holdings
- Means to clip, restructure and download

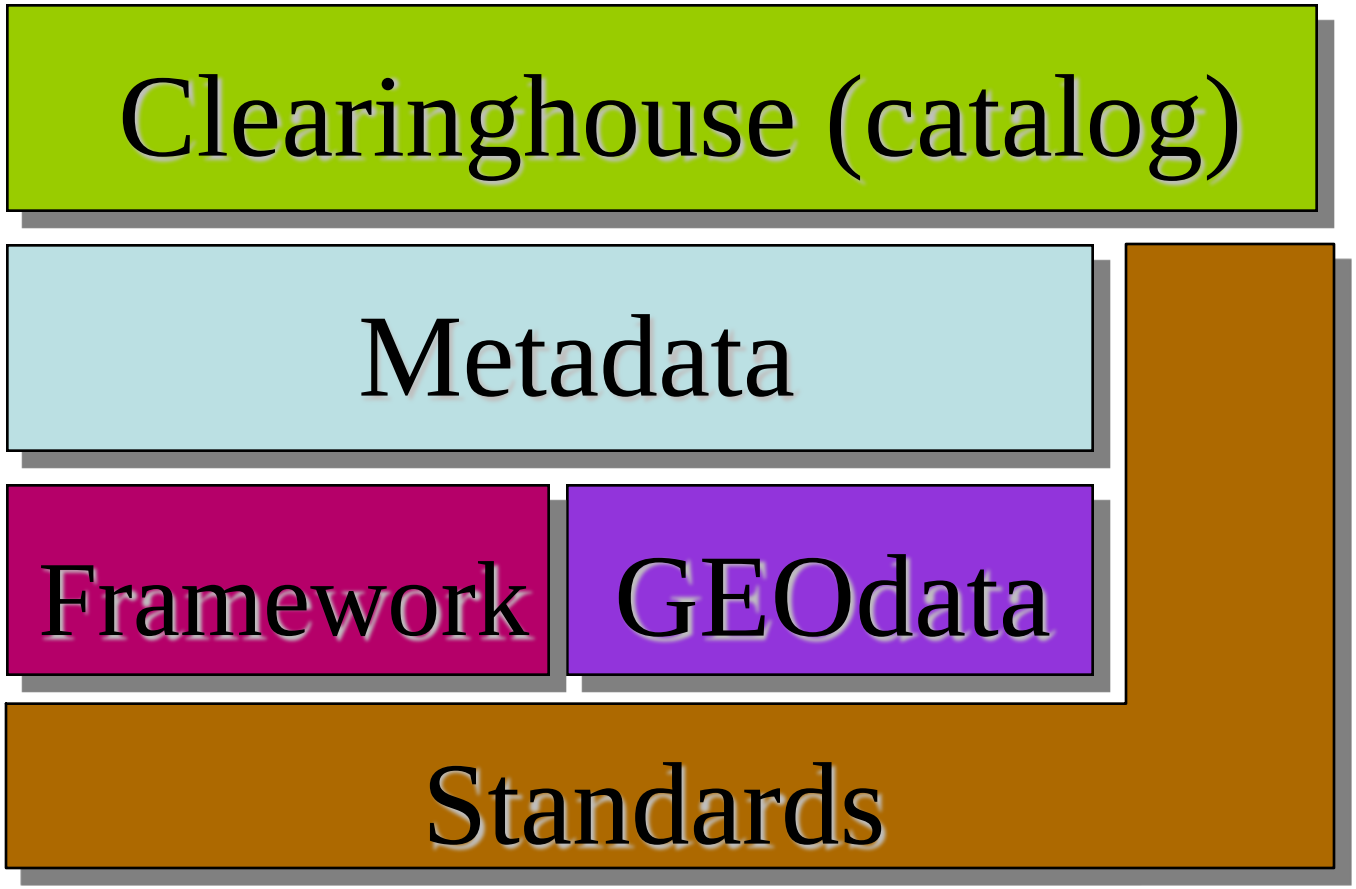
e.g. the National Map Viewer



e.g.Geoplatform.gov



NSDI Components



Partners in FGDC

- 15 Federal Agencies within the U.S. Government
- 18 State or regional affiliated agencies
- FGDC is Principal Member of the OpenGIS Consortium
- Coordinates with the National Association of Counties (NACO) and National States Geographic Information Council (NSGIC)

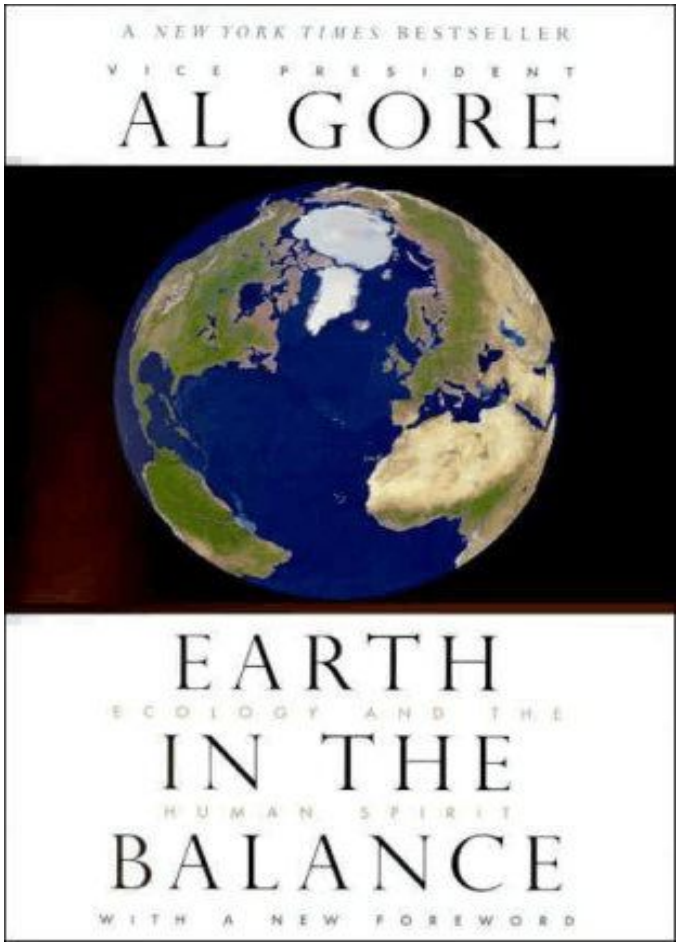
NSDI today

- FGDC working on next generation of vision
- Open Geospatial Consortium has lead on standards
- Host of Federal initiatives, GeoSpatial One Stop, eGovenment, Imagery for the Nation, National GIS
- Emerging GSDI

NSDI and Digital Earth

- Beyond portals and data supply
- Framework concept has led to much embellishment, e.g. TIGER
- GeoBrowsers now commonplace, BingMaps, GoogleEarth, etc.
- Could the current situation, both bottom-up and top-down, lead to a DE?

Gore's *Earth in the Balance* (1992)



"A multi-resolution, three dimensional representation of the planet, into which we can embed vast quantities of geo-referenced data."

Source: http://www.filmweb.no

Gore’s DE Vision

- What is digital earth?
- Do we have it today?
- If not, what more do we need?
- What advantages does a DE offer?

Gore's Digital Earth: 1998

"Imagine, for example, a young child going to a Digital Earth exhibit at a local museum. After donning a head-mounted display, she sees Earth as it appears from space. Using a data glove, she zooms in, using higher and higher levels of resolution, to see continents, then regions, countries, cities, and finally individual houses, trees, and other natural and man-made objects. Having found an area of the planet she is interested in exploring, she takes the equivalent of a 'magic carpet ride' through a 3-D visualization of the terrain. Of course, terrain is only one of the numerous kinds of data with which she can interact. Using the system's voice recognition capabilities, she is able to request information on land cover, distribution of plant and animal species, real-time weather, roads, political boundaries, and population. She can also visualize the environmental information that she and other students all over the world have collected as part of the GLOBE project. This information can be seamlessly fused with the digital map or terrain data. She can get more information on many of the objects she sees by using her data glove to click on a hyperlink. To prepare for her family's vacation to Yellowstone National Park, for example, she plans the perfect hike to the geysers, bison, and bighorn sheep that she has just read about. In fact, she can follow the trail visually from start to finish before she ever leaves the museum in her hometown.

She is not limited to moving through space, but can also travel through time. After taking a virtual field-trip to Paris to visit the Louvre, she moves backward in time to learn about French history, perusing digitized maps overlaid on the surface of the Digital Earth, newsreel footage, oral history, newspapers and other primary sources. She sends some of this information to her personal e-mail address to study later. The time-line, which stretches off in the distance, can be set for days, years, centuries, or even geological epochs, for those occasions when she wants to learn more about dinosaurs." (U.S. Vice President Al Gore, in a speech written for presentation at the California Science Museum, Los Angeles, January 1998)

Gore's Digital Earth

Hardware

- virtual digital globe display
- head-mounted display (immersive VR)
- data glove

Interactive Capabilities

- voice recognition
- zoom
- search
- 3-D visualization and movement
- time-lines

Source: www.5dt.com

Interactive capability

- Voice recognition
- Navigation
- Zoom: “Drill down”: Progression
- Search
- 3-D visualization and movement
- Time-line
- Multimedia : web portals

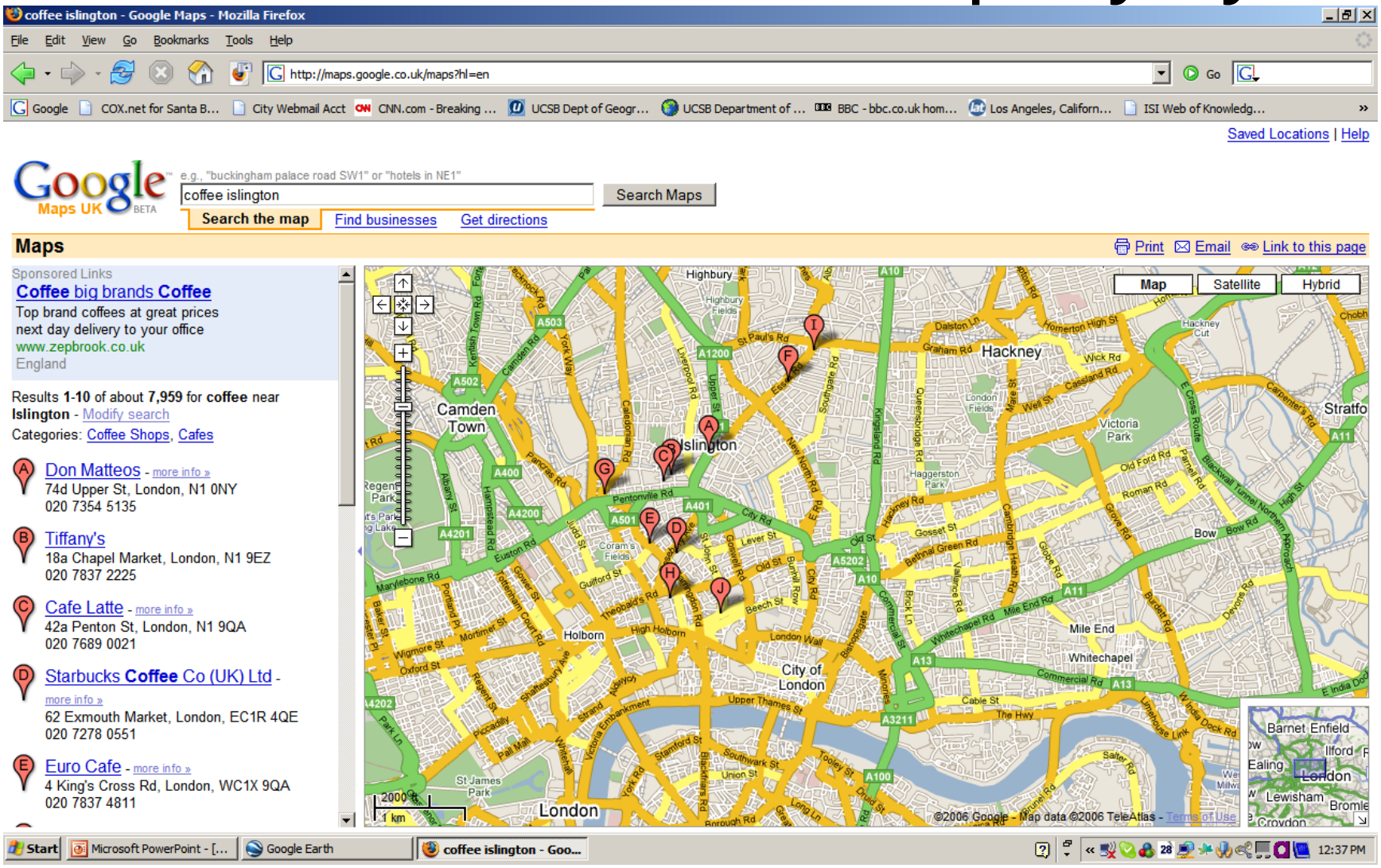
Gerhard Mercator: Terrestrial globe, 1541
© Österreichische Nationalbibliothek

