



National States Geographic Information Council

REPORT OF STAKEHOLDER ENGAGEMENT ON FOUR GEOSPATIAL ISSUES WITH NATIONAL IMPORTANCE

At NSGIC's February 2014 Midyear Meeting

Abstract

The National States Geographic Information Council (NSGIC) is a “melting pot” that provides opportunities for all sectors of the geospatial community to collaborate on nationally important issues. At its 2014 Midyear Meeting, NSGIC conducted four separate three-hour breakout discussions on pressing national issues, including the development of a National Address Database, continued development of Transportation for the Nation, general issues related to the National Spatial Data Infrastructure, and the geospatial component of Emergency Management.

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BACKGROUND

The National States Geographic Information Council (NSGIC) is a “melting pot” that provides opportunities for all sectors of the geospatial community to collaborate on nationally important issues. At its 2014 Midyear Meeting, NSGIC conducted four separate three-hour breakout discussions on pressing national issues, including the development of a National Address Database, continued development of Transportation for the Nation, general issues related to the National Spatial Data Infrastructure, and the geospatial component of Emergency Management.

These discussions were intended to increase everyone’s understanding of the issues. They were not designed to gain consensus on solutions. After all, these issues have been discussed in nearly every forum of the geospatial community (facilitated, or not) for as long as 20 years, and solutions to the problems have been very elusive. Many of the underlying problems are simply related to resourcing, bureaucracy, public law, and the fact that national coordination is complex and requires exceptionally strong leadership. These issues will only be resolved with the full understanding and support of Federal agency executives and Congress. To assist with their understanding of the issues, a copy of this document will be forwarded to appropriate Federal agency executives, the Government Accountability Office (GAO), the Office of Management and Budget (OMB) and the various committees of Congress with oversight in these areas.

What follows is a distillation of the issues that were identified. Detailed notes were taken during each session and will be made available upon request. Suggestions are offered for incremental improvements (“solutions”) in each issue area, with the hope that these improvements are fully achievable. These suggestions will not solve all of the problems, but they will make measureable improvements that will enable major initiatives like the President’s Climate Action Plan, and allow agencies to effectively deal with discreet programmatic requirements. These suggestions were based on the input of the participants and may, or may not require significant resourcing to implement.

1 NATIONAL SPATIAL DATA INFRASTRUCTURE (NSDI)

SUMMARY OF THE DISCUSSION: We have lost ground in recent years with regard to the Federal/state coordination efforts that are required to build the National Spatial Data Infrastructure (NSDI). We explored some key coordination issues, including requirements for Federal liaisons to the states, incentive programs, and national data programs to identify what works and what doesn’t work. The participants suggested incremental solutions to improve Federal/state coordination mechanisms and programs.

KEY TAKEAWAY POINT: *Some agencies with A-16 theme lead assignments are ignoring their responsibilities and not coordinating with state and local government. Agencies with mission specific needs for data are more likely to obtain appropriations and contract for data than*

agencies trying to develop cross-cutting framework data that would be shared by multiple agencies.

ISSUES IDENTIFIED:

Solutions to NSDI-related problems are generally elusive, and we've essentially been dealing with, or talking about the same issues for 20 years. However, one significant insight was offered when the discussion turned to successful and unsuccessful programs. It was noted that mission-specific programs are typically successful, but not always in a way that meets the needs of the entire geospatial community. In contrast, the development of 'Framework' data has typically been approached with the mindset that it should meet the needs of the entire community. This model needs to be reassessed and more thought given to approaches that include 'core' products that can be bought-up by other partners to meet their business requirements. National programs are generally unwilling to entertain stewardship of such programs with the possibility that their agency would be required to underwrite the full cost. In addition, when jointly funding national projects with large groups of stakeholders, there are very real costs associated with coordination, contracting, quality assurance, maintenance, and data distribution. The positive impacts of mission-specific projects should shape our thinking as we move forward.

