



Digitally Mapping Our World

Tarun Bhatnagar

Head of Geo, Americas





***We are striving to create
the highest fidelity
possible, digital
recreation of the world***



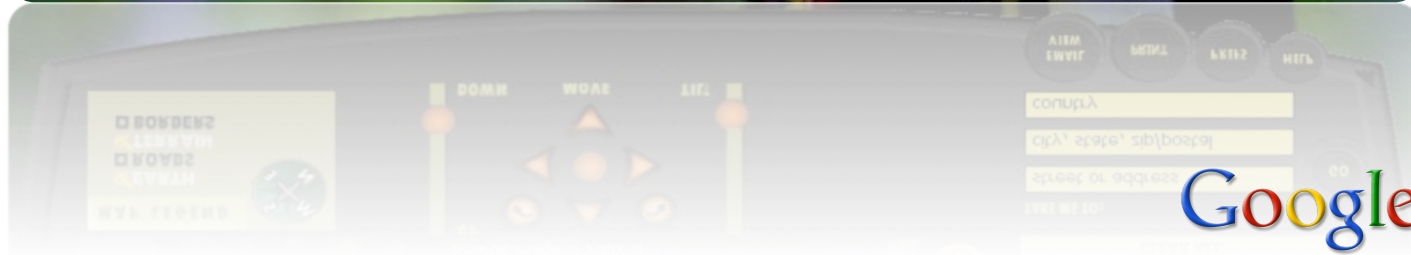
Why?

Organize the world's information *geographically* and make it universally accessible and useful.



Keyhole, 2001

Mapping the world since 2001



Enterprise

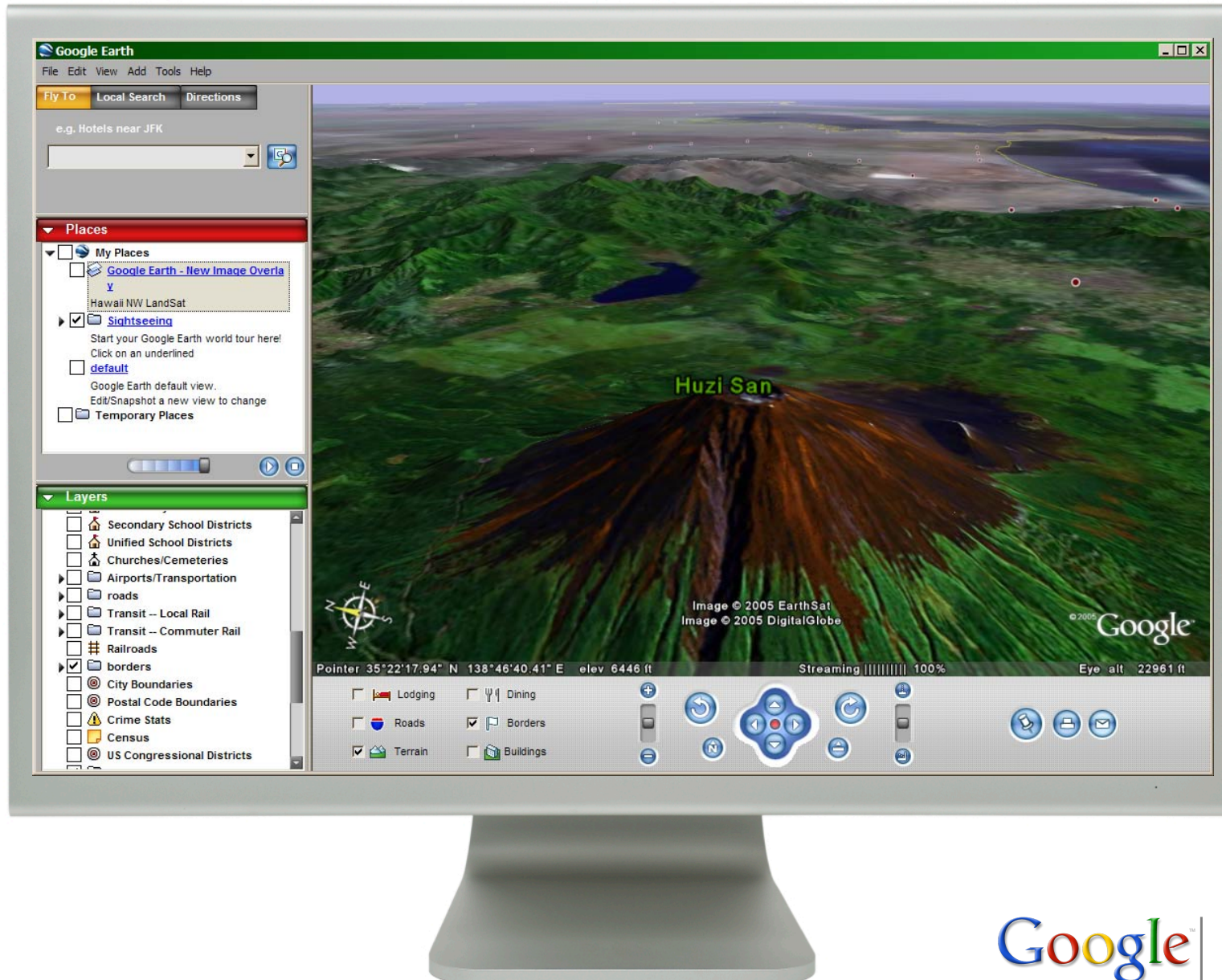
Keyhole, 2003

Scaling our own Cloud in 2003



October 2004

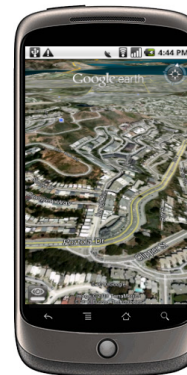
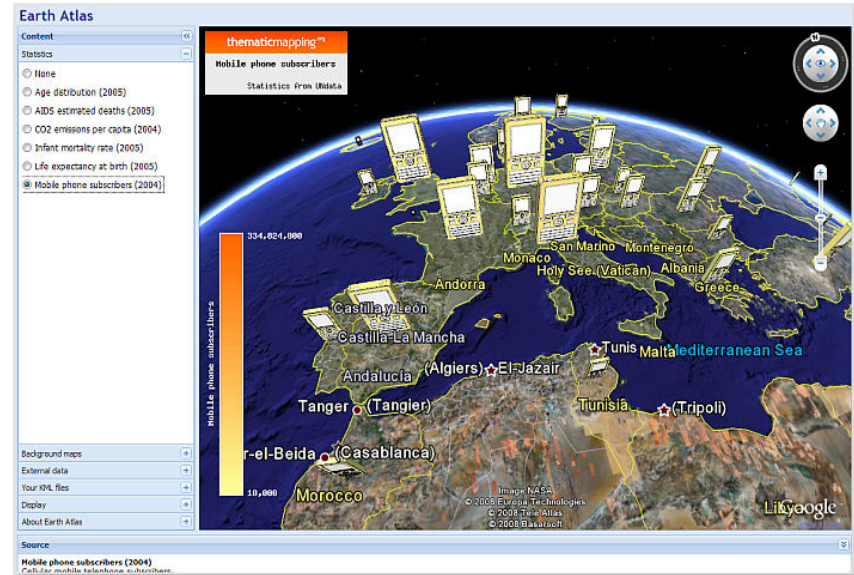
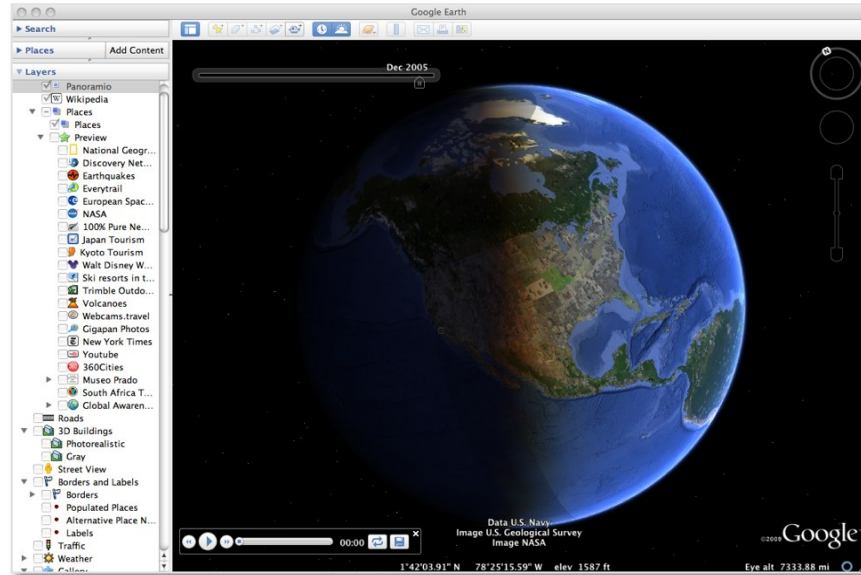
Google acquires Keyhole



Google | Enterprise

Geo Today

950 Million+ downloads later...



**The importance of accurate, fresh,
authoritative mapping data**

Currently The World's Largest Imagery Database



- From a few TBs to hundreds in just a few years
- Exclusive partnership with GeoEye and Spot Image
- >70% of world's population in sub-meter imagery
- 2009, historical imagery added to catalog change over time



