Where Are We? Emergency Management, GIS, and Data Mining

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Where I’m Coming From...
In those days, the thread on fire hydrants and fire hoses was not standardized; each county and city had its own kind of thread. When the first out-of-town firefighters rushed from Washington to help, they could do little. Because they could not use their fire hoses, the firefighters could only marginally increase the amount of water thrown on the fire. As a result, the fire took longer to put out than it would have otherwise.
A Painful Lesson Still Not Learned

Interoperable Communications
Post-9/11, Emergency Radios Still Not Connected
By: Alicia A. Caldwell, Associated Press
09/01/11

WASHINGTON (AP) — Amid the chaos of the Sept. 11 attacks in 2001, emergency responders found they could not communicate with each other. That problem persists 10 years later, according to a review of the 9/11 Commission's recommendations.

A National Preparedness Group report released Wednesday concludes that the recommendation that a nationwide broadband network for emergency responders be created "continues to languish."

"Despite the lives at stake, the recommendation to improve radio interoperability for first responders has stalled because of a political fight over whether to allocate 10 MHz of radio spectrum ... directly to public safety for a nationwide network, or auction it off to a commercial wireless bidder who would then be required to provide priority access on its network dedicated to public safety during emergencies," says the report, whose authors include 9/11 Commission chairmen Lee Hamilton and Thomas Kean.
• Emergency services are standards based organizations
  – Standard of care
  – Interoperability/interchangeability
  – Organizational consistency (NIMS/ICS)
  – Scalability
  – Continuity of operations/common operating picture
• When the incident occurs IS NOT the time for innovation

George Washington was a volunteer firefighter with Friendship Veterans Fire Co.
Take-away #1: When the crisis occurs is not the time to invent, improvise, or discover a lack of interoperability

- Understand basic needs and potential implementations before inserting solutions
- Solutions must be vetted, tested, and trained upon
- Train together!

Would you want my fire department’s first use of a new set of Jaws-of-Life rescue tools to occur when you are trapped in your vehicle after a wreck? The analogy applies to any geospatial product you might insert during a crisis.
Geospatial Hearts In The Right Place, BUT...
Are you willing to risk your life on your map?

New Orleans - Lower 9th Ward
National Grid (500M) - Zone 15 & Zone 16
<table>
<thead>
<tr>
<th>Color</th>
<th>Symbol</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>/</td>
<td>Sector/planning boundaries</td>
<td></td>
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<tr>
<td>Black</td>
<td>/</td>
<td>Travel barriers</td>
<td>Chiffs, etc.</td>
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<tr>
<td>Black</td>
<td>==</td>
<td>Modifications/updates to map</td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>[I] [II] (A) (B)</td>
<td>Branches Divisions</td>
<td>Consider naming divisions North, South, East, etc</td>
</tr>
<tr>
<td>Red</td>
<td>PLS 9 Jan 1820</td>
<td>Point Last Seen or Last known position</td>
<td>Consider adding direction of travel</td>
</tr>
<tr>
<td>Red</td>
<td>X</td>
<td>Hazard</td>
<td>Write description</td>
</tr>
<tr>
<td>Blue</td>
<td>△</td>
<td>Incident Command Post</td>
<td></td>
</tr>
<tr>
<td>Blue</td>
<td>B</td>
<td>Incident Base</td>
<td>Often same as CP</td>
</tr>
<tr>
<td>Blue</td>
<td>S</td>
<td>Staging area</td>
<td>Often same as CP</td>
</tr>
<tr>
<td>Blue</td>
<td>• H-1</td>
<td>HeliSpot (location and (LZ))</td>
<td></td>
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</table>

**Operational Friction?**

**SUGGESTED FOR PLACEMENT ON BASE MAP**

**MINIMUM RECOMMENDED**

- **BLACK**
  - Ridge
  - Completed Dozer Line
  - Completed Line
  - Crew Completed
  - Forestry Feature
  - Hazard
  - Incident Command Post
  - Incident Base
  - Camp (identify by name)
  - HeliSpot (location and number)

- **RED**
  - 10 Aug 1730
  - Uncontrolled Fire Stage
  - Spot Fire
  - Hot Spot

- **BLUE**
  - Incident Command Post
  - HeliBase
  - Red Cross Mobile Relay
  - Telephone
  - Fire Station
  - Water Source (identify, e.g., pond, well, hydrant)
  - Mobile Weather Unit
  - IR Down Link
  - First Aid Station

- **ORANGE**
  - 10 Aug 2000
  - Planned Fire Line
  - Planned Secondary Line
  - Initially Numbered

**SUGGESTED FOR PLACEMENT ON OVERLAYS**

- **RED**
  - Fire Origin
  - Initially Lettered
  - Clockwise from Fire Origin

- **BLUE**
  - A-Z (Segments)
  - Clockwise Lettering within the Division
  - Wind Speed Direction
  - Proposed Dozer Line
  - Fire Break (planning or incomplete)

**ALL OVERLAYS MUST CONTAIN REGISTRATION MARKS. THESE MAY CONSIST OF IDENTIFIED ROAD INTERSECTIONS, TOWNSHIP/ RANGE CORNERS, MAP CORNERS, ETC.**
Take-away #2: Crisis/emergency response is NOT about you

• It is about the preservation of life and property as facilitated by emergency responders who are **USERS** of geospatial products.

• It is about the population suffering loss and their need for geospatial products for recovery

• It is about facilitating the decision-making process for planning and mitigation.
Without Further Horse Whipping...