Without sound mechanisms to coordinate and partner, we cannot build a National Spatial Data Infrastructure. Prior to FFY 2006, the Federal Geographic Data Committee (FGDC) dealt more directly with NSGIC and state governments. During FFY 2006, the FGDC began work on the Geospatial Line of Business as part of President George W. Bush's management agenda and the advancement of electronic government. When that happened, the FGDC essentially stopped working with other stakeholder groups and only deals with Federal agencies, because OMB focused these initiatives on budgetary issues. However, some of the priority actions identified in the Geospatial Line of Business (e.g. portfolio management) have yet to be implemented. Effective communication and mutual interests are at the heart of every partnership. The FGDC attempts to communicate effectively across its member agencies. However, there are so many 'pockets' of geospatial activity within the entire Federal Government that it can't communicate and coordinate with all of them. We must identify effective ways to communicate and coordinate between Federal, state and local government on the development of National Geospatial Data Assets (NGDA).

In FFY 2014, the U.S. Geological Survey (USGS) has effectively withdrawn their Liaison Network that was an integral component of many statewide coordination programs. These individuals, which nearly numbered one per state in FFY 2006, lived and worked in the states that they serviced. Due to sequestration, budget priorities and a change in management focus on internal science needs at USGS, the number of Liaisons has decreased and their activities are now focused only on USGS projects. This network was highly effective at coordinating data development projects in many states. A good example is the 133-Cities Program at the National Geospatial-Intelligence Agency (NGA) which is prohibited from working on civil issues within the United States. Through an agreement between the agencies, the USGS Liaisons developed partnerships with other Federal agencies and with state and local governments. The net effect was that they

were able to typically leverage NGA's funds at a ratio of 7.5 to 1. This clearly indicates the success of the program. At this time, the Liaisons are limited to working only on USGS priority projects such as the 3DEP Elevation Program. This focus still has value to the states and other partners, but it is also very limiting and can't support the development of a National Spatial Data Infrastructure. Other programs like 133-Cities will lose all support in FFY 2015. An effective Liaison Network between the states and Federal agencies must be re-established in an oversight agency as we move forward.

States have no clear guidance from the Federal government. The concept of the NSDI was put forth in 1994 through Executive Order 12906 and reinforced by OMB Circular A-16. Unfortunately, without a clear vision of the NSDI, adequate Federal resources, legislated programs, authoritative mandates, or acceptance of agency responsibilities, the states have been left with no clear direction on how they should work effectively with the Federal government on the over-arching components of the NSDI such as some Framework Data or national web-based systems that meet the needs of all stakeholders. This is in stark contrast to the mission-specific initiatives noted in the opening paragraph. Instead, the stakeholders, including the states, are subjected to programs that:

- Rapidly evolve with changing technologies;
- Ebb and flow due to funding issues;
- Change direction and focus frequently;
- Suffer from personality conflicts; and
- Simply disappear with no suitable replacement, or are replaced with entirely new efforts.

It isn't possible to build stable National Spatial Data Infrastructure programs while these issues impact the stakeholder community. There are very straightforward structural management issues within the Federal government that must be corrected if we hope to create an effective NSDI.

As a result of the above issue, **each state is left to evolve their own Statewide Spatial Data Infrastructure (SSDI) to meet the needs of their enterprise.** In some cases, states have very effectively worked with their stakeholders in local government and in others they have not. The result for the Federal agencies is that the states and insular areas now look and act like fifty-six completely different entities. When Federal agencies want to initiate a national program, they quickly become frustrated with this variability and often decide to simply meet their own internal needs. This problem can only be overcome when there is:

- An overwhelming need within state and local government for the Federal product;
- A legal mandate to participate in a national effort; or
- An appropriate incentive that will prompt states and local governments to exchange information in uniform ways.

It is not possible to build a National Spatial Data Infrastructure without state and local government participation, because in many cases, they are the authoritative data sources. However, there are logical choices for building certain National Geospatial Data Assets (NGDA) starting with the Federal government (down), Local government (up), and through the Private sector as licensees. Appropriate incentives that will elicit participation by state and local governments for the

authoritative data will generally cost far less than Federally-focused efforts to duplicate this data, not to mention the actual compounding effects of wasted and duplication of effort. We must build layer-specific Business Plans that establish the logical producer and federal custodian of choice for each National Geospatial Data Asset and then develop appropriate incentives, cost-share rates, contracting mechanisms, partnership opportunities, and governance.