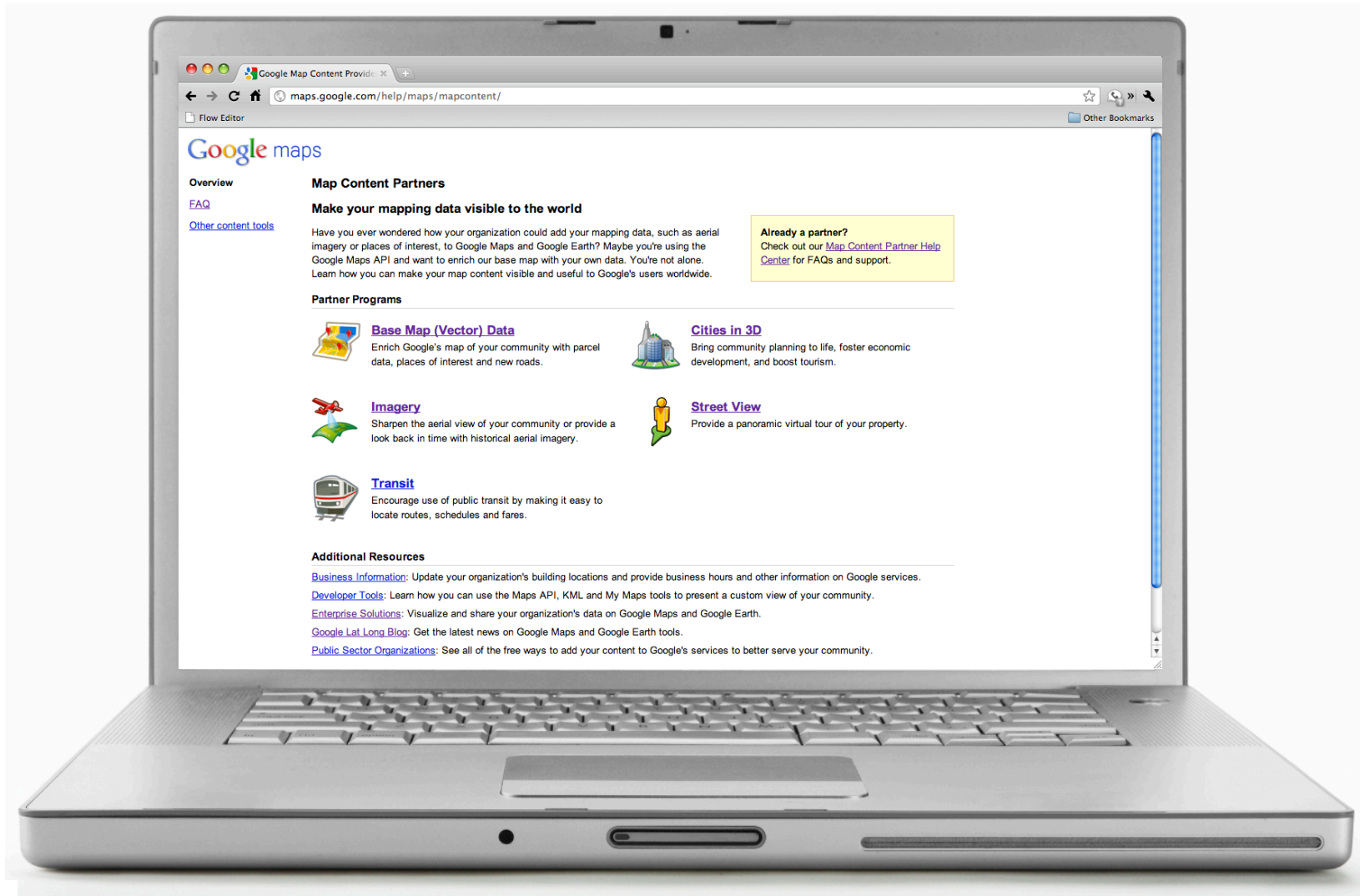
Partnering With Industry



GeoEye-1. The world's highest resolution commercial satellite



Partnering With Governments For Authoritative Data



More Than Just Satellite Imagery

- Aerial and oblique imagery collection platforms
- Generating 3D textured models and DSMs