• Geospatial technologies may play a crucial supporting role in crisis/emergency management – your map can save lives or contribute to their loss

• Standardization of spatial technologies as applicable to emergency response is required:
  – Planning
  – Mitigation/Prevention
  – Response
  – Recovery
Emergency Management and Response

- Structured and compartmentalized
  - Incident command system is nationally consistent and authorizes a single command authority backed by an organized chain of command
  - Broken into an operational structure with functional areas
  - It is flexible and scalable
Take-away #3: Standards

• Standards exist within the emergency response community. Learn them:
  – FEMA Distance Learning Program for Incident Management
    • [http://training.fema.gov/IS/](http://training.fema.gov/IS/)
  – National Search and Rescue Committee
  – Wildland Fire

• Standards exist within the geospatial community. Learn them:
  – Federal Geographic Data Committee
    • [http://www.fgdc.gov/standards/projects](http://www.fgdc.gov/standards/projects)
A Fundamental Challenge and Chronic State of Denial For Emergency Responders

Many still remain homeless in Mississippi after Hurricane Katrina (2005)
The current official death toll in Haiti is 230,000 persons dead

Imagery courtesy GeoEye via the Google cloud portal
Disasters and emergencies often remove the means by which we traditionally navigate our environment – street signs, house numbers, and other visual clues.

An analysis of the location field for all fire calls reported to the National Fire Information Reporting System for the 2000-2006 time period revealed that nearly a THIRD of all calls for service DO NOT occur at a street address.

Responders typically have intimate knowledge of their primary area of responsibility, but beyond that, we’re lost.

Senior Cpl. Victor Lozada perished when his motorcycle crashed into a bridge abutment while escorting then Senator Clinton in Dallas after a campaign rally – 11 min. response time.
Four Dead...
Take Away #4: Standards promote interoperability and facilitate efficiency

- **EXAMPLE: GEOADDRESSING**
  - US National Grid is the only coordinate system for which an FGDC standard exists
  - Continuing educational need with public (emergency responders are catching on quickly!)
  - Continued work with vendor community to integrate USNG into their products (ex., Garmin Nuvi 500 and 550 Automotive GPS will navigate over roadways to USNG points, ESRI and Google Earth have incorporated USNG into their base viewer systems – must now go after Google Maps, Tom Tom, etc...)
  - Work with other Federal agencies to make the standard attractive for use within their organizations
This Is All About Some POS

- Land search and rescue is an exercise in high school math and geography
  - Probability of Detection
  - Probability of Containment
  - Probability of Success
Take Away #5: What’s “Old” is “New” Again
http://store.usgs.gov
(Choose “Map Locator”)
Big Picture: Crisis/emergency management

• Need for meeting needs for any given crisis/emergency plan, mitigation, response and recovery is based upon:
  – The multi-disciplinary nature of any event
  – The variety and degree of which of built infrastructures are interdependent
  – The willingness of stakeholders to embrace cooperative, standardized approaches that work towards and are appropriate for the audiences they SERVE
The 2010 Haiti Earthquake

- At 15:53 CST on 12 January 2010 a 7.0 magnitude earthquake rocked the island nation of Haiti near the town of Léogâne while I was enroute from conducting a search and rescue mapping workshop with Maryland State Police.

- Joe Toland, a senior GIS Analyst for FEMA, contacted me as I landed in Memphis and requested mapping support which included the provision of USNG/MGRS data and map products.

- US-based assets were en-route and would arrive in less than 18 hours. Our challenge: Create large-scale standardized map products for an area the size of Connecticut in a third world country for which little geospatial data existed.
The earthquake did not completely disrupt cell phone services, though local emergency numbers did fail. As a result, survivors trapped in debris called and/or sent text messages to relatives in cities such as New York, posted to Facebook or Twitter, which were in turn, forwarded to assistance agencies.

CrisisMappers.Net stood up a listening service that permitted the geo-coding of such messages – it was called USHAHIDI.
• While the USHAHADI team worked, GeoEye had satellites in the “right place” at the “right time” to capture post-event imagery. This imagery was processed near-real time and handed to Google.
• Google published the imagery for download and as a kml that could be loaded as a map service
• Open Street Map (http://www.osm.org) pushed the imagery to its constituents who vectorized features
• The result: the known street map of Haiti went from 9,000 named street segments to 72,000 in a period of about 3 days.
Delta State GIS

- DSU GIS consumed data from these sources to produce printable map products that could accompany responders into the disaster zone.
- Maps are still available at [http://mississippi.deltastate.edu/data/haiti](http://mississippi.deltastate.edu/data/haiti) - these products were created by a team of faculty and students starting with 1:25,000 scale maps (first 24 hours) and then 1:6,000 scale maps over the next 12 days.
The Final Takeaway: A New Paradigm

- Haiti taught us that “authoritative” data is not always so authoritative.
- Volunteered/crowd-sourced data may be of tremendous value (but can be difficult to use when not standardized).
- As spatial technologies advance, the level of technical ability required to interact with complex systems decreases thereby increasing access to ever broadening audiences.
- This has created a tremendous set of conundrums for the geospatial industry:
  - When is the use of crowd-sourced data appropriate?
  - Who owns the data and how may it be used?
  - What is the intrinsic and financial value of professionally-collected geospatial data and when is it required?
  - How does one protect “sensitive” or “restricted” data?
  - …???
New and Emerging Applications

- Open Street Map (http://www.osm.org)
  - Check out your neighborhood and try digitizing in some features
- Real-time traffic reporting (http://apollo.smu.edu.sg/papers/mobisys11-traffic.pdf)
- US Army – “Every soldier is a sensor”(http://www3.ausa.org/PDFdocs/IP_Sensor08_04.pdf)
- ESRI Community Maps Program (http://www.esri.com/software/arcgis/community-maps-program/index.html)
Collaborate to live: Live to collaborate again

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