“This giant, 200-foot diameter sphere will be a miniature earth -- the most accurate global representation of our planet ever to be realized." "This…*Geoscope* would make it possible for humans to identify the true scale of themselves and their activities on this planet. Humans could thus comprehend much more readily that their personal survival problems related intimately to all humanity's survival." — R. Buckminster Fuller, 1962

The Geoscope, as drawn by Tom Shannon, for the Buckminster Fuller Institute

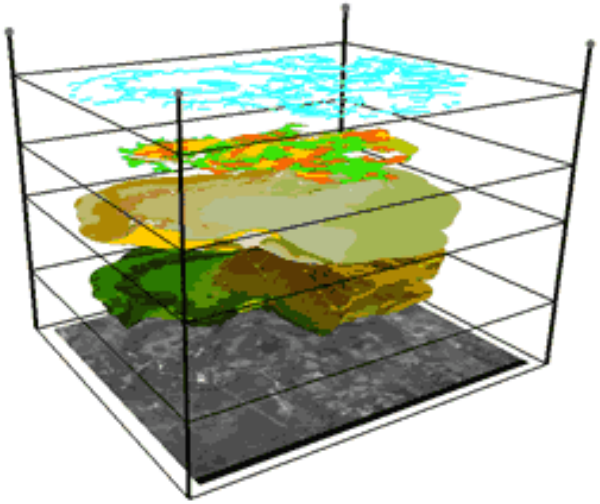
Mary Baker Eddy Library for the Betterment of Humanity 1935

Coordinates and Interaction
Text-based search: Toponymy



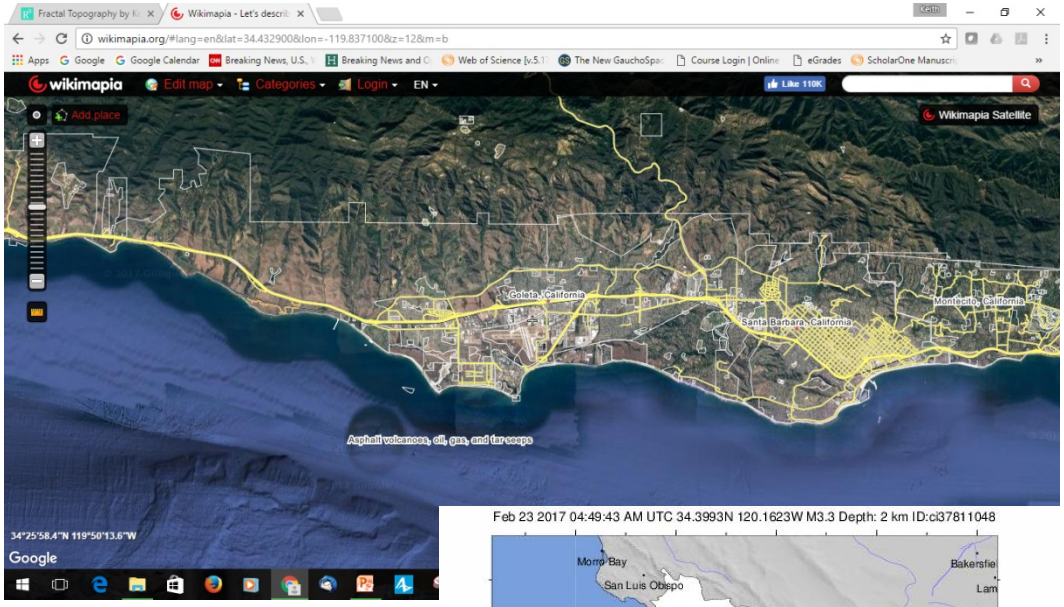
Content

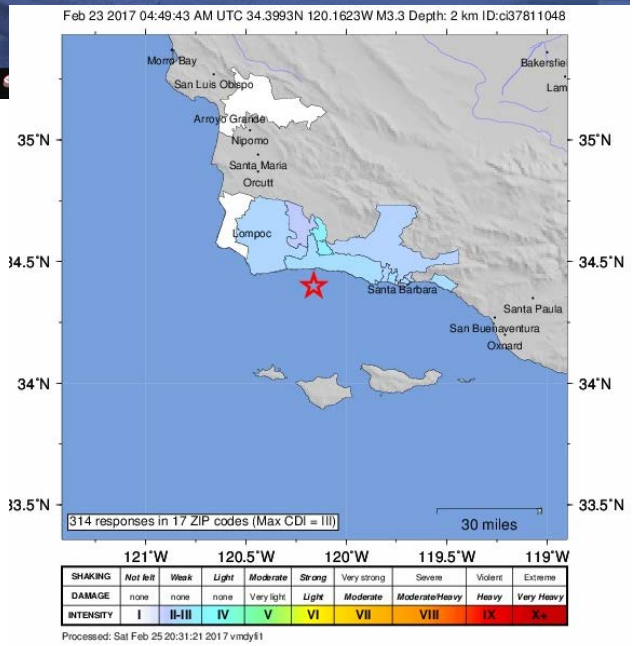
- “numerous kinds of data” = Themes
- Participant content
- Seamlessly fused
- Hyperlinks
- Multi-temporal