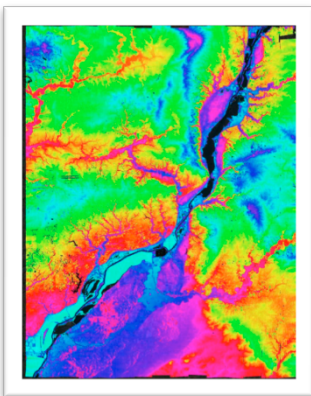
2.5D Buildings in Android/Maps



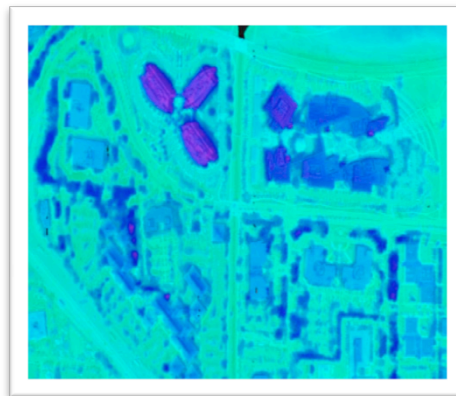
3D Trees



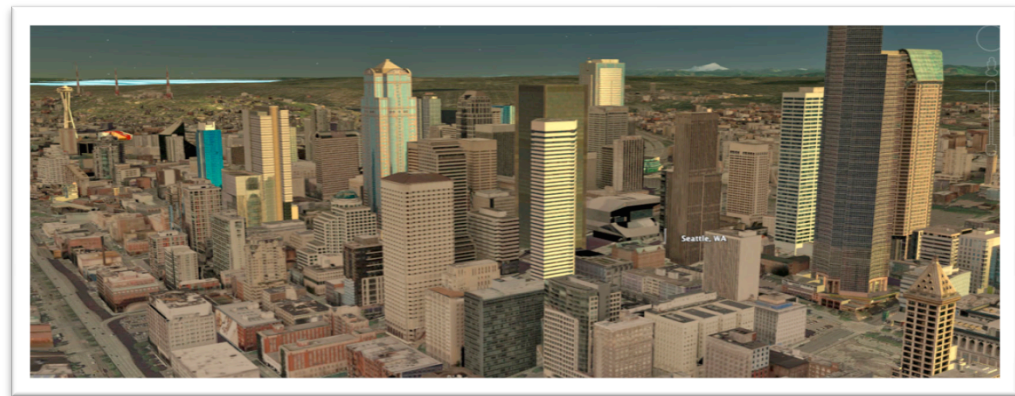
3D Data Alignment



3D Terrain



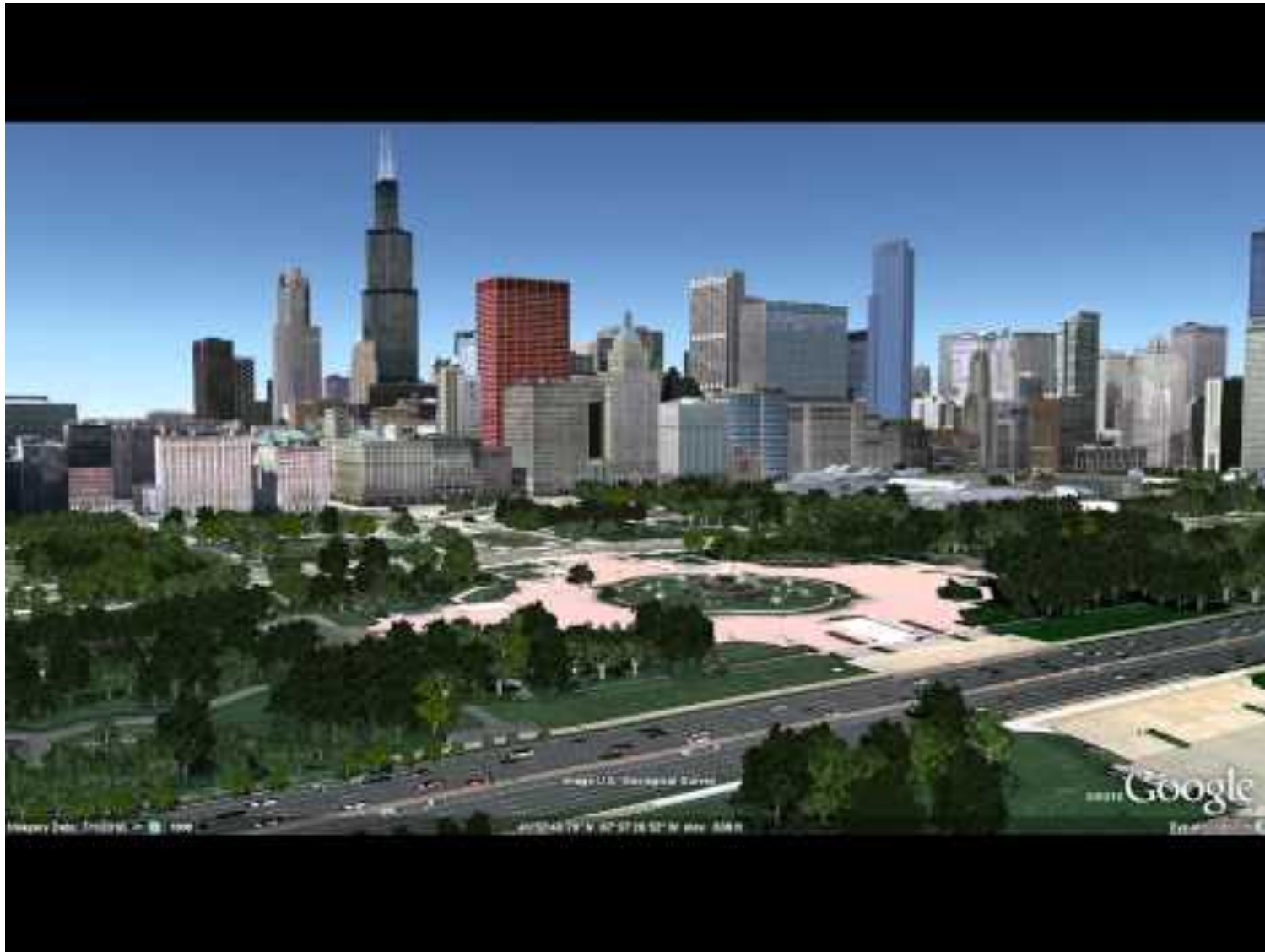
DSM



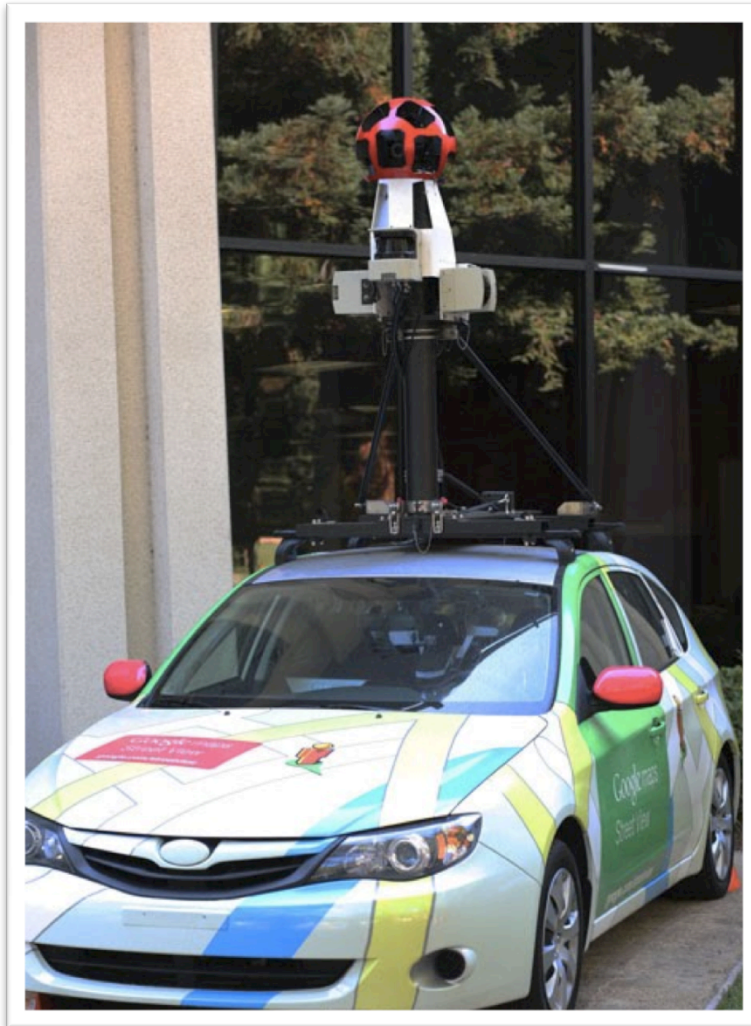
Fully Textured 3D Cities



Providing That last Bit Of Realism



Latest Generation Street View Camera



Our Street View Fleet

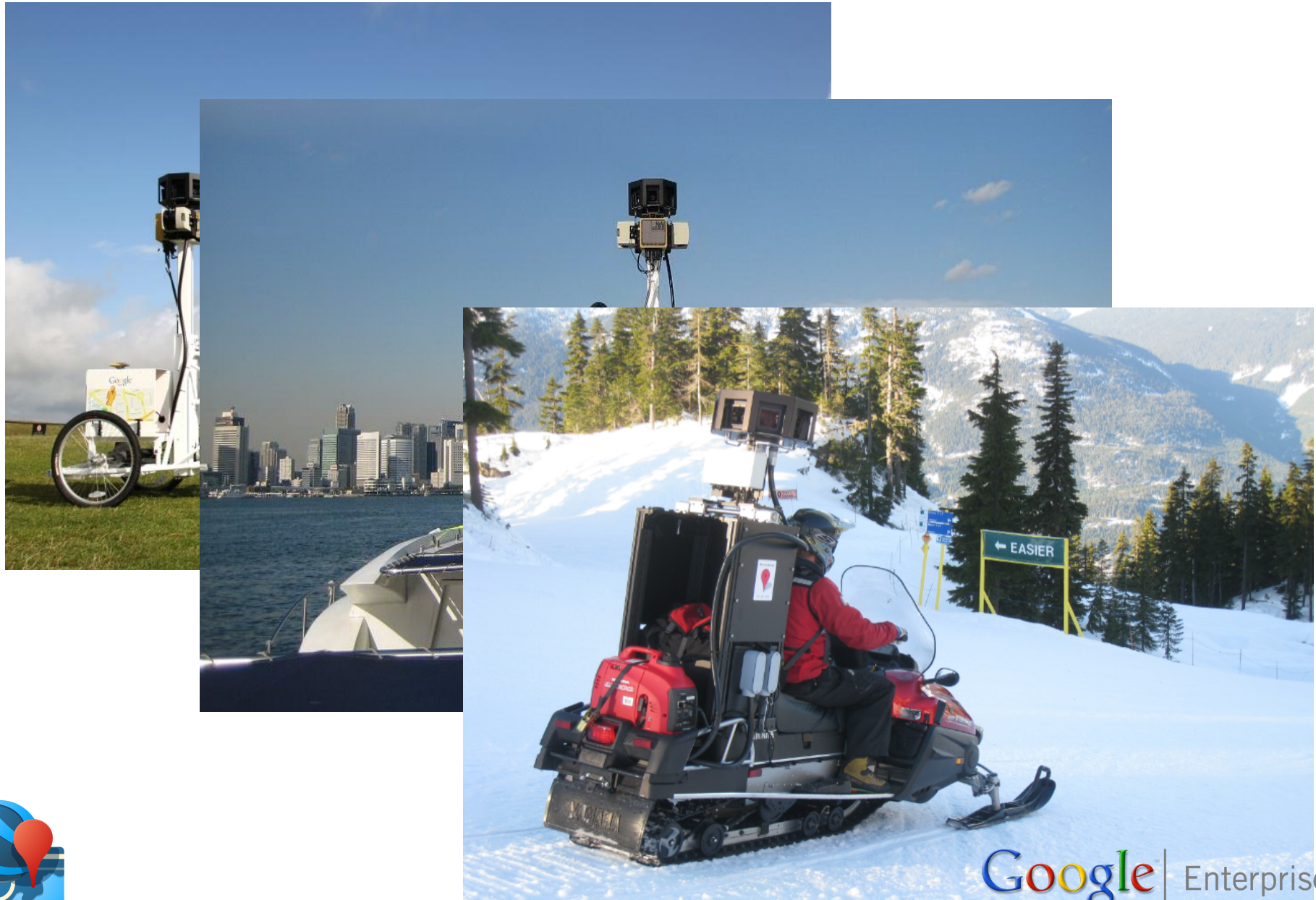


Panorama Resolution Comparison: 2007 - 2011



Beyond The Streets

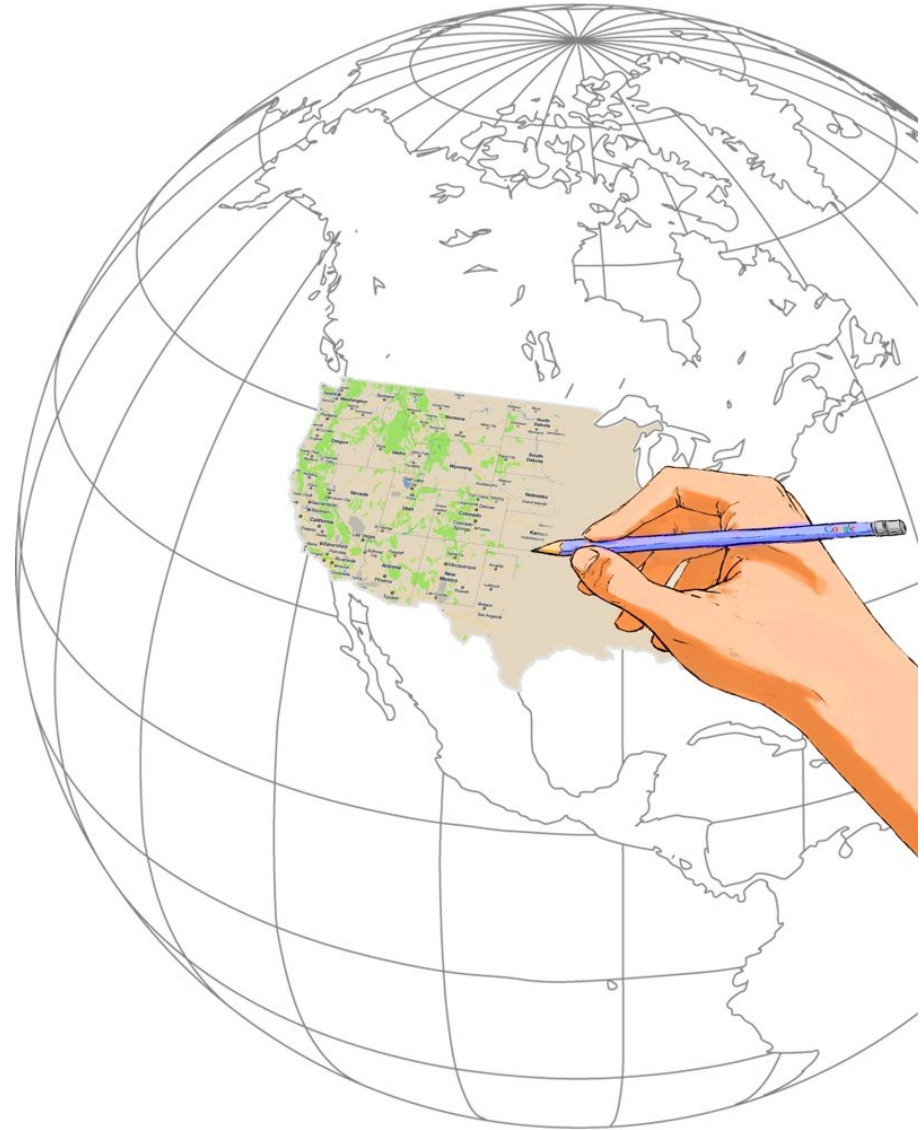
Street View “Trike”