Standards are necessary, but they can become overly complex. The Federal and International data standards process is so slow that, when published, the standards can be out-of-date due to technological, commercial, or programmatic advancements. It is not possible to build a National Spatial Data Infrastructure without the ability to quickly publish appropriate standards. We must start focusing on topology and simple Data Models and Data Exchange Standards for core data elements to enable effective exchanges of information between Federal, state, and local government partners.

RECOMMENDATIONS:

- 1) Business Plans must be developed with the stakeholder community for each NGDA that identify the authoritative data source, federal custodian, appropriate incentives for partnering, cost-share rates, contracting mechanisms, partnership opportunities, governance (including the states and other stakeholders), data models and data exchange standards.
- 2) Every Federal agency with mission-specific state and local government partners should implement systems and programs similar to the Environmental Protection Agency's (EPA) Information Exchange Network for data development and maintenance.
- 3) Congress should establish an oversight Committee for Federal geospatial activities. This Committee should authorize FGDC or another 'neutral' agency to quickly implement portfolio management of federal-wide geospatial programs and to properly address technology, legal, communications, governance, and funding issues. This agency must be given the responsibility, authority and resourcing for coordinating the NSDI.
- 4) An agency-agnostic Liaison Network with at least fifty-six field staff should be established to coordinate between Federal agencies and state and local governments. These individuals must reside in each state and insular area, and work directly with state, tribal, regional and local governments.
- 5) We must recognize and affirm the appropriate roles for the Private Sector in building and maintaining the NSDI. Public/Private partnerships are working in other locations such as Alberta, Canada through the AltaGIS/Spatial Data Warehouse. Success stories like this should be more carefully examined for implementation in the United States.
- 6) We must find effective ways to identify and communicate the amount of money that Federal, state and local agencies are spending on geospatial data and the impact of that data on local and national scales. The scale of expenditures is much larger than typically envisioned.

2 NATIONAL ADDRESS POINT DATABASE (NAPD)

SUMMARY OF THE DISCUSSION: This discussion explored the issues surrounding the development of an authoritative National Address Point Database (NAPD), and the extent and reasons for duplication of effort. After the issues were identified, participants provided suggestions for incremental improvements to effectively roll-up local address point data (X & Y coordinates) to a single authoritative NAPD.

KEY TAKEAWAY POINT: *Nearly every aspect of government operations has a requirement for authoritative and consistent address data; however, at this time Next Generation 9-1-1 is a compelling business driver and enabler for developing the NAPD.*

ISSUES IDENTIFIED:

Because they assign addresses as part of the building permit and approval process, **local government is recognized as the appropriate source of authoritative address data**. However, there are many obstacles to building and maintaining an authoritative NAPD in collaboration with local governments, including:

- Even with a common national standard, interpretations of that standard will differ, and individual jurisdictions will often enter data differently.
- When data is maintained by public safety organizations, they may be reluctant to share what they view as private information, and technological interoperability issues may be an impediment (e.g. Computer Aided Dispatch v. GIS).
- Rural counties simply may not have data and helping them build capacity is important.
- Continuous updates may be difficult or unrealistic for address authorities.
- In some jurisdictions, if data is shared for commercial reasons, the steward may charge for geospatial data, or even require payment at market value for that data. This creates a disincentive for sharing and other incentives must be developed to offset these issues.
- The stream of requests for local data from several state and Federal agencies represents a lost opportunity to coordinate address work flow.
- Local government may see this as an unfunded mandate.
- Many local governments are reluctant to share data freely that they funded/produced with others, especially the private sector, without resolving the ‘what’s in it for me’ question.

As relatively simple as an address may appear, **Standards and Data Models must account for many complexities** to produce consistently useful results. Complexity led to the existing FGDC’s United States Thoroughfare, Landmark, and Postal Address Data Standard, which is over 600 pages long. There are many standards-related issues that must be considered in the development of a NAPD, including:

- We need a universally accepted definition of what the term “address” means. Is it the billing address of a person who owns property, 9-1-1 data, X & Y (and soon to be Z) coordinates, a substructure location, or an actual mailing address. The business uses will vary.