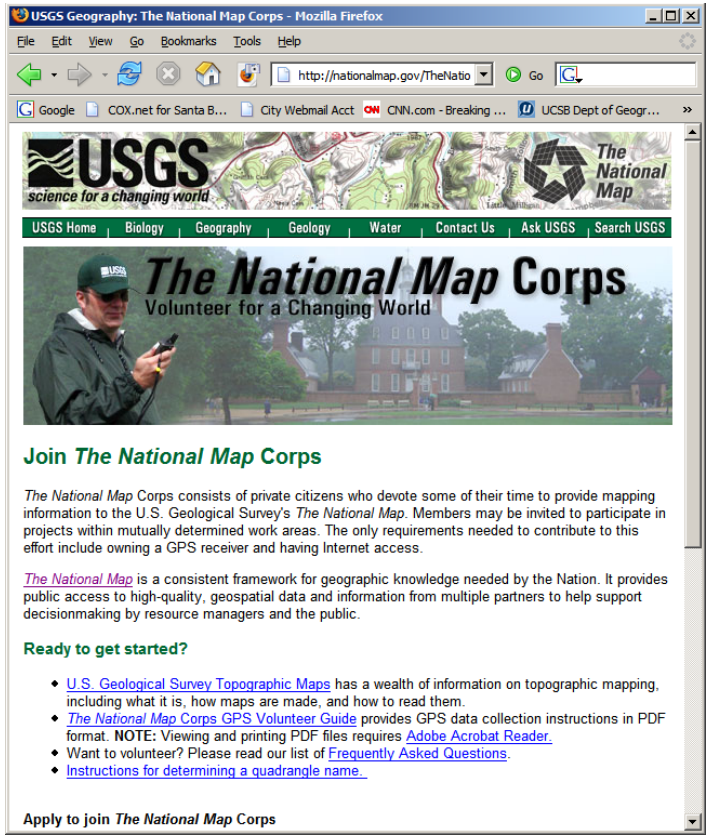


http://www.ruraltech.org

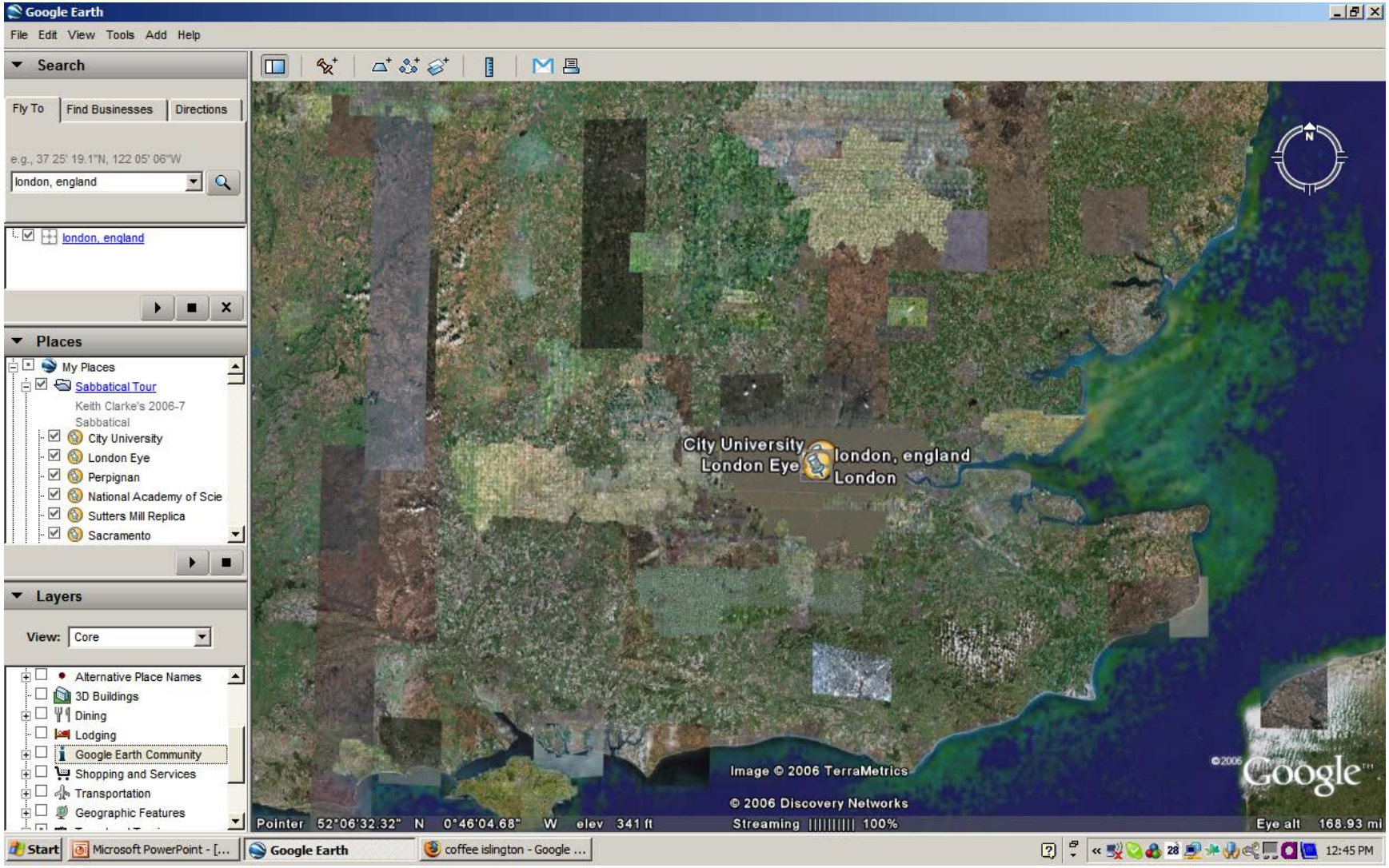
Participant Content





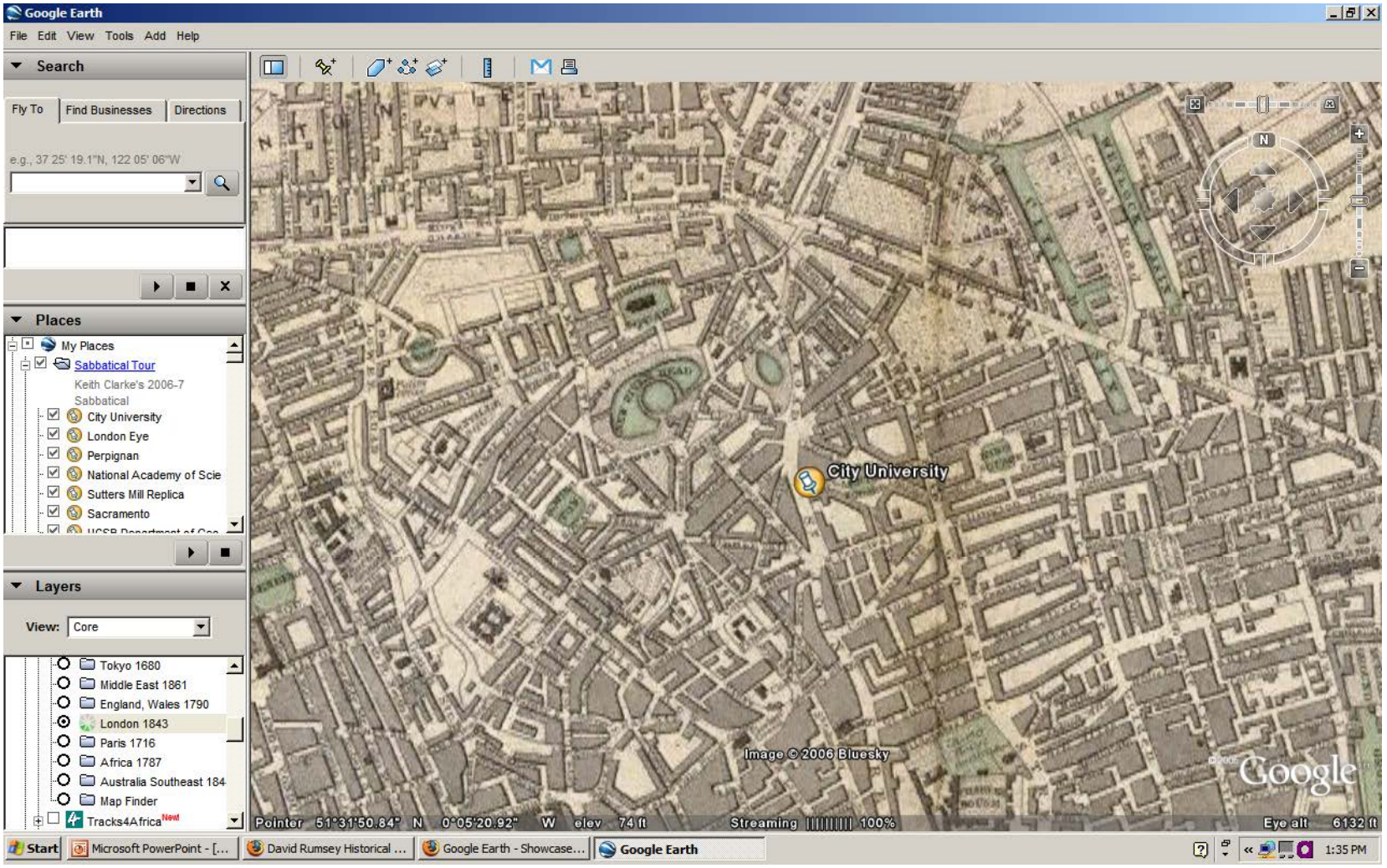


“Seamlessly fused” Time and space

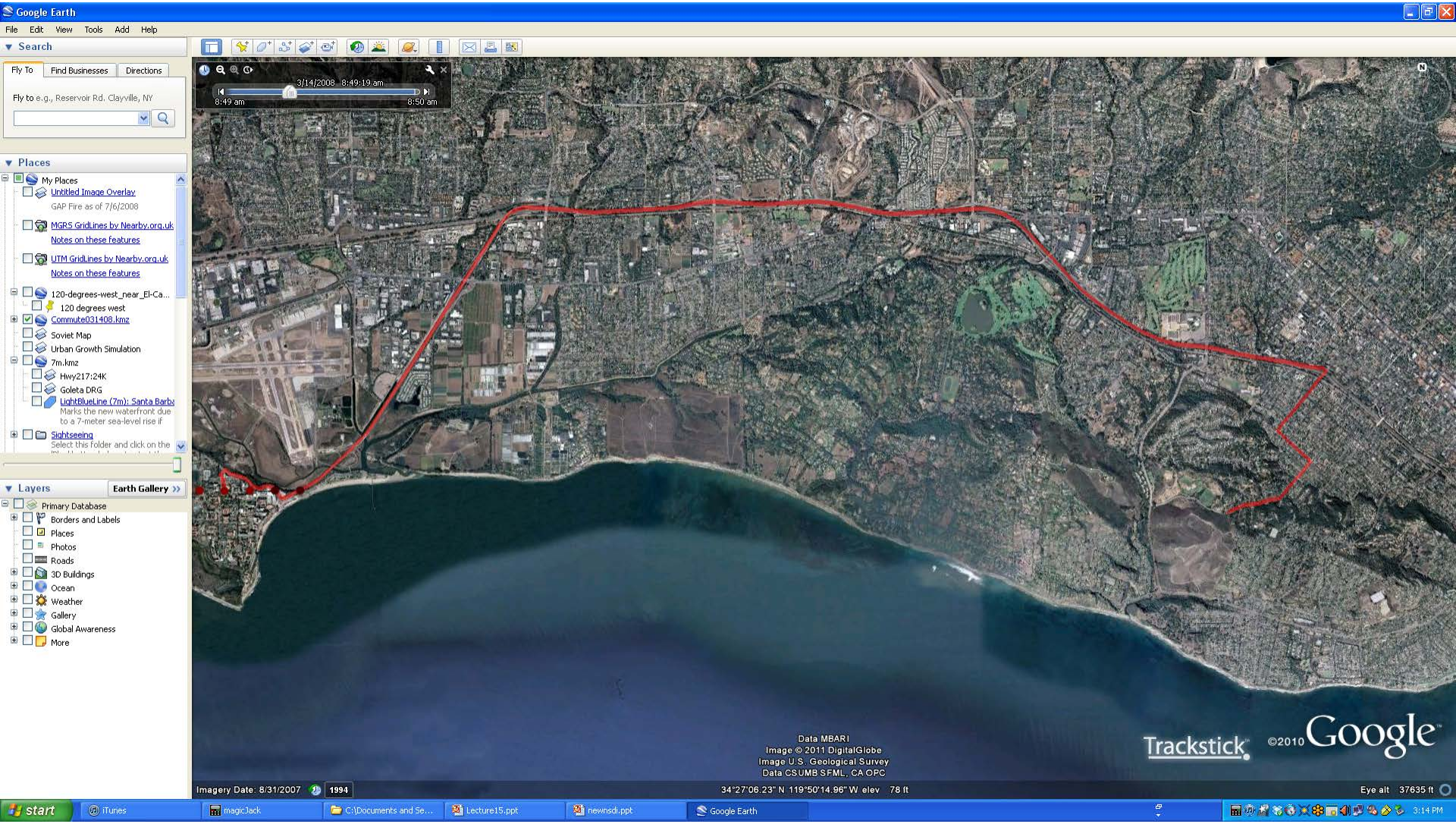


Seamless Manhattan?