Creating & Curing An Authoritative Basecamp

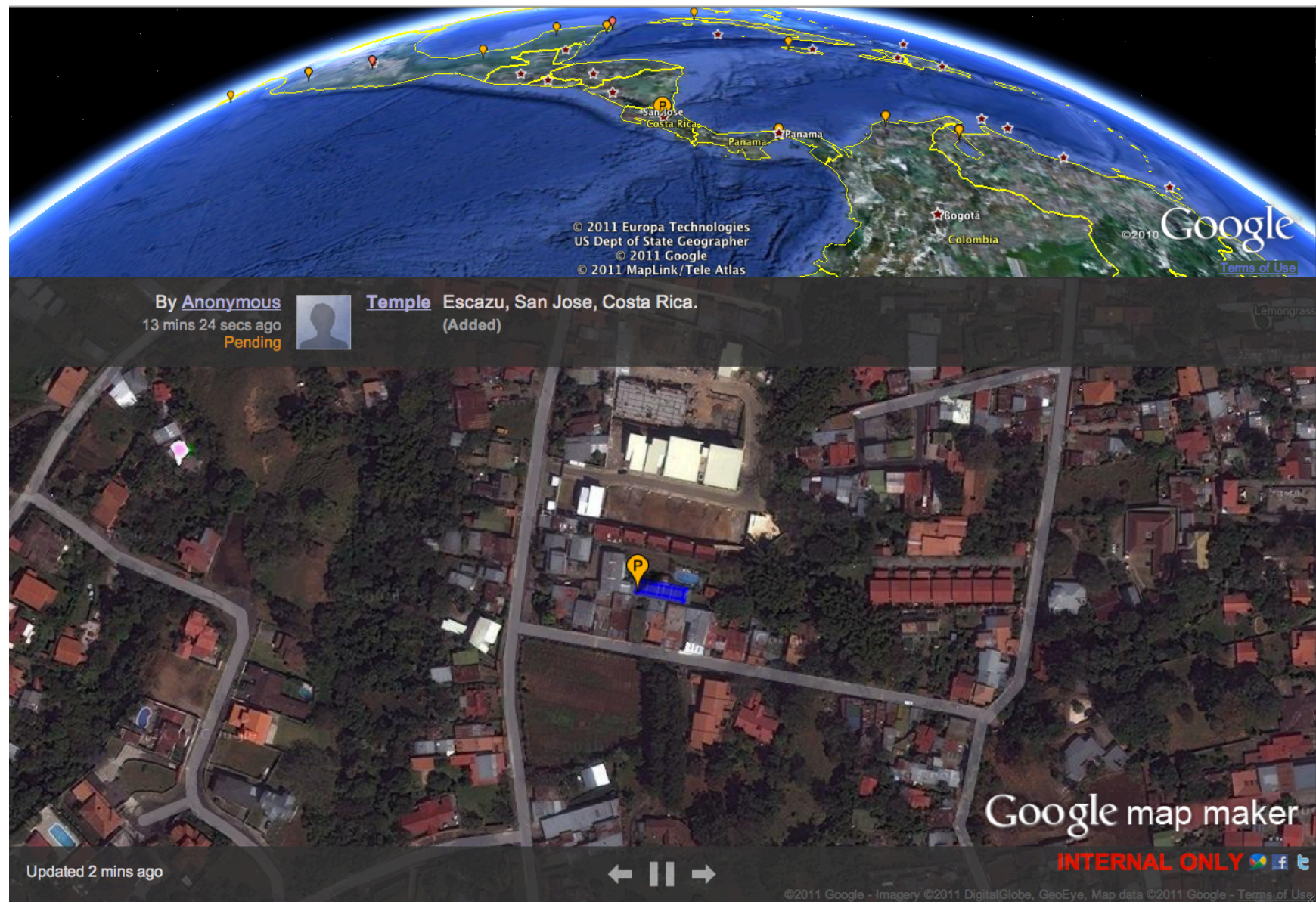
Video

- We started with a large collection of Street View driving tracks.
- We built a tool that relies on computer vision principles to make it quick for users to align Street View tracks to the roads in the underlying imagery.
- The tool also makes it easy to view signs in SV imagery to determine street names etc.
- For many countries we seed the tool with authoritative Gov't basemap data.
- We have a team at Google that use this tool to literally map the world.



Google MapMaker: Users Creating Maps

Demo





Bringing Remote Sensing To The 5th Grade Classroom

Google Earth Engine
a google.org project

Home Data Catalog Workspace Map Gallery

These maps, created by our launch partners and the Earth Engine team, demonstrate the extensive data archive and processing capabilities of the Earth Engine platform.

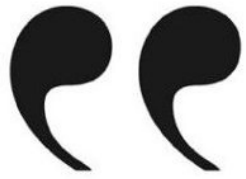
- Mexico percent tree cover**
Hansen, M., Potapov, P.
Per pixel estimate of tree crown cover.
- Water Mask of Central Africa**
Potapov, P., Hansen, M.
Map of persistent surface water for Central Africa using Landsat data
- NDFI over the Amazon**
Carlos Souza
Index for detecting forest canopy damage caused by selective logging and forest fires
- Landsat 7 L1T Coverage**
Google
Heatmap showing global coverage of Landsat 7 L1T data in Earth Engine
- Democratic Republic of the Congo Forest Cover Loss, 2000 to 2010**
Potapov, P., et al
Provisional map of forest cover change in the DRC from 2000 to 2010

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Democratic Republic of the Congo Forest Cover Loss, 2000 to 2010
Potapov, P., Turubanova, S., Adusei, B., Bongwele, E., Amani, P., Hansen, M. - South Dakota State University, the Observatoire Satellital des Forêts d'Afrique Centrale and the University of Maryland - [project site](#)
As part of the USAID and NASA-funded CARPE (Central Africa Regional Program for the Environment) project, an exhaustive mining of the Landsat ETM+ archive was performed to map forest cover loss for the whole of the Democratic Republic of the Congo from 2000 to 2010. Forest was defined as 30% or greater canopy cover for trees of 5 meters or more in height. All such assemblages that were converted to non-forest are quantified and labeled as forest cover loss. Forest cover loss was divided into three categories, primary forest cover loss (red), secondary forest cover loss (yellow) and woodland loss (orange). Over 8,000 Landsat images were processed to make this product. A final version of this map will be the initial derived product of the Observatoire Satellital des Forêts d'Afrique Centrale's FACET (Forêt d'Afrique Centrale Étude des Télédétection) product suite.

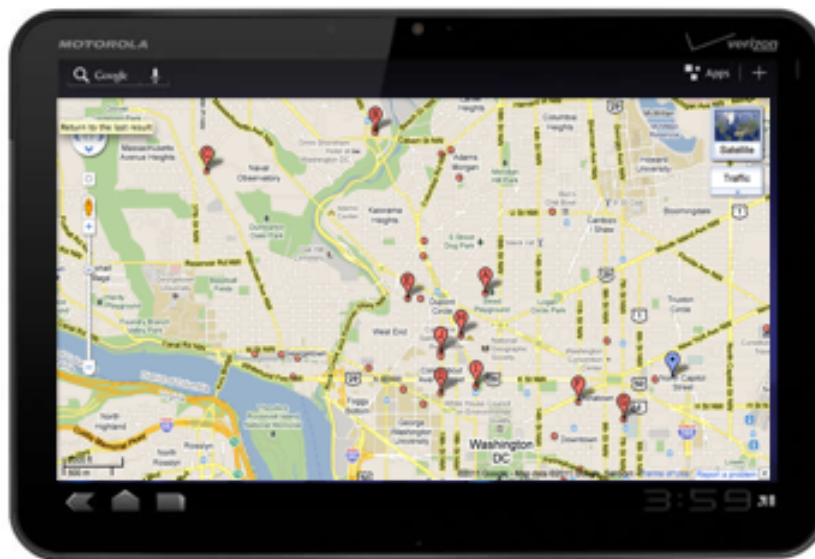
Google Enterprise

Geo & Mobile



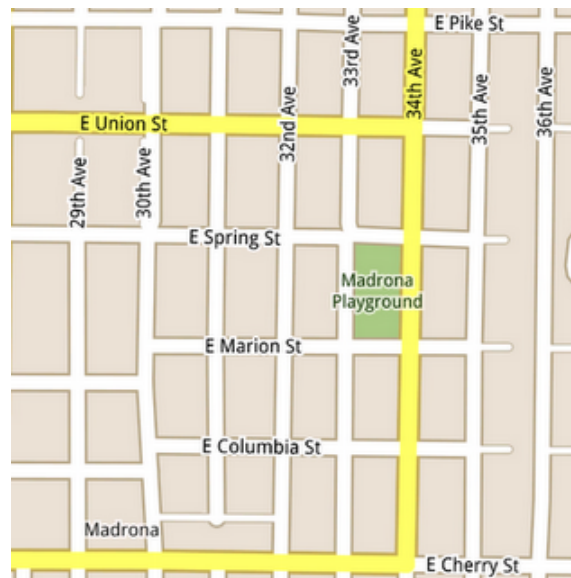
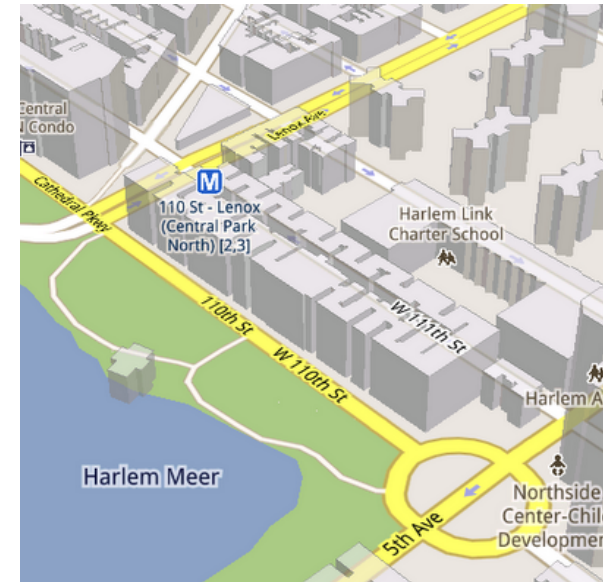
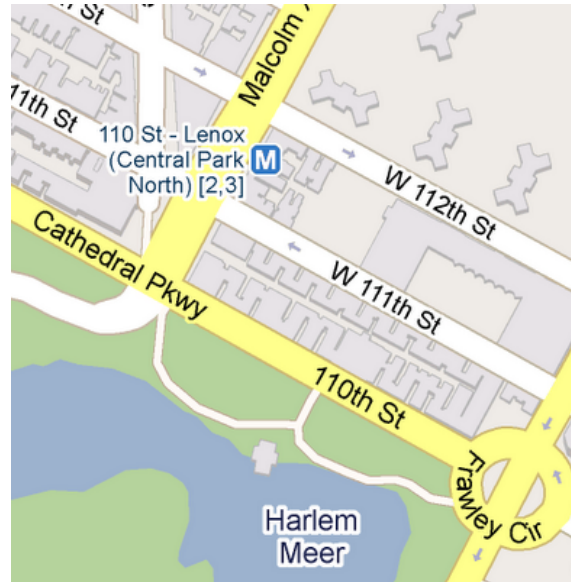
40% of Google Maps usage is mobile. On Christmas and New Years day mobile usage of Maps surpass the desktop — which is a first for Google products.

Google Maps now has 150 million mobile users. To put that in context, Maps for mobile had 100 million users in August of last year.



Defining The Art of The Possible With Mobile Maps

3D buildings on
mobile



Improved
legibility

Disaster Response & Geo

Sometimes Maps Are Needed In The Field



[List globes and maps directory](#)

Google Earth Portable Map Creator

Welcome to the portable map creation page. From here you can define an area of interest on the map at the right and extract all the content falling within it, which you can then download and host from your own laptop using the Google Earth Portable Server. To get started follow the steps below and when you're finished, hit 'Build Map'.

The time it takes for your portable map to build is proportional to the area of interest that you define.

Select the map you'd like to extract

default_map ▾

Name your new portable map

Map name

☐ Overwrite existing map.

Choose high-resolution extent of

Using the embedded tools, define the extent of the map you'd like to extract at the highest resolution.



use this tool to move the map.



use this tool to draw your polygon.

If you'd like to start over you can hit 'Clear' a

☐ Enter polygon as KML.

