Web 2.0 and Geospatial Convergence

Geoff Zeiss, Director of Technology
Worldwide Challenges
The Norwegian Nobel Committee has decided that the Nobel Peace Prize for 2007 is to be shared, in two equal parts, between the Intergovernmental Panel on Climate Change (IPCC) and Albert Arnold (Al) Gore Jr. for their efforts to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations for the measures that are needed to counteract such change.
Sustainable Infrastructure

• **LEED**
  - *Leadership in Energy and Environmental Design*
  - Standards for environmentally sustainable construction
  - U.S. Green Building Council (USGBC)
  - Inception in 1998

• **As of July 2007**
  - 14,000 projects
  - 50 US States and 30 countries
  - 1.062 billion square feet
Aging and Impaired Infrastructure

- El Paso Gas Explosion, 2000
- New York Steam Explosion, 2007
- Minneapolis Bridge Collapse, 2007
- Quebec Overpass Collapse, 2006
- Singapore Nicoll Highway Subsidence
- Riverside Expressway collapse

Minneapolis Bridge Collapse 2007
Northeast Blackout 2003
Emergency Response Needs

Belgium Gas Explosion 2004

Oklahoma City 1995

Yogyakarta Earthquake 2006

Oklahoma City 1995
Challenge: Aging Workforce

Decline in Number of Workers Aged 35-44 by 2010

![Graph showing the decline in number of workers aged 35-44 by 2010 for different countries. Germany shows the highest decline, followed by the UK, Italy, Japan, and China with similar lower declines.]
Annual Construction Spend

Worldwide $2.3 trillion per year

China $88 billion (1Q 2007)

India $50 billion per year

Canada $68 billion (in 97$) per year

US $1.2 trillion per year
Challenge: Productivity

Construction & Non-Farm Labor Productivity Index (1964-2003)

Constant $ of contracts/workhours of hourly workers
Sources: US Dept. of Commerce, Bureau of Labor Statistics
Operational Efficiency: Islands of Information

- Architectural Design
- Civil Engineering
- GIS
- Infrastructure Management
Operational Efficiency: Value of Interoperability

2002 National Institute of Standards and Technology (NIST) Study

- Quantified efficiency losses in the U.S. capital facilities industry from inadequate interoperability over entire facility life-cycle.

- Estimated poor interoperability costs $15.8 billion

- “ Likely to be a conservative figure” - NIST
Industry is Developing New Technologies
Location-enabling IT

Examples: Web search, RDBMS, CAD, architectural design, engineering, …
Open Standards
Web 2.0 Enables Participation
3D Simulation
Experience Before You Build
3D Cityscapes
Convergence Enables 3D Urban Simulation

- Building structure & interior design
- Mechanical, electrical, & plumbing detail
- GIS street and parcel information
- Underground utility data
- Realistic visualization
Challenge: Aging Workforce in Utilities and Telcos
CAD/BIM is a Primary Data Source of Precision Infrastructure Information

Data

- Architects, Engineers, Planners, Designers, Drafters
- EO Satellites, Aerial overflights, Terrestrial scanning
- Paper, Data conversion, Digitization
- Field data capture, Surveyors, GPS
- CAD, BIM
- Photogrammetry, Radar, Laser Scanning, LIDAR
- Scanning, CAD
- Theodolite, GPS
Inefficient Flow of Infrastructure Information

- Engineering Design (CAD)
- Construction Drawings
- Field Force (Linesmen, Troublemen, Install and Repair)
- Records (GIS)
- Construction
- As-buils
- Records
- Markups
- Paper
Aging Workforce in the Utility Industry

- Average age of utility workers is close to 50
- By 2010, as many as 60 percent of today’s experienced utility workers will retire.
  - Study by American Public Power Assn
- Aging work force is #1 concern of utility HR executives
  - Survey by Carnegie Mellon University Electricity Industry Center
- 20 % decline in productivity forecasted
  - Booz Allen study
# What is Web 2.0?

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*Source: Tim O’Reilly “What is Web 2.0?”*
Web 2.0 Enables Field Participation

- Engineering Design (Geospatial CAD)
- Field Force (Linesmen, Troublemen, Install and Repair)
- Spatial RDBMS
- Construction Drawings
- Construction
- Paper
- Workprint
- Records
- Update
- Enable field force participation
- Streamline as-buils
- Records (Geospatial CAD)
Open Source Geospatial Foundation

Web Mapping
MapServer
MapGuide Open Source
OpenLayers
MapBender
MapBuilder

Desktop Applications
GRASS
OSSIM
Quantum GIS

Metadata Catalog
GeoNetwork opensource

Geospatial Libraries
GDAL/OGR
GeoTools
Feature Data Object (FDO)
Web 2.0 Open Source Web Mapping Platform

Desktop Applications
- Spatially-enabled CAD Desktop

Web Applications
- Fusion
  - MapGuide Open Source

Feature Data Object API
- SDF
- Shape
- ArcSDE
- MySQL
- Oracle Spatial
Web 2.0 and the Aging Workforce
Convergence: First Responders
What is the Problem?
What Does a First Responder Need?

**OUTSIDE**

3D exterior urban visualization

Including:
- Utility structures
- Full city blocks of 3D detail
- Precise spatial orientation
- Line of Sight calculations
- Space – to – Sidewalk view

**INSIDE**

Full interior, 3D visualization

Including:
- Utility / HVAC systems
- Furniture
- Mechanized lifts / elevators
- Walls, doors, windows
- Precision architectural detail

**UNDER**

3D subterranean visualization

Including:
- Sewer systems
- Utility / Phone systems
- Electrical systems
- Access routes / portals
- Precision CAD detail
How Did We Do It?

3D Studio Max

BIM Files
GIS Files
CAD Files
Terrain Files
Civil Design Files
Infrastructure (Oracle RDBMS)

Visualization Engine

Emergency Responder
Web Browser
“Like SIMCity, but with real data”
Convergence: Citizen Communication
Summary

• Worldwide challenges: global climate change, aging infrastructure, aging workforce, productivity

• New technologies are being developed to address these challenges.

  ▪ *Convergence* is changing the way infrastructure and buildings are being designed, managed, and operated

  ▪ Provides important benefits to utilities, telcos, and government.