Multi-temporal: Rumsey Map Collection



Timeline


Google Earth
File Edit View Tools Add Help
Search
Fly To
Find Businesses
Directions
Fly to e.g., Reservoir Rd, Clayville, NY
Places
My Places
Untitled Image Overlay
GAP Fire as of 7/6/2008
MGRS GridLines by Nearby.org.uk
Notes on these features
UTM GridLines by Nearby.org.uk
Notes on these features
120 degrees west
Commute031408.kmz
Soviet Map
Urban Growth Simulation
7m.kmz
Hwy217:24K
Goleta DRG
Marks the new waterfront due to a 7-meter sea-level rise if
Sightseeing
Layers
Earth Gallery
Primary Database
Borders and Labels
Places
Photos
Roads
3D Buildings
Ocean
Weather
Gallery
Global Awareness
More
3/14/2008 8:49:19 am
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8:50 am
Data MBARI
Image © 2011 DigitalGlobe
Image U.S. Geological Survey
Data CSUMB SFML, CA OPC
Trackstick
©2010 Google
Imagery Date: 8/31/2007
1994
34°27'06.23" N 119°50'14.96" W elev 78 ft
Eye alt 37635 ft
start
iTunes
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C:\Documents and Se...
Lecture15.ppt
newnsdi.ppt
Google Earth
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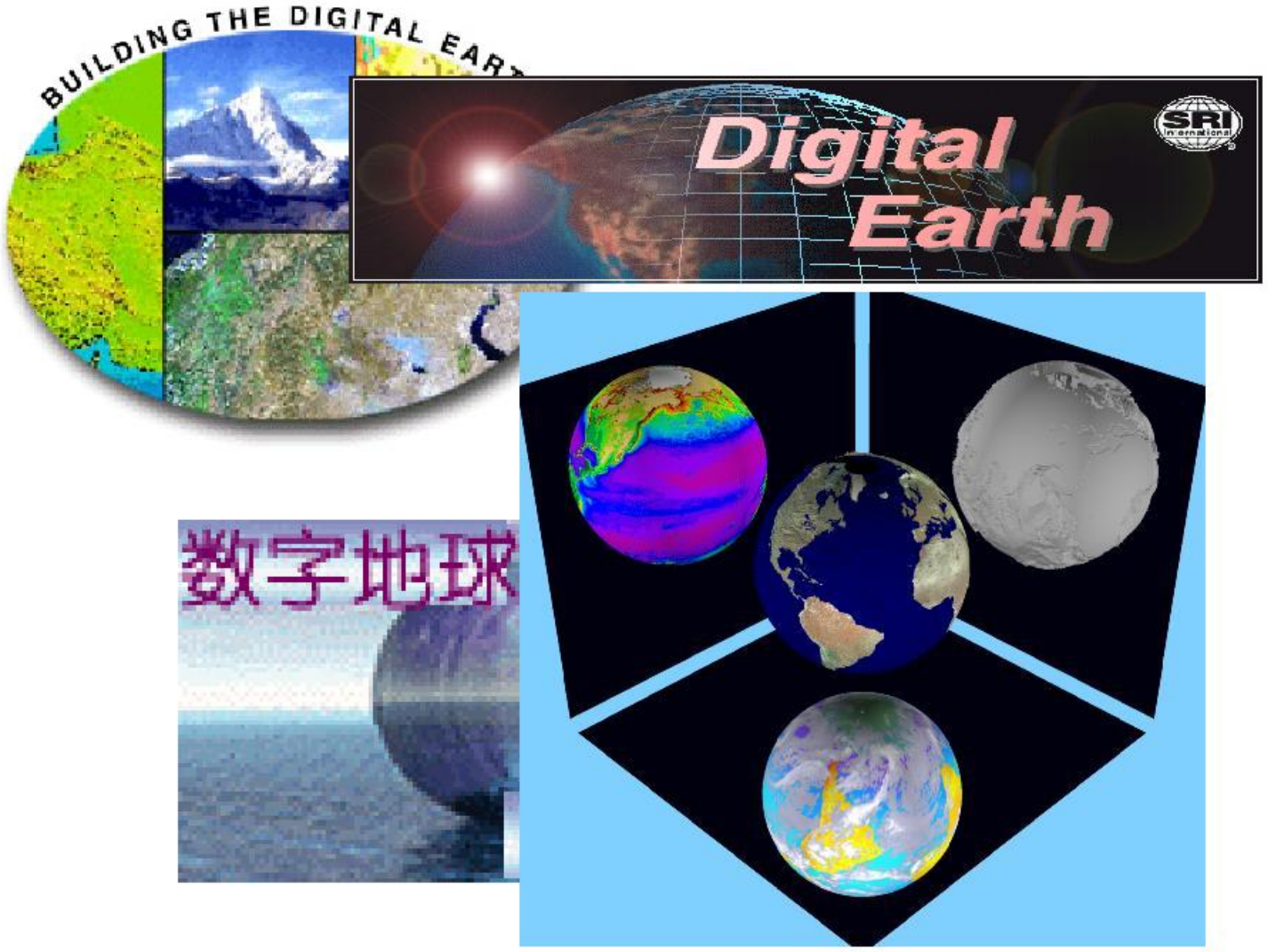
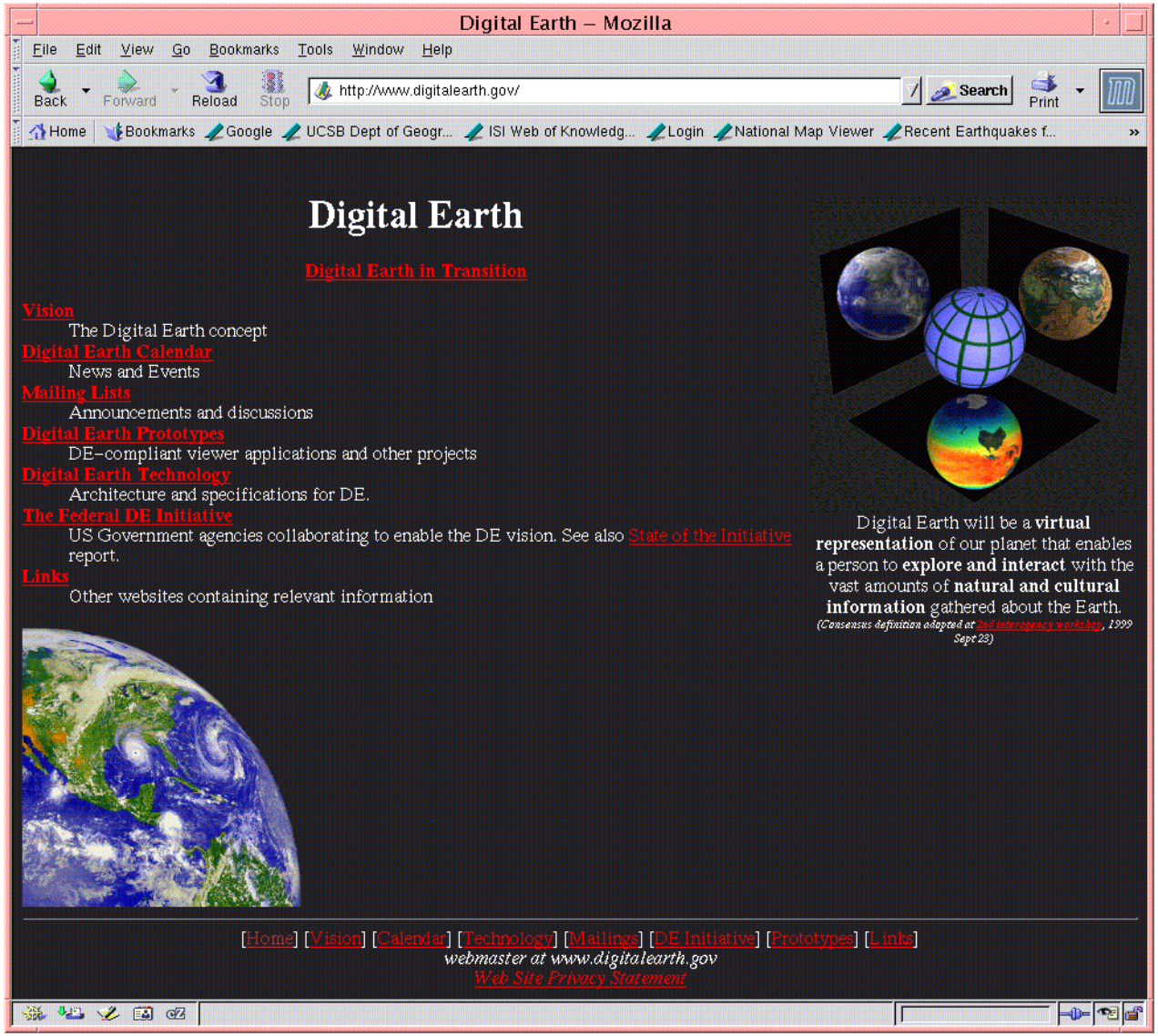
What became of Digital Earth?



NASA leadership to January 2001



Consensus definition 1999

- Digital Earth will be a **virtual representation** of our planet that enables a person to **explore and interact** with the vast amounts of **natural and cultural information** gathered about the Earth. *(Consensus definition adopted at 2nd interagency workshop, 1999 Sept 23)*

DE Leadership since 2000

- IDEW (Interagency Digital Earth Working Group)
- ISDE (International Society for Digital Earth)
- 11 other companies, agencies, universities
- UCSB's Alexandria Digital Earth Prototype (ADEPT)

But no central government leadership or funding, other than in China

Digital Earth Symposia

- Beijing (1999)
- New Brunswick, Canada (2001)
- Brno, Czech Republic (2003)
- Tokyo (2005)
- Auckland (2006)
- San Francisco (2007)
- Beijing (2009)
- Perth (2011)
- Digital Earth Summit (2012) Wellington, New Zealand
- Halifax, Nova Scotia (2015)
- Sydney (2017)

So what is Google Earth?

"We are like an iPod for Earth images."

Michael T. Jones, Chief Technologist, Google Earth (Nov 2006)

Google Earth: A history

- Gore represented Tennessee in the US Senate, 1985-1992. VP 1993-2001. Served on Senate Select Committee on Intelligence
- Dayton Peace Agreement /Wright-Patterson Air Force Base, Ohio Dec 1995, ends war in Bosnia
- Google founded 1998
- Keyhole Earthviewer (2002) In-Q-tel funding, Dual use
- Google buys Keyhole (Oct. 2004)
- Google Maps/Local Feb. 8th 2005
- Google Earth (June 2005)
- Google Earth Community added (2005)
- Partnership with National Geographic (2006)
- 100 million downloads: Version 4 (Nov. 2006)
- 1 billion (2011)
- Development ended 2015

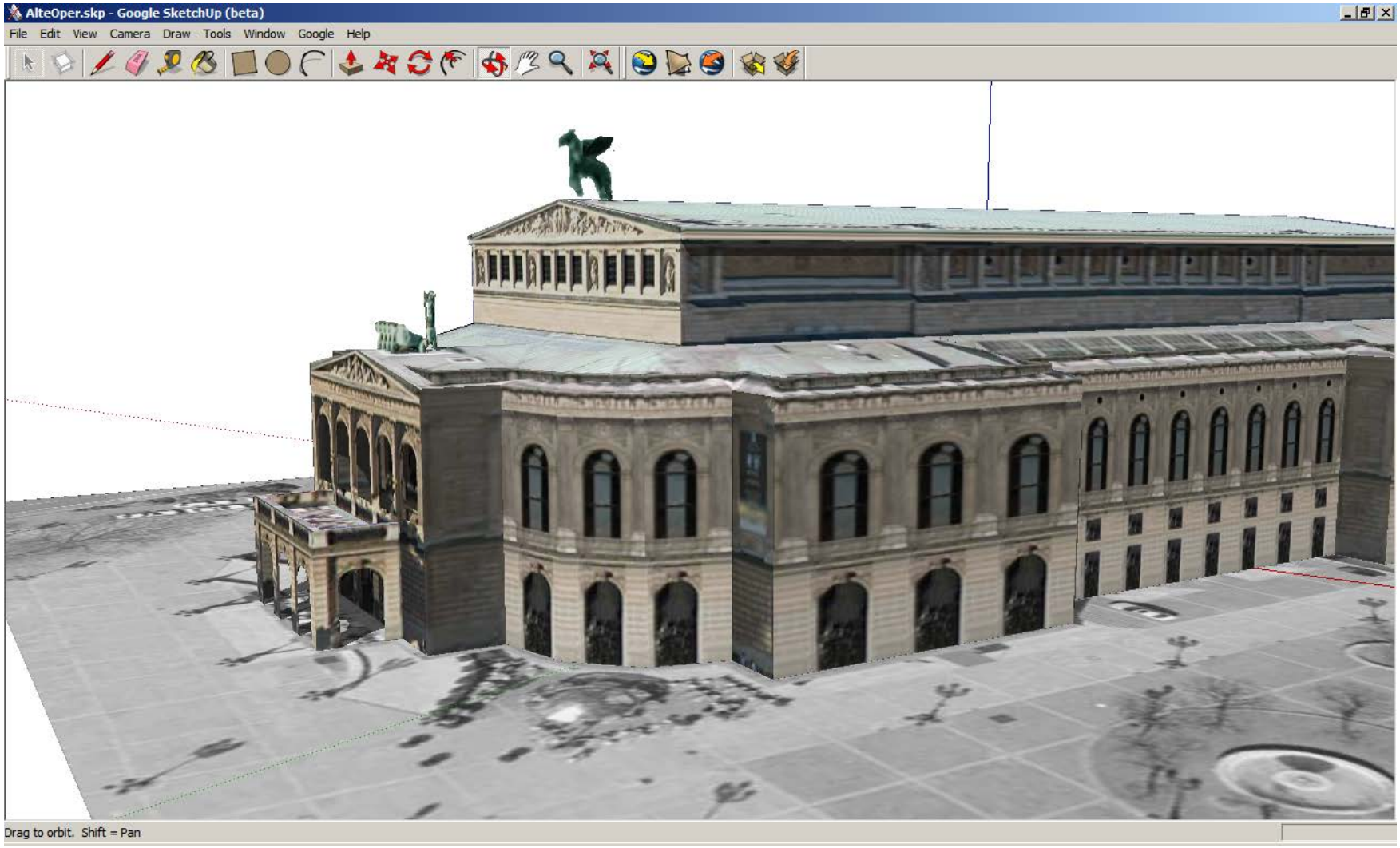
In-Q-Tel (Created 1999)

"The (Senate Select Committee on Intelligence) encourages a symbiotic relationship between the Intelligence Community and the private sector using innovative approaches, such as the CIA's In-Q-Tel. In-Q-Tel is a venture capital fund, largely funded by the US Intelligence Community, to stimulate new technologies through private sector entrepreneurs. It shows great promise." Comments by Senator Graham, Chairman of the Senate Select Committee on Intelligence, introducing the Intelligence Authorization Act for Fiscal Year 2002