Choose your map resolution

Minimum resolution to extract

Maximum resolution to extract

Briefly describe your map (optional)

When complete, click 'Build Map' to start building



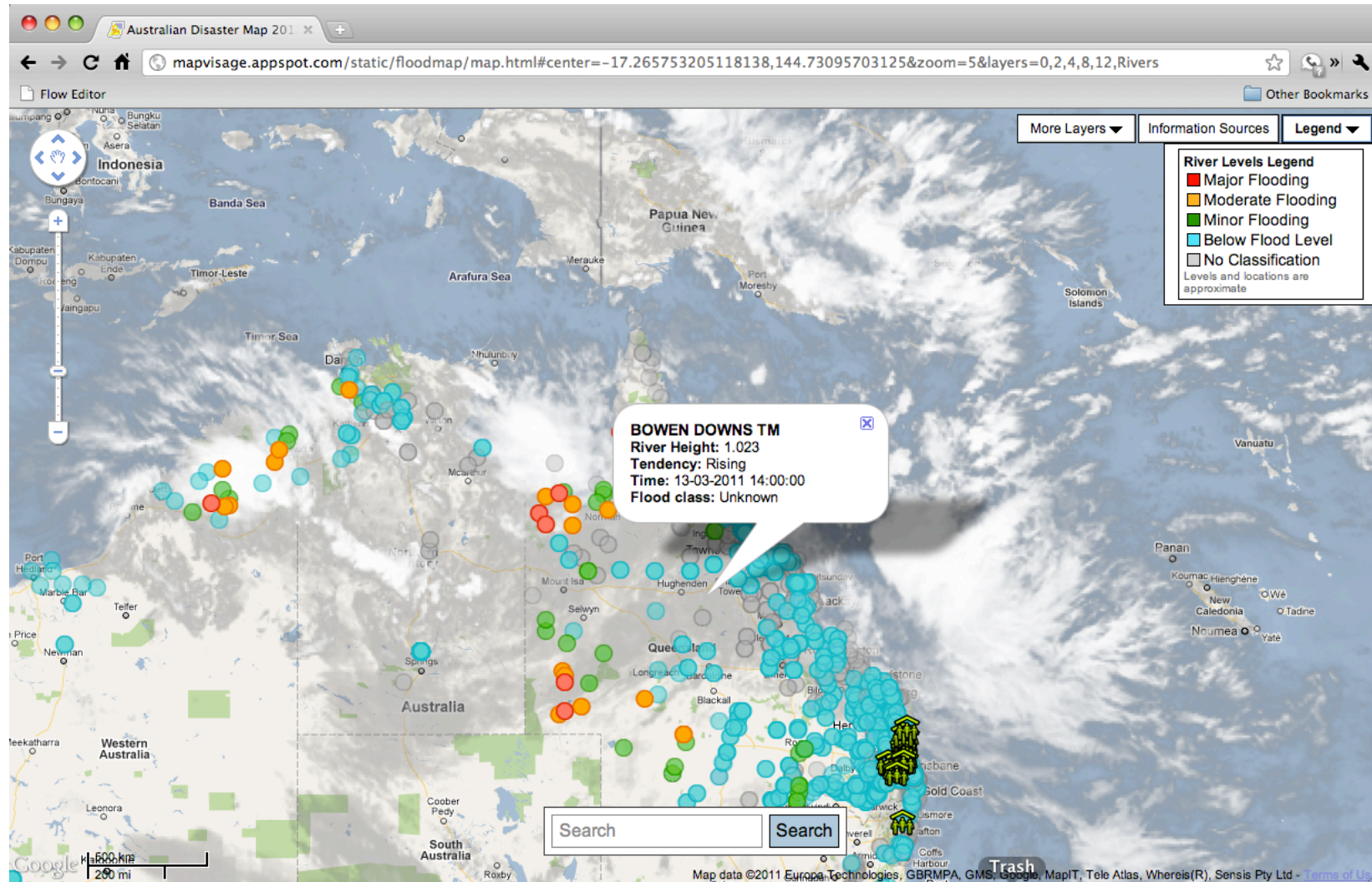
Imagery Provided To The Haiti Response Community



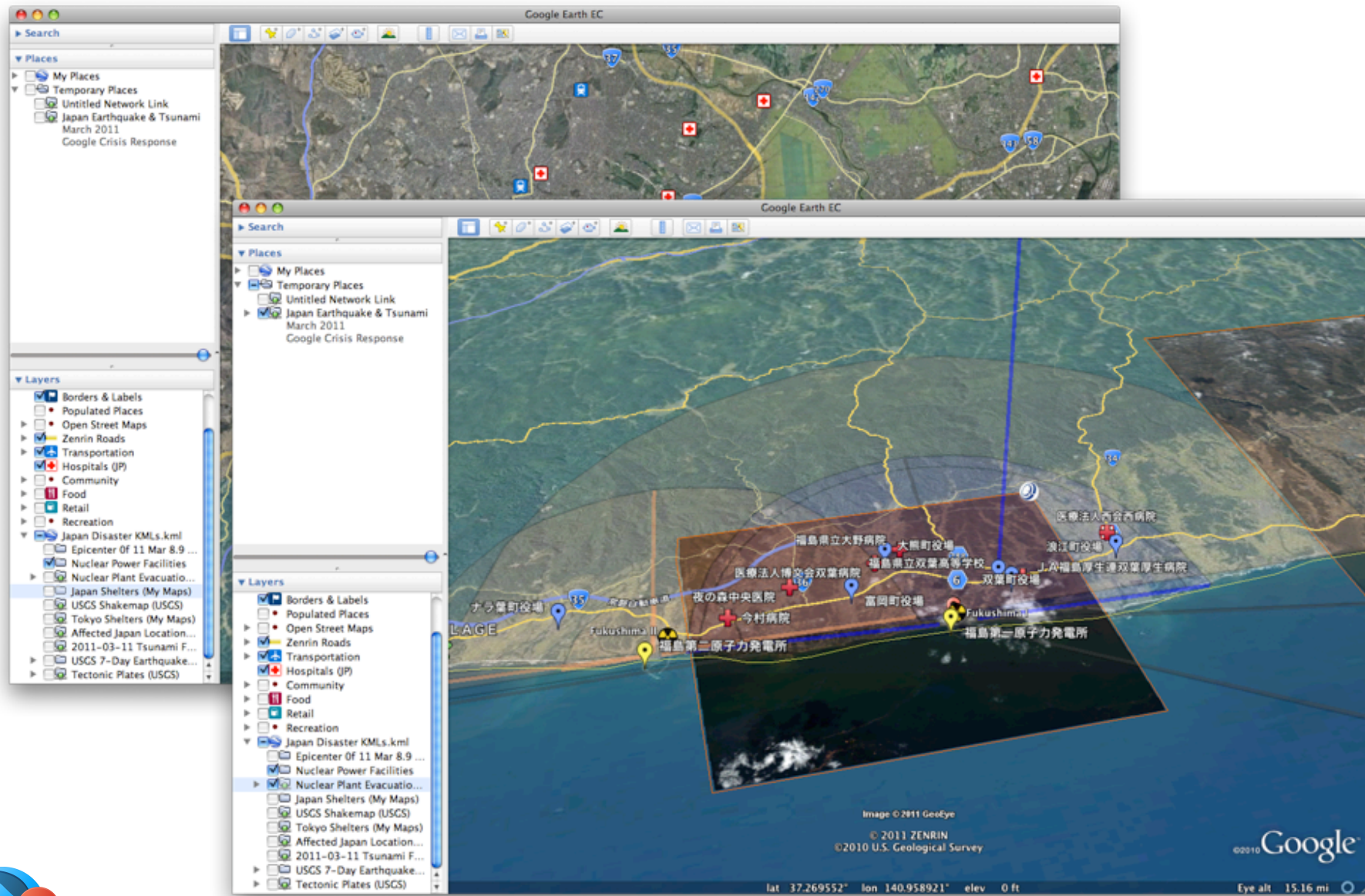
- Rapid post-event coverage; 48 hour turn-around from acquisition to publication
- Returned Nov 8th for updated coverage
- Provided USAF and the response community with Earth Portables



Mapping The Queensland Floods



Earth Portable Servers for Japanese Crisis Response



Bringing Consumer Innovation to the Enterprise

Bringing Consumer Innovation To The Enterprise




Google Enterprise strives to provide our consumer innovation to Enterprise customers.

Within Geo, much of our innovation is with the data processing pipelines that run at scale, and the APIs and clients we provide consumers to view Google Earth and Maps.

We believe these products and services can be used to great benefit by Enterprise organizations, and intend to provide greater access to them.

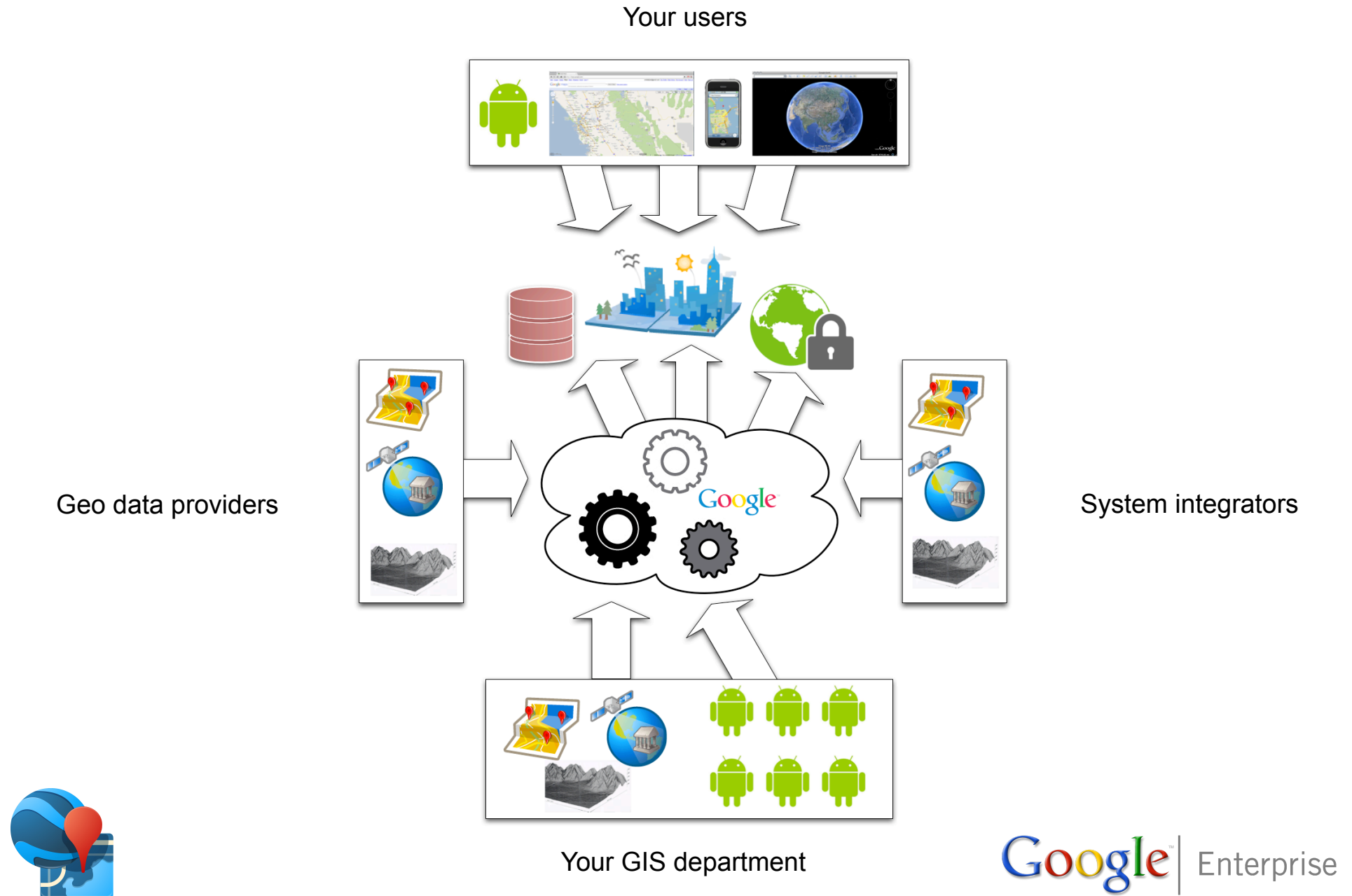


In 2011 We Intend To Provide More Enterprise Services

	<p>Manage all your mapping data in Google's cloud, including your imagery, 3D models and basemap vector data.</p>
	<p>Process your mapping data into map tiles, POI databases, imagery layers, map widgets, and even your own Google Earths.</p>
	<p>Serve your maps - with or without access controls - through our Geo APIs and to Google Earth on the desktop and on Android devices.</p>



We Envision A Complete Mapping Platform In The Cloud



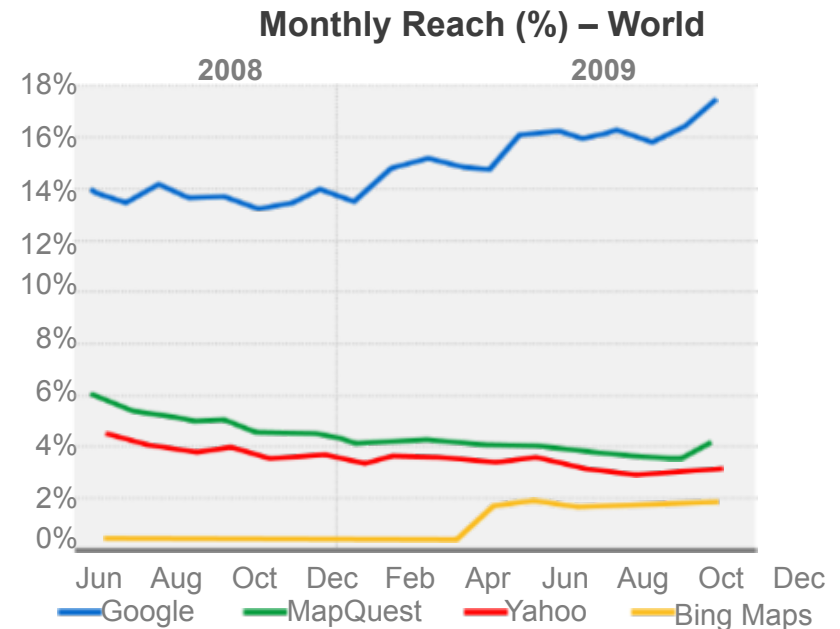


Enterprise Product Suite

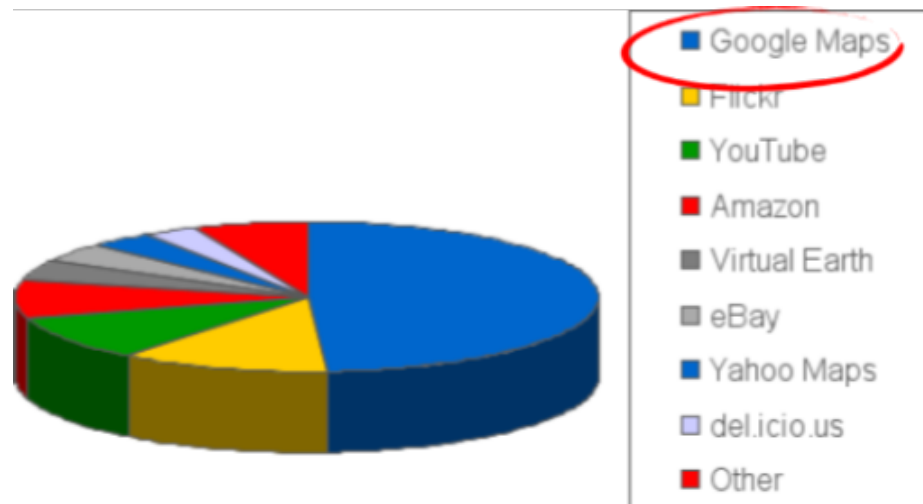
Google[™] | Enterprise

Most Usable Mapping Technology

Most popular mapping site with **consumers** around the world...