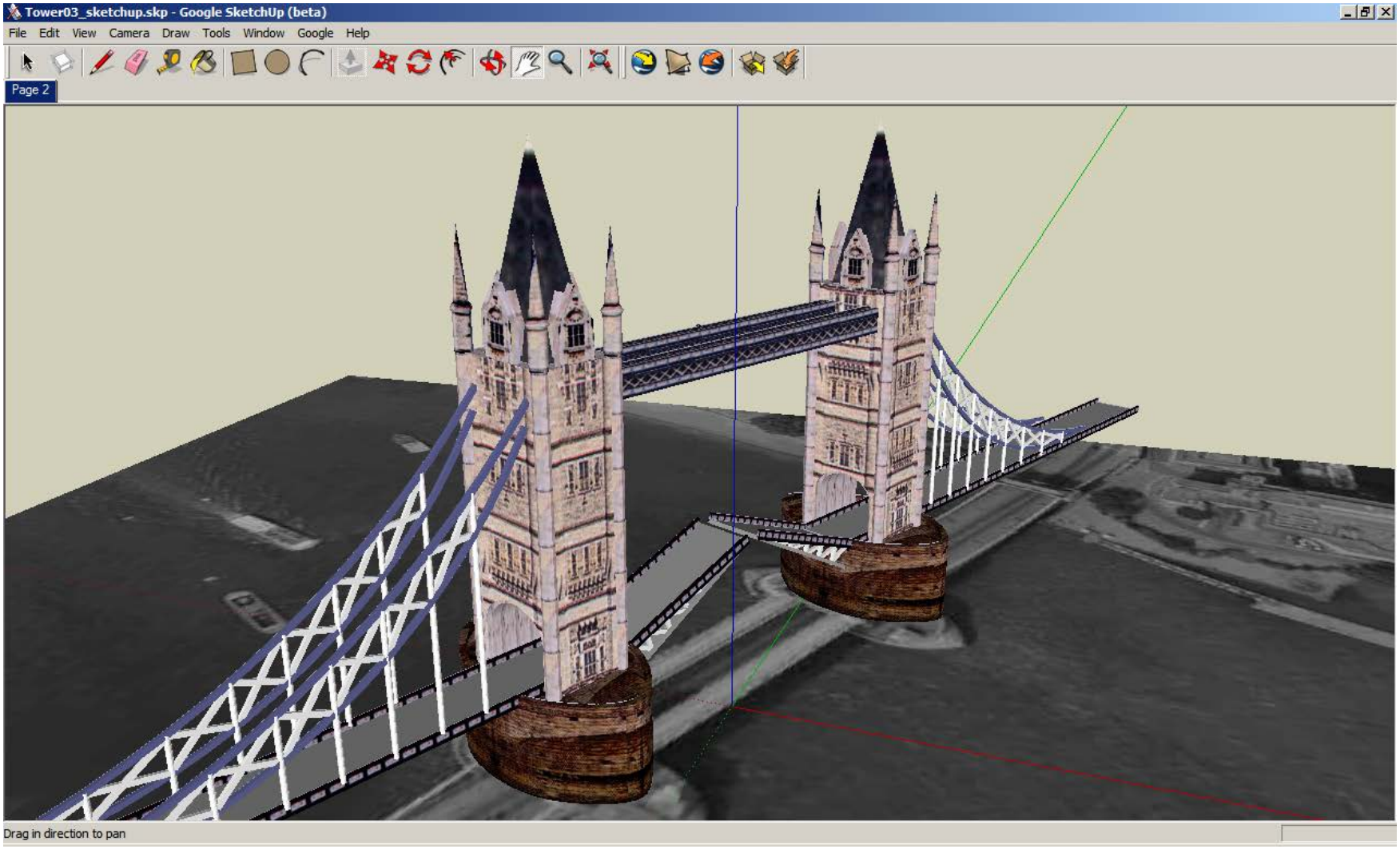
Google Earth Today

- Google Earth viewer downloadable free
- Google Earth Plus GPS device support, import spreadsheets, drawing tools and better printing
- Google Earth Pro “the ultimate research, presentation and collaboration tool for location information.”
- Various additional tools e.g. Streetview, GoogleMaps, API, etc.

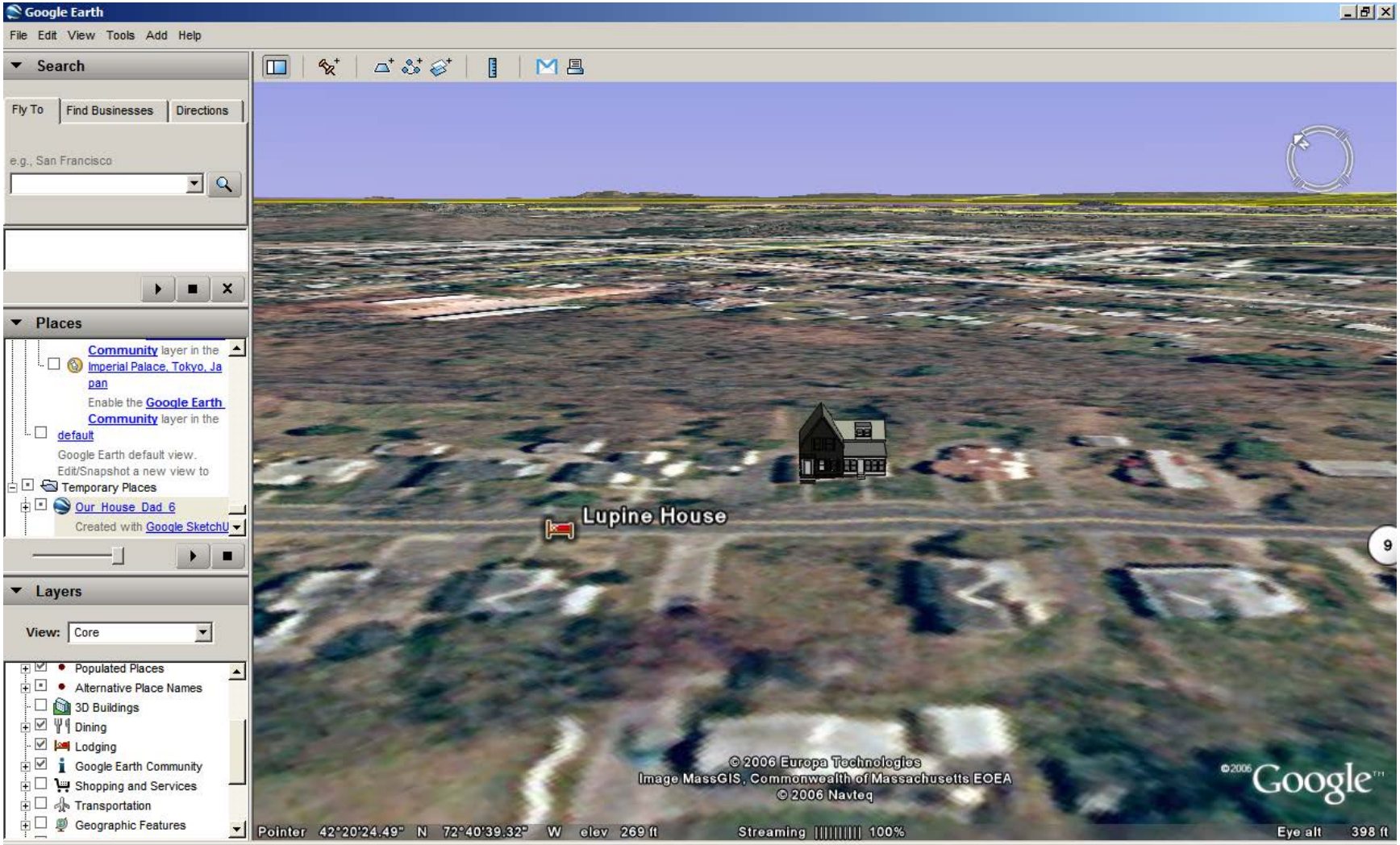
Google SketchUp
Model of the Alte Oper, Frankfurt



Tower Bridge by Rene Almere



177 N Main St- Model of house in Florence, MA

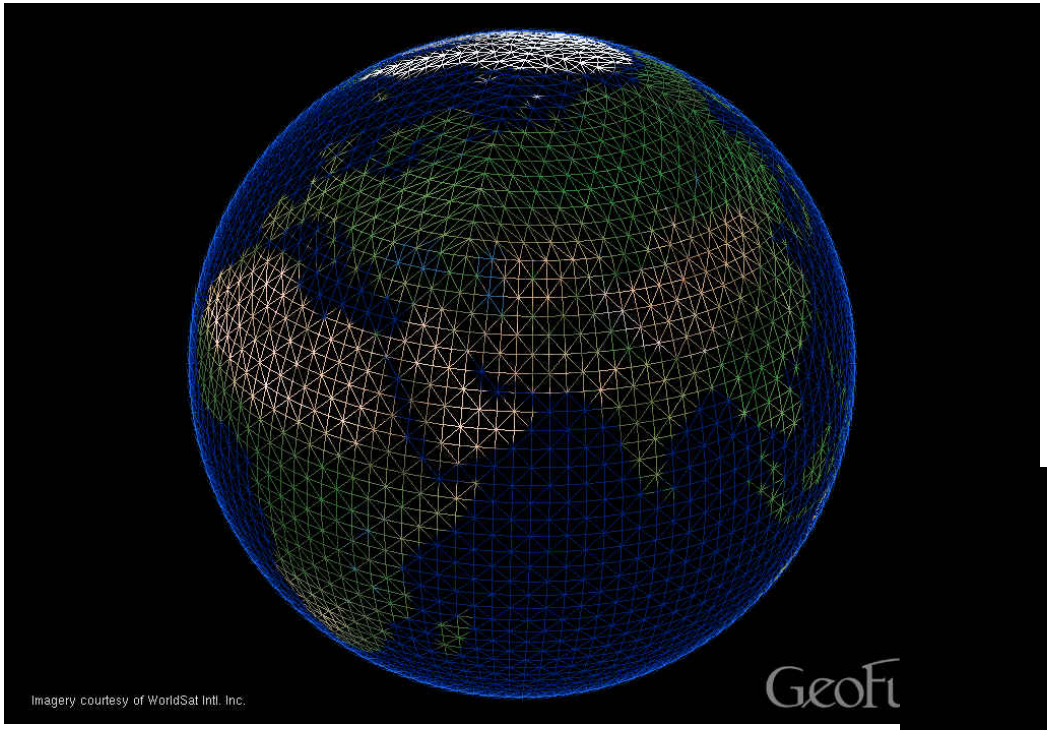


So is Google Earth Digital Earth?