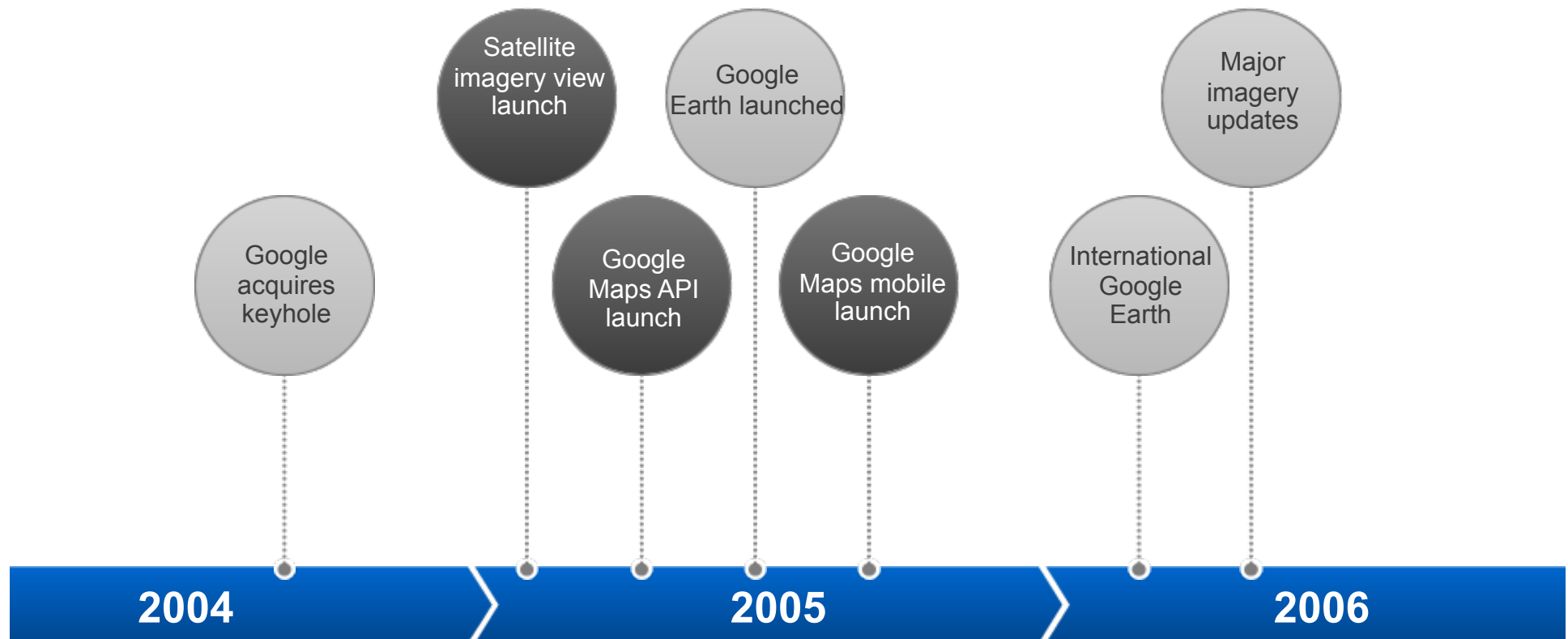
Source: ComScore, December 2009



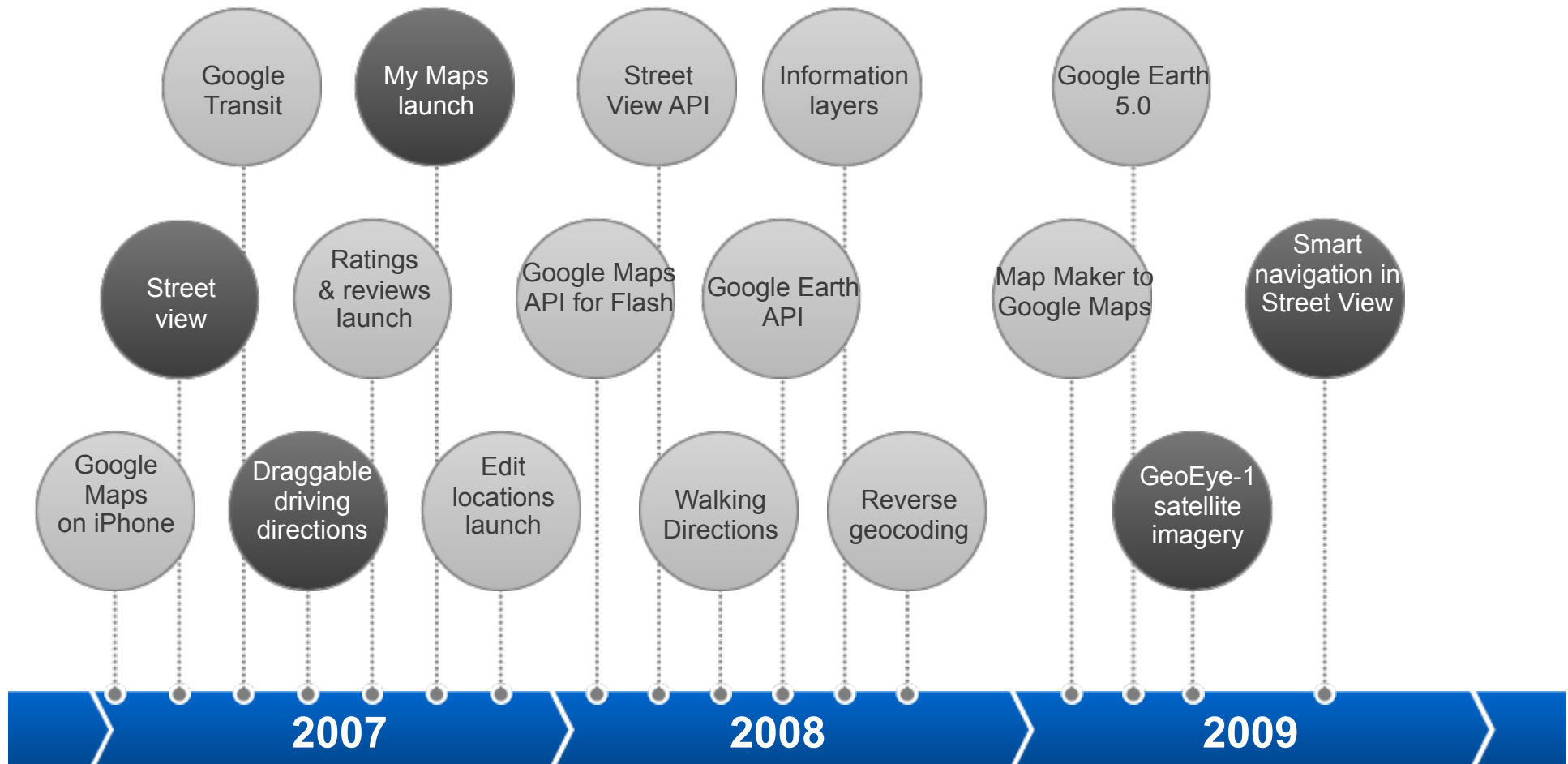
Source: ProgrammableWeb, Dec. 2008

...and developers, with **over 150,000 developers** using Google Maps API to create new applications and change the web

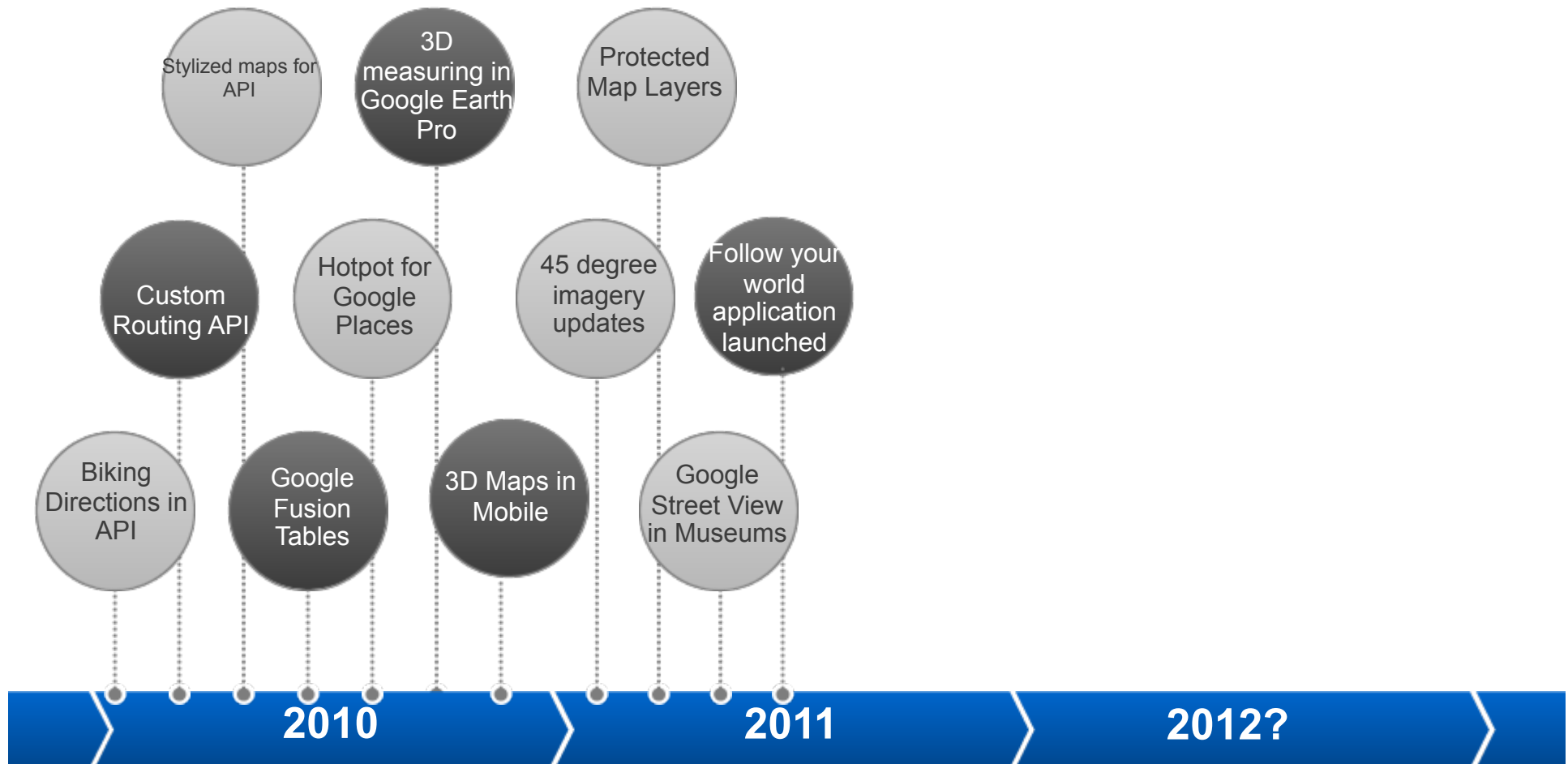
Constant Innovation, Massive Investment



Constant Innovation, Massive Investment



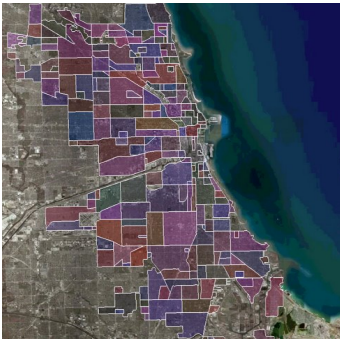
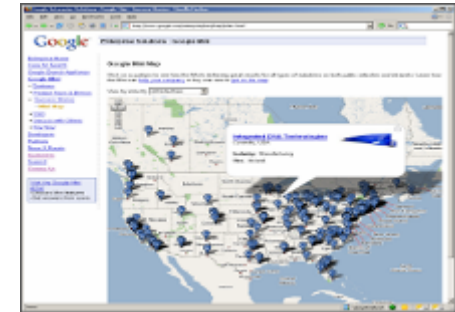
Constant Innovation, Massive Investment



Enterprise Geospatial Portfolio

Google Maps API Premier

- Hosted Solution for web based maps
- API integration for web based solutions
- Premier edition for enterprise level support

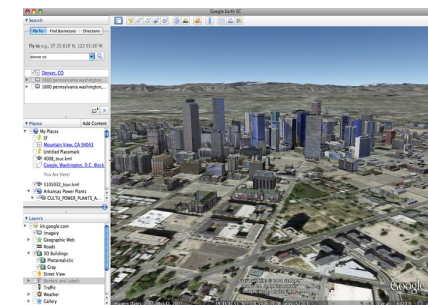


Google Earth Enterprise

- Build custom earth with large geospatial datasets
- Connect to internet or disconnected globe
- Support thousands of internal users

Google Earth Pro

- Access to Google's comprehensive database
- Print and export high resolution images
- Import GIS address data with rich styling





Google Earth Builder


Google[™] | Enterprise

Location is everywhere



“By the end of 2011, over 75 percent of devices shipped in mature markets will include a GPS” Gartner 2011 trends

Location is anywhere

A pair of hands is shown holding a black tablet computer. The tablet's screen is a solid blue color, and it displays white text in the center. The hands are positioned on the left and right sides of the tablet, with the thumbs resting on the edges.

Worldwide smartphone
and tablet shipment
exceed PC and
notebook shipments as
of CQ4-2010

KPCB/Mary Meeker and Katy Hurberty, Ehud Gelblum – Morgan Stanley Research as of 2/2011

Google Confidential and

Geospatial data is difficult to manage



Hidden Server Costs

Upkeep and server maintenance is a hidden cost when dealing with large geospatial datasets.



Scalability

Servers need to be provisioned and updated in order to scale for additional use or demand



Data Replication

Geospatial data needs to be replicated for disaster recovery – doubling the cost for servers.

Decision making extends beyond the GIS department



Technical GIS Software

Often, employees must have desktop GIS software to view geospatial data and require training in order to use the software.



Difficult to Process

Geospatial data is large must be processed to be viewable on mobile phones.



Basemap is expensive

Comprehensive basemap data is needed to see the full potential of business GIS data and sourcing basemap data is expensive.

Employees must collaborate and work outside the office



Coding Required

Building web based maps often requires coding and cannot be done by GIS staff.



Access Controls

Some employees need access to all geospatial data while others only need to view some datasets.



Mobile workforce

Geospatial data needs to be viewed outside of the office, but employees are relegated to desktop GIS software in order to view data

Google is uniquely positioned to deliver this vision



Massive Popularity



#1 Worldwide Online Map

Most popular map in the world

160+ Countries of user generated data

Passionate users and local expert help map roads

#1 in Ten Countries

With millions of users

Enormous Scale



Road Maps for 100+ Countries

With over 10,000 corrections per hour

Exclusive GeoEye rights

For half-meter high resolution imagery

StreetView in 20+ Countries

And over 200 U.S. Cities

Engineering Excellence



Fastest to Load a Map

Quicker than other web maps

Guaranteed SLA

99.9% guaranteed uptime

350,000 Developers Worldwide

Built for our unique architecture

The most intuitive products built on the most scalable infrastructure

Introducing: Google Earth Builder



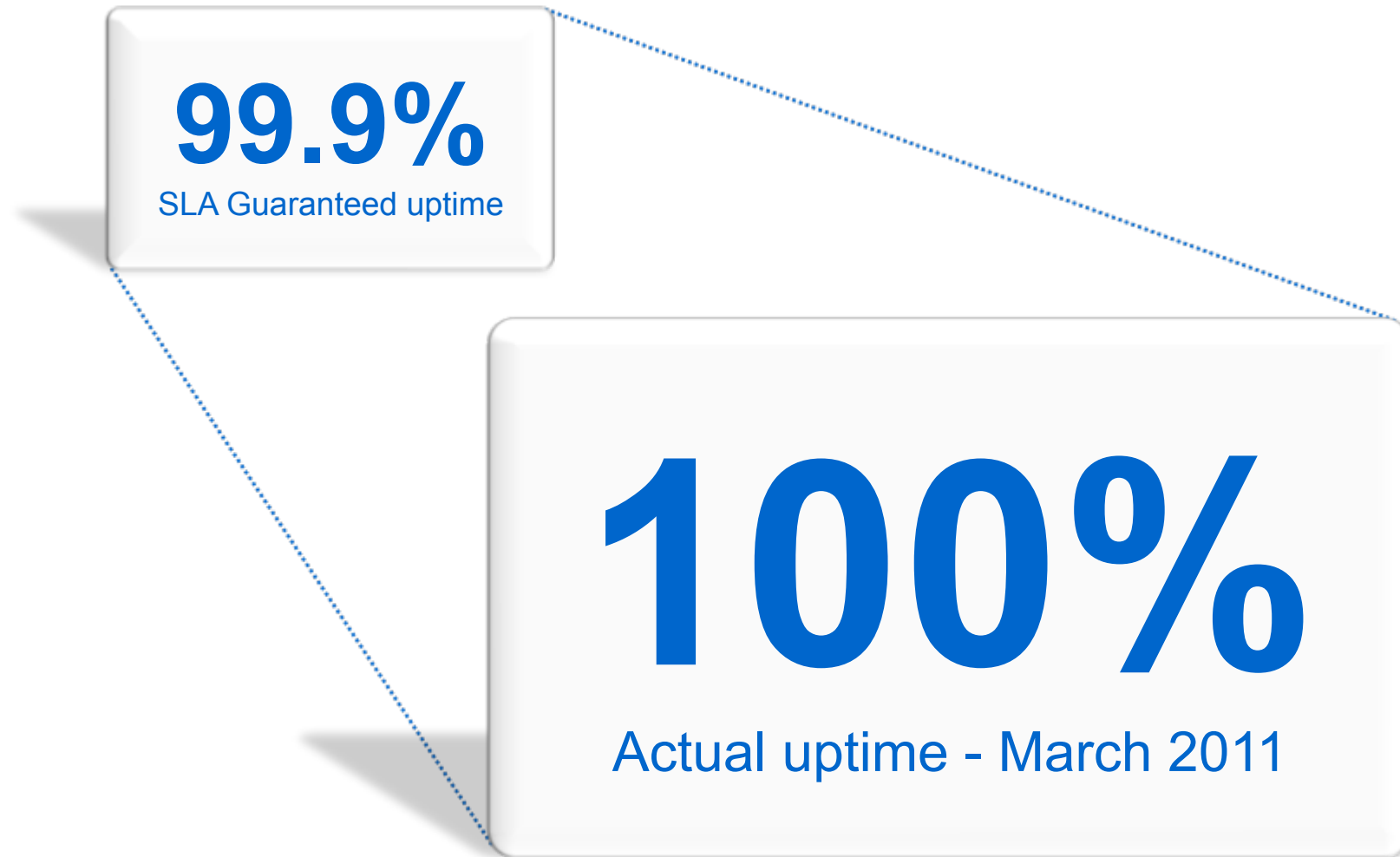
Google infrastructure



Saves budget
No on site hardware
Always up to date



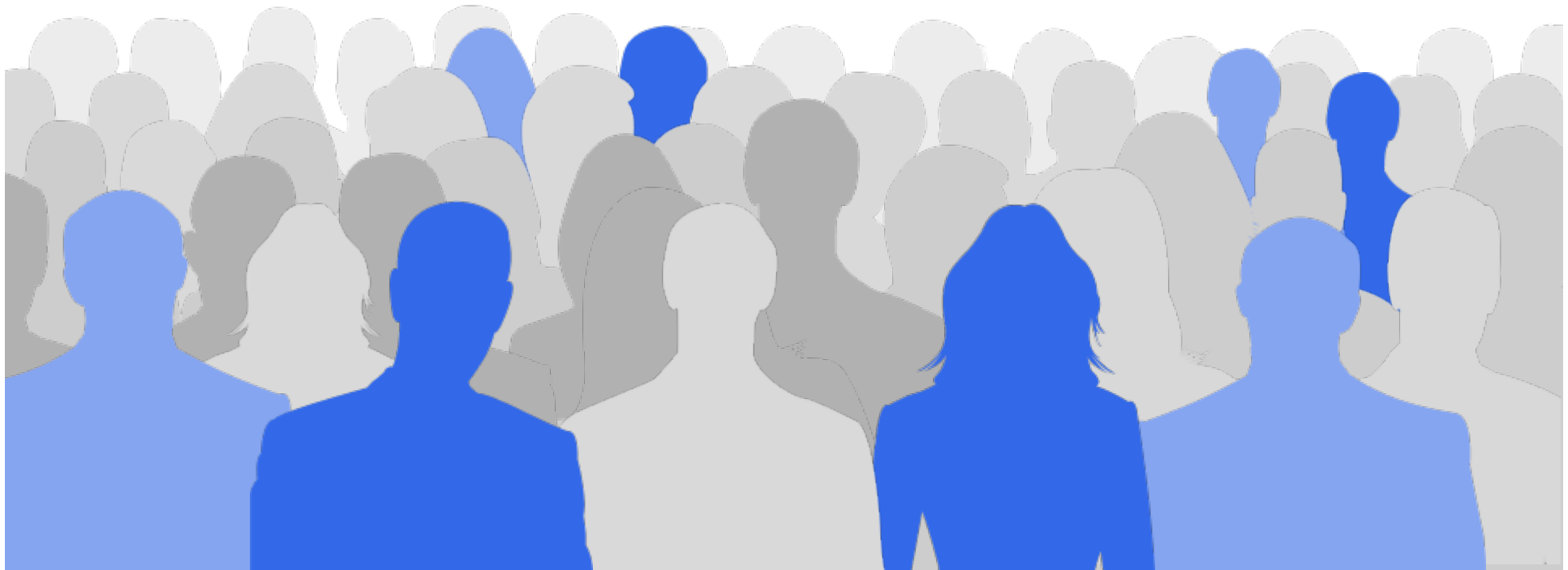
Google Earth and Maps guaranteed uptime



Massive popularity



Google Earth has been
downloaded over 700 million
times.



Extensive basemap



Image © 2011 TerraMetrics
Image USDA Farm Service Agency
Image © 2011 DigitalGlobe

© 2010 Google

Google MapMaker Live and Expanding



Google Places - 6M claimed and growing



Extensive basemap



Complex geospatial data



Large Files



Very large imagery files

Seamless Tiles



Fast seamless map
image technology

Admin



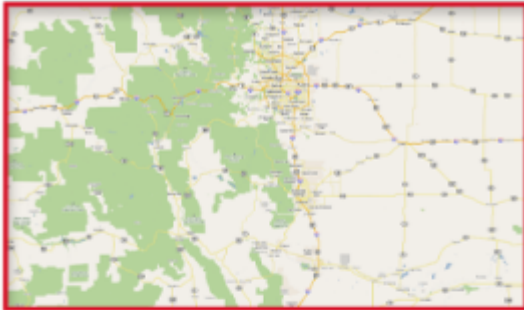
Map Makers



Map Users



Aligning Data to Users



Access Google Earth and Maps anywhere



Tablet



Android



iPhone



Browsers



HOW IT WORKS

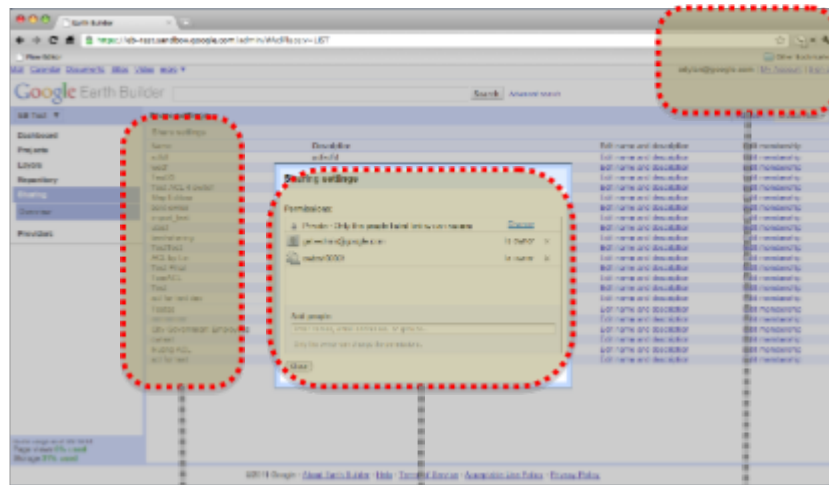
Managing Data



Geospatial data is uploaded to cloud
Map builders style map layers
Users see custom map layers

Defined access throughout the organization

Google Earth Builder Administrators



Access control for individual layers

Administrator explicitly shares with one person or a group

One or many administrators manage the accounts

Google Earth Builder Users



Users must log into Google account to see Google Earth options

User sees Google Earth Globes explicitly shared with him

Customized Google Earth experience

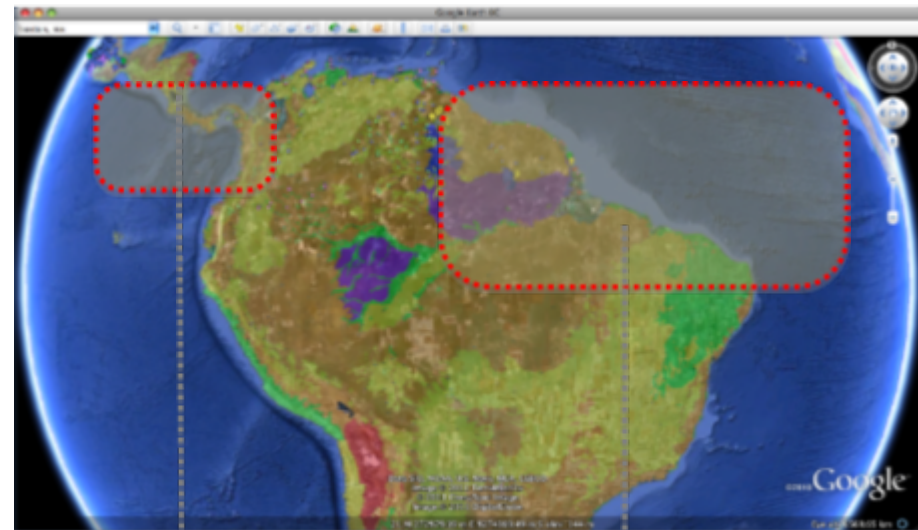
Google Earth Builder Administrators



Google Earth Builder
Administrators can
see metadata

Administrators
have a overview of
uploaded and
stored data

Google Earth Builder Users



Google Earth
Builder Users only
sees authenticated
layers

Layers can be styled and
customized for each
individual user or
workgroup

Google Earth Builder: 100% Web





Thank You