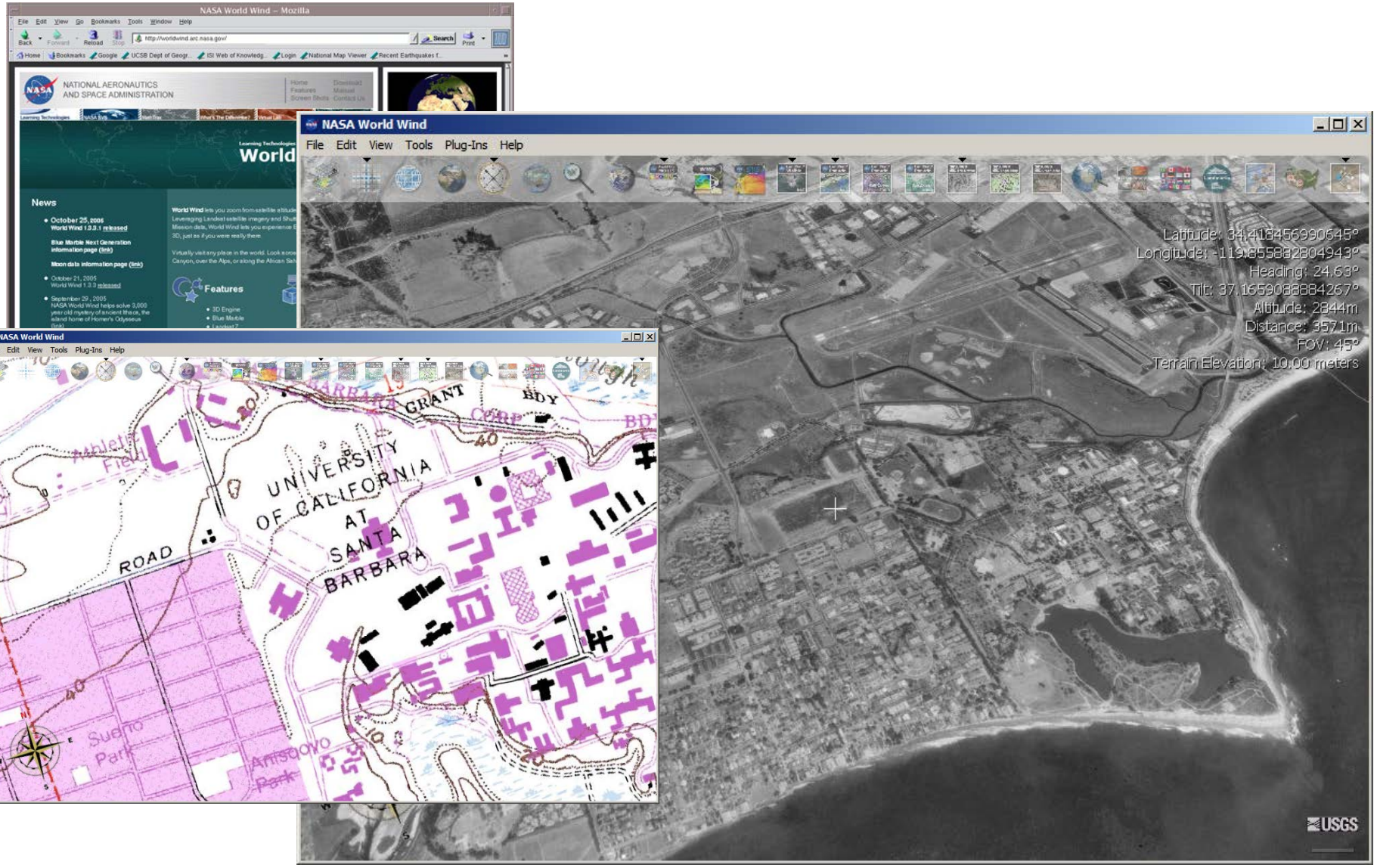
NO: because

- Not all components of the vision are in place
- Google is a media company, not an information broker
- Not yet in a position to do exploratory visualization in depth
- DE = Geobrowser + Global data
- Many browsers (30 on web)
  - NASA Worldwind (2003)
  - GeoFusion GeoPlayer (2001)
  - ESRI ArcExplorer
  - Microsoft Virtual Earth

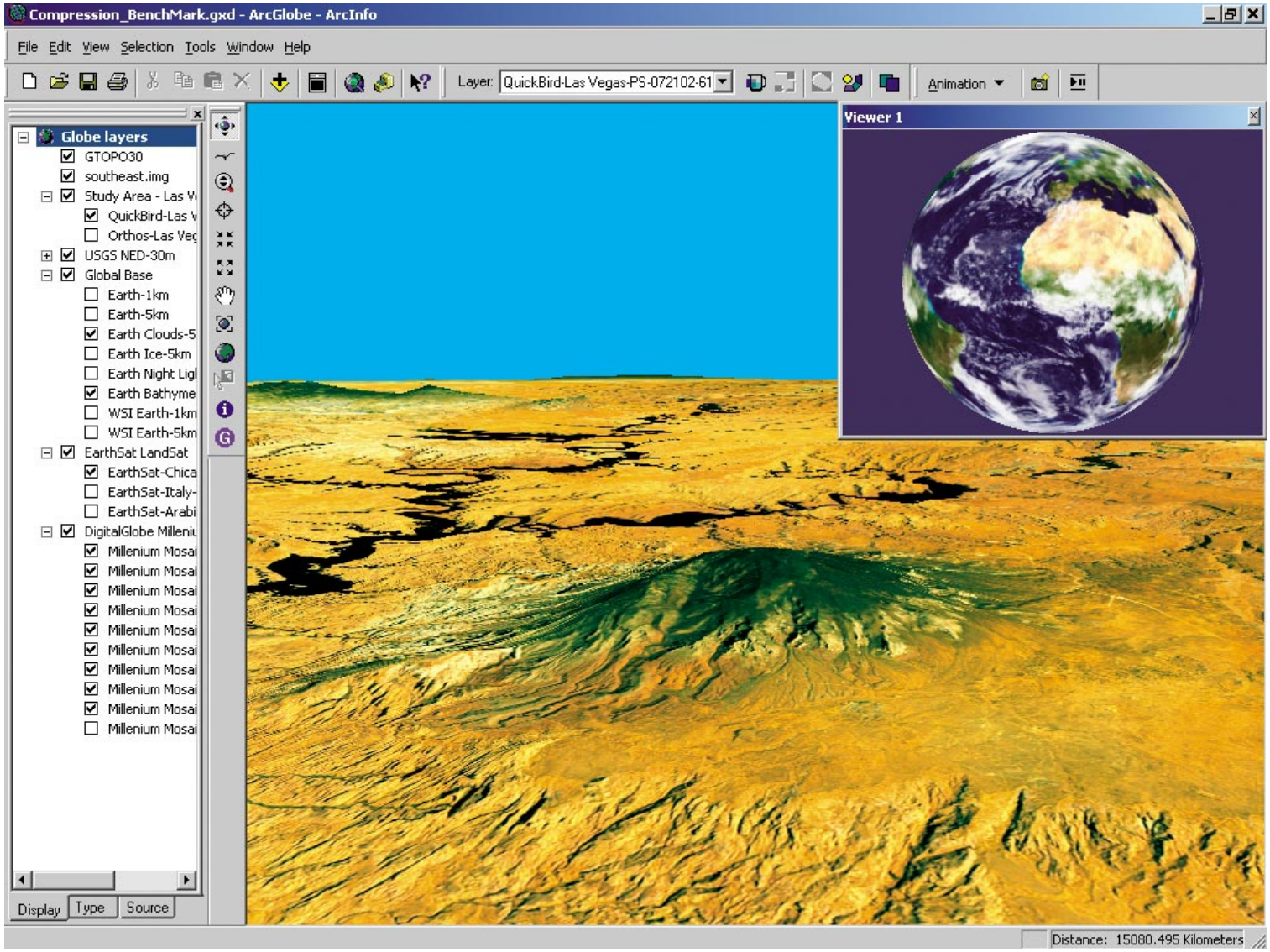
Geofusion (Aligned with ESRI)



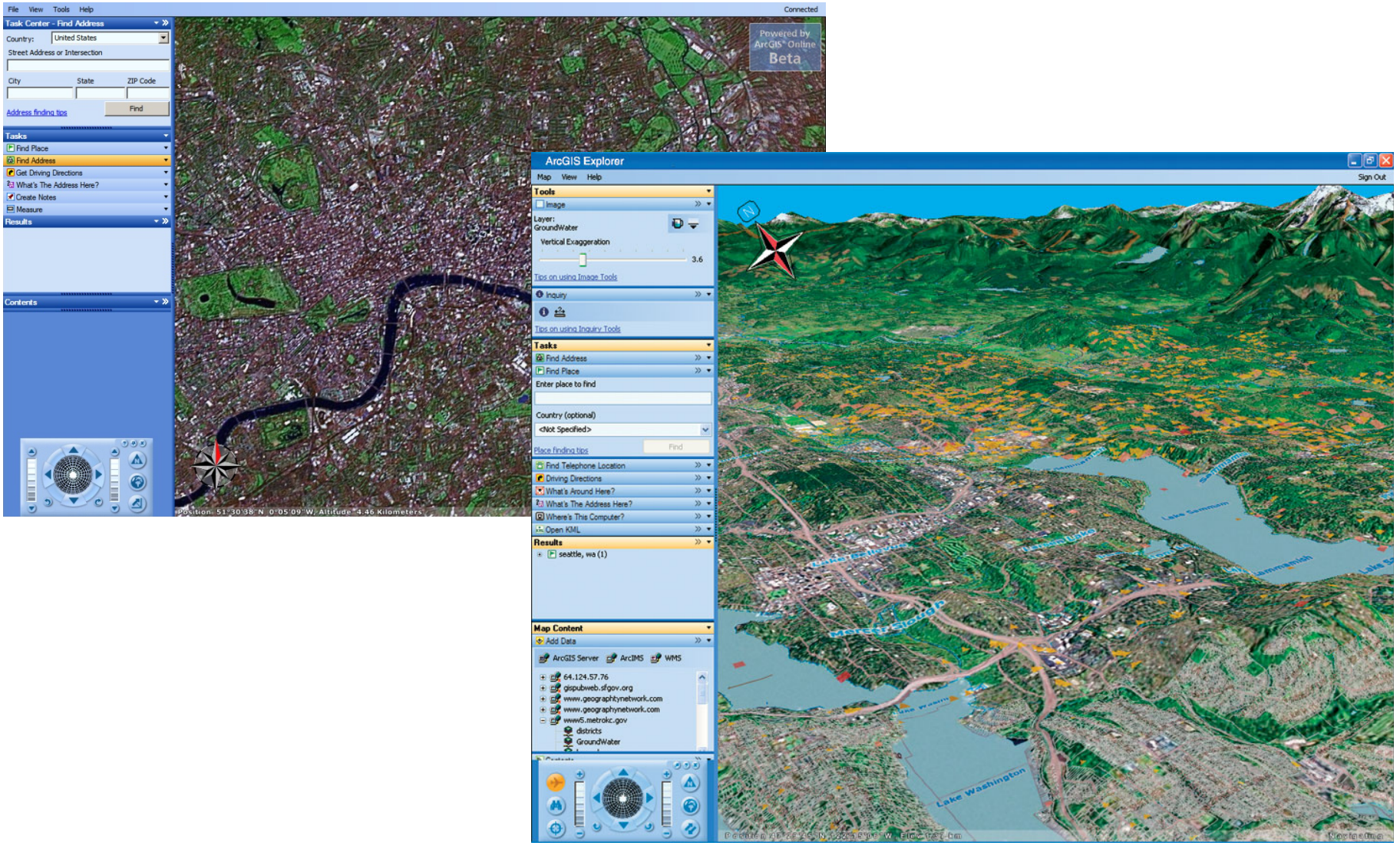
NASA World Wind



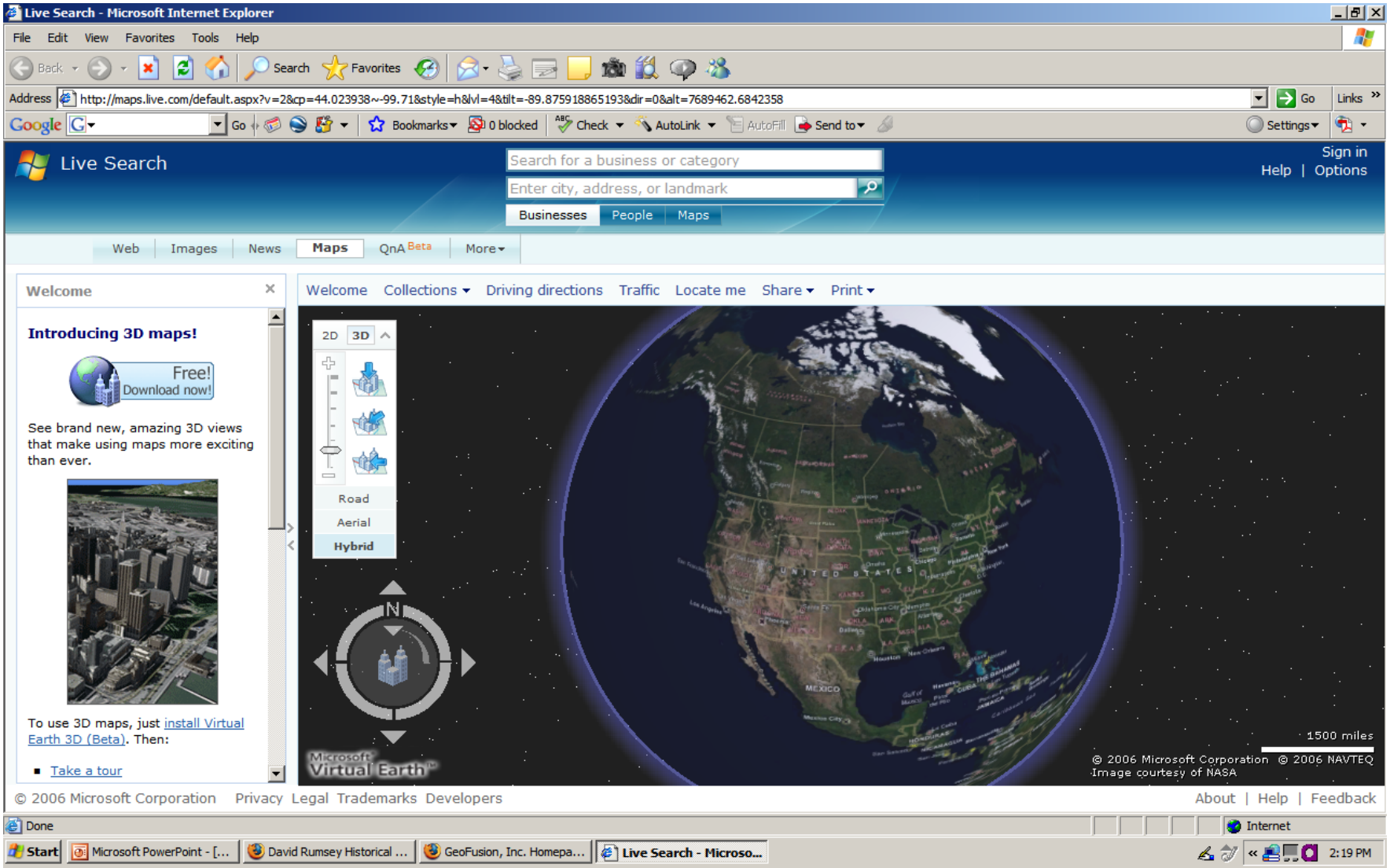
ArcGlobe: 3D Analyst Extension



ArcExplorer



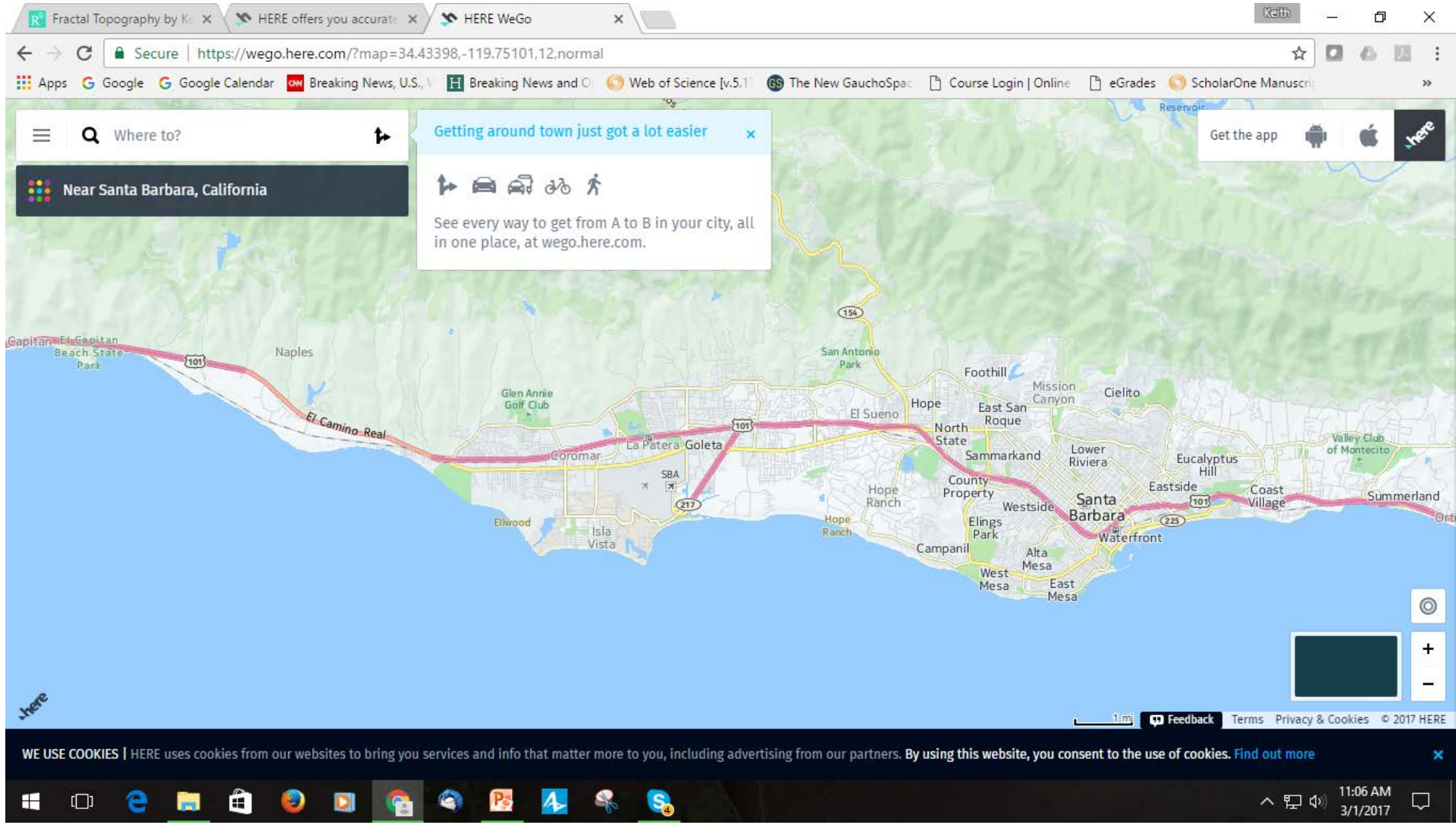
Microsoft: Virtual Earth-> Bing Maps



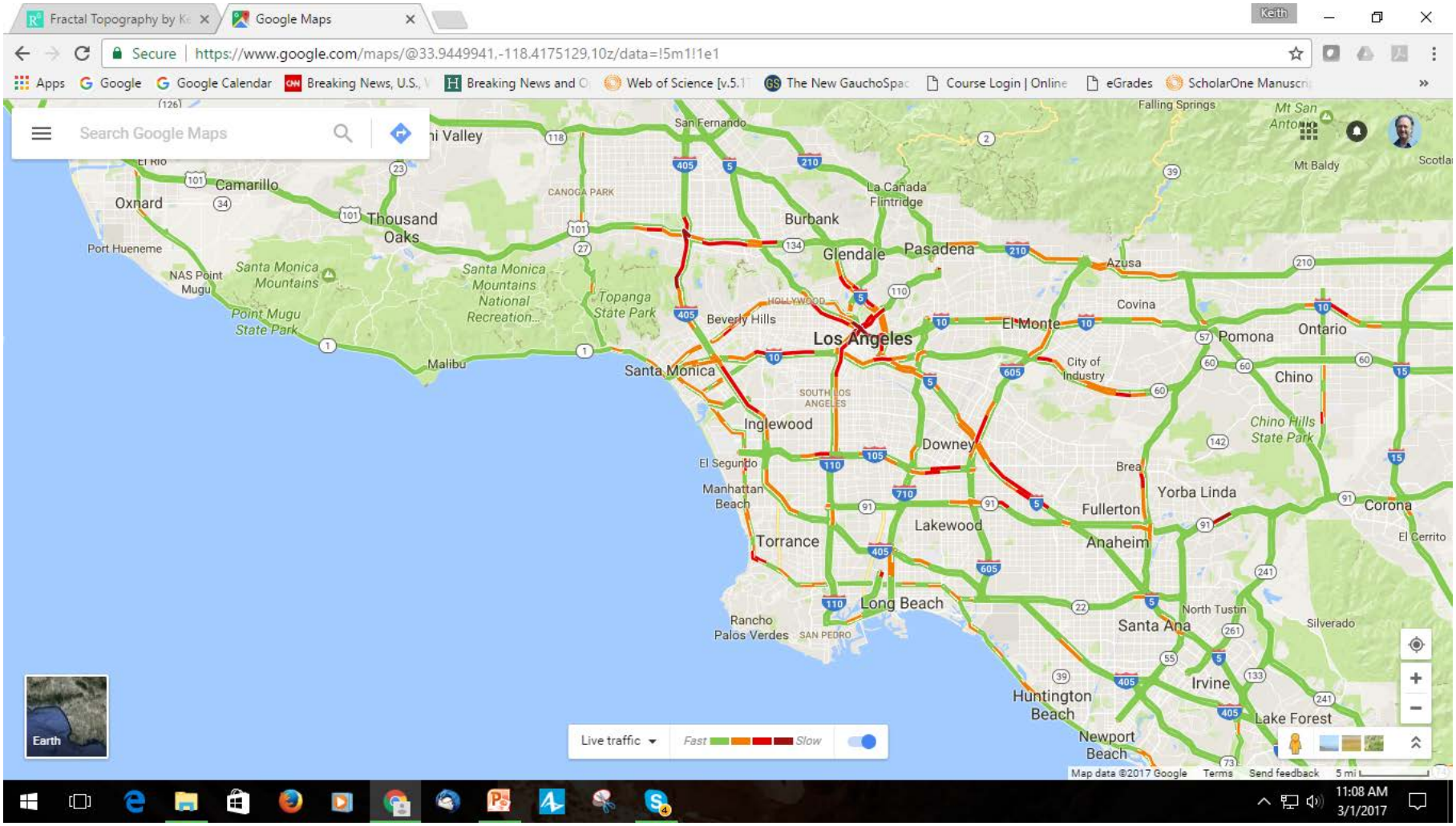
Bing Maps 3D

7th Ave
Lenora
Westlake Ave
Virginia St
8th Ave
Stewart St
7th Ave
Virginia St
6th Ave
Westin-Seattle
Stewart St
7th Ave
5th Ave
6th Ave
Olive Way
Westlake Ave
Stewart St
5th Ave
Olive Way
Pacific Place
Norcstrom
Bus

Here (Navtec, Nokia)



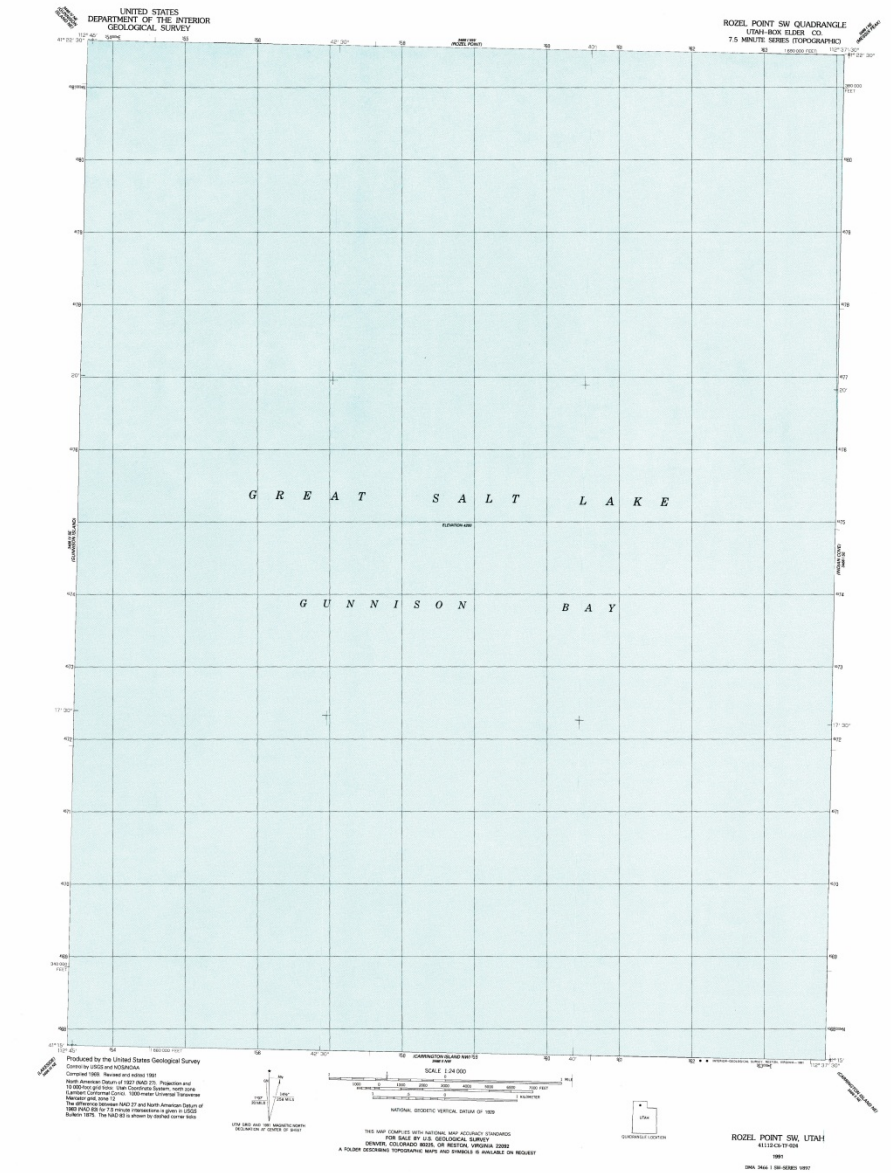
LA Traffic: 11:08am 3-1-2017



What about Content?

- Maps
  - International Millionth Map of the World
  - VMAP0 (Digital Chart of the World)
  - GlobalMap
- Imagery
  - US 133 Cities images
  - USGS digital orthophoto quadrangles 1m
- Toponymy (NGA web service)
- BUT: Proprietary vs. Public domain

The empty quad problem



Where next for Digital Earth?

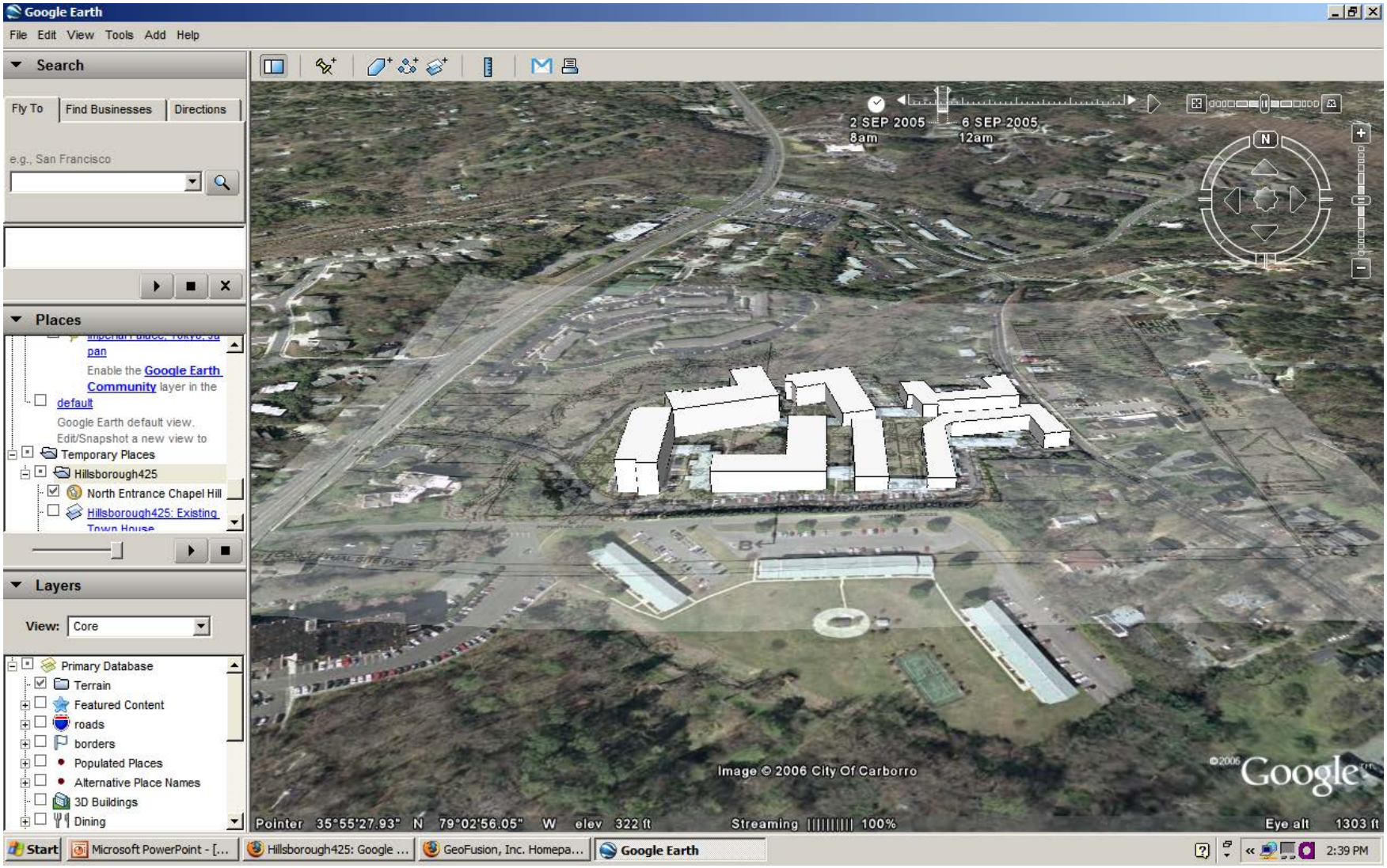
Negative

- Linking text, maps and imagery: Fusion
- Making maps and images text searchable
- Data structures, content and resolution
- Timeliness and accuracy
- High license cost: but Google pays ($500M/year)
- Privacy

Positive

- Standards in place
- Supports proprietary and open data by encryption
- Can add content easily, if contributed by users
- Strong link to www
- Excellent source of public information

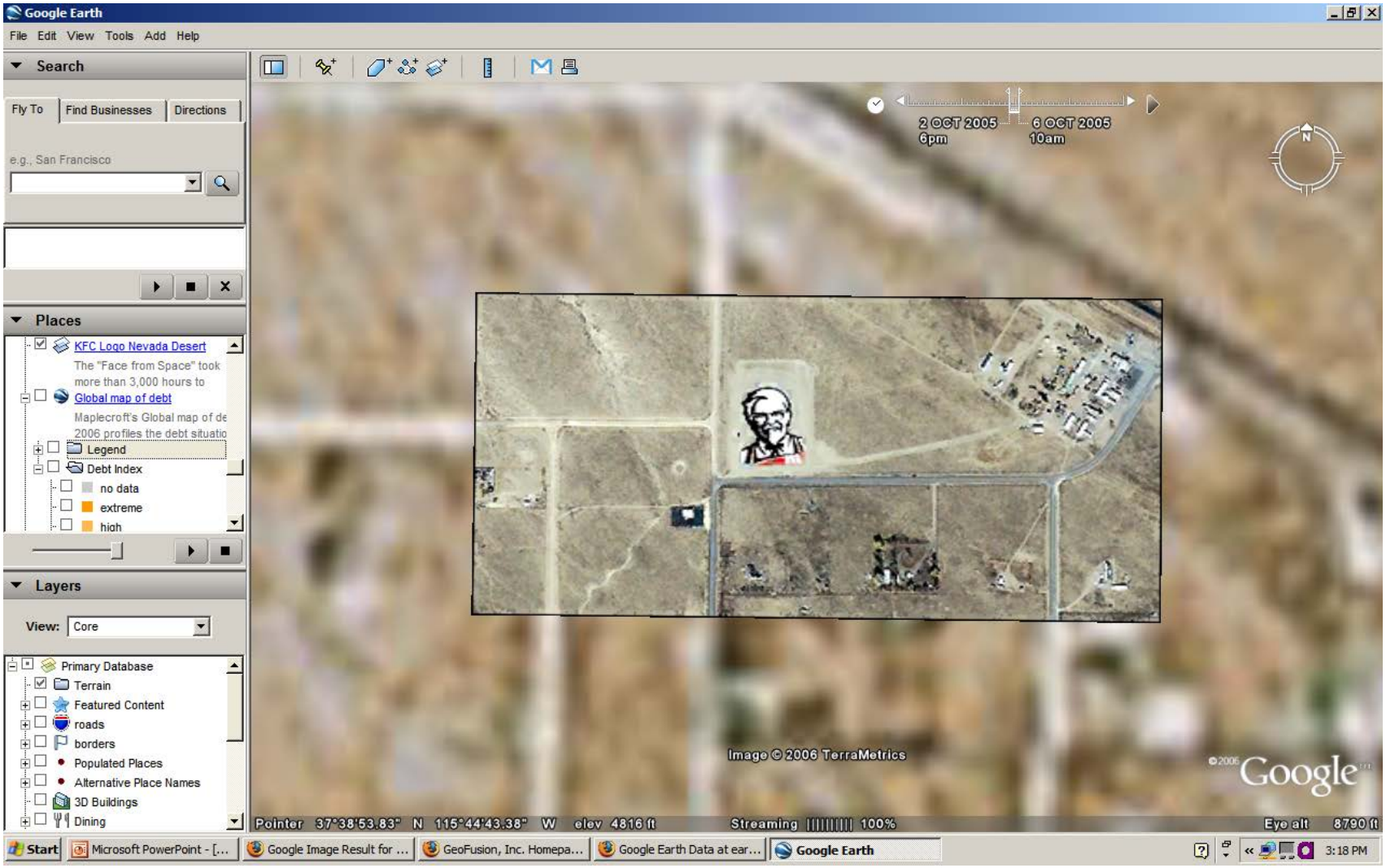
Hillsborough 425, Chapel Hill NC



Nanaimo, Canada

http://earth.nanaimo.ca/data.html

Nevada KFC Logo



Summary

- US Federal Vision of a National Spatial Data Infrastructure
- Based on metadata, standards, framework layers, clearinghouses
- Led to vision of a Digital Earth
- Changing vision, but much now available
- Examined development of Google Earth
- Examined some issues for open data today