- The FGDC standard is very robust, but intimidating for many to the point that they simply won't use it.
- Some participants feel that the exchange and address standards are impractical and that we should identify a "minimally-compliant standard." It could be developed by picking the parts that can be practically implemented to provide a common baseline data set. Individual organizations can choose to exceed the minimal standard with implementation up to the full standard.
- Keeping addressing standards and guidelines as simple as possible is very important, however, you can't ignore that there are some inherent complexities in addressing that must be dealt with (e.g. managing sub-units, choosing the placement of coordinate points, managing multi building parcels such as townhouse complexes, and multi-address commercial structures like mini-malls or malls).
- Getting data submitted in a uniform fashion at the Federal level has been an obstacle to date.
- When NENA's Civic Location Data Exchange Format (CLDXF) exchange standard is implemented, it may increase efficiency.
- Data producers and maintainers are likely to implement complex standards in irregular ways. Simplicity is the key to a good standard.

The economic drivers and incentives for developing the NAPD must be identified and effectively communicated. Address data is a frequently duplicated form of geospatial data, because nearly every agency requires it for their business process and a nationally-consistent file is not currently available. The duplication of effort is both extremely wasteful and inefficient. The main points identified with regard to economic drivers and incentives, include:

- We must create incentives for state and local government to encourage their participation in building the NAPD (e.g. funding, technical expertise, in-kind services, distribution, maintenance, verification and validation).
- We need clear and consistent messaging to higher officials on the value of address data, different address location methods and the duplication of effort is critical.
- Missed addresses can cost lives and property when first responders can't find citizens in need, or citizens don't get notifications of impending emergencies or disasters.
- Missed addresses also add up monetarily. Inaccurate population counts during a decennial Census result in the improper distribution of Federal Block Grants. This results in the loss of ~\$1,945 per year for each individual that is not counted (\$607 billion in FY 2011/312 million population). Therefore, sharing addresses is economically very important to local government.
- Inaccurate addresses may also result in the improper distribution of sales or property taxes.
- We need to be able to demonstrate what it costs to create address point data to a core standard. Census has tried this and wasn't able to develop an accurate number.
- ROI figures may actually be greater at local level than at the Federal level.
- Enumerating cost savings is very difficult, which makes it difficult to obtain budget appropriations.
- A couple of very brief value documents can help express the importance of addresses and why sharing in the public domain can be so beneficial to the data providers (e.g. local level data maintainers, state aggregators, and Federal agencies).

Documenting business requirements is a critical step that must be done now. There are two critical milestones that must be met if we hope to have the political support required to build the NAPD. The first is the decennial Census in 2020. The states must be able to aggregate local government addresses and provide them to the NAPD by FFY 2017 so that the U.S. Census Bureau can exercise contingency plans to create their own Master Address File (MAF) if efforts to build the NAPD with the states either fail or stall. By sometime in 2015 Census will list where on-the-ground forces will have to be mobilized for their targeted canvassing. By the end of 2016, Census must invite stakeholders to join the data collection process, including partners like the U.S. Postal Service. Another critical milestone is the implementation of Next Generation 9-1-1 service which has already started in some states and local governments as joint projects. These two efforts are critical functions of government and they will both require independent action if they cannot be 'connected.' The main discussion points on these issues include:

- Having authoritative address data is different from having the authority to create data. Local Public Safety Answering Points (PSAPs) generally have authoritative data and the most stringent requirement for data maintenance. The U.S. Census Bureau has a legal mandate (authority) and budget to create the data for their purposes to support the decennial Census efforts.
- While 9-1-1 and NG 9-1-1 are logical drivers for local address point data development and maintenance, not all states understand their requirements. The data must also meet other local government requirements.
- Outreach and messaging for public safety, and other local government is important.
- To justify the funding required for data maintenance (regular/secure) those agencies maintaining address point data need to know which organizations rely on their work, and particularly as potential funding partners. ROI figures must be developed as part of their justification.
- Tying address points to road centerlines is important, especially in densely populated areas.
- Data may not be adequately aggregated even when it is available from many local sources, because no entity is properly resourced to collect it.
- Many tools are being developed by the states to manage address data workflow and maintenance. We need to exchange information routinely about the development of these tools and their efficacy.
- The Census Bureau is doing a great deal of work with "one hand tied behind their back," which is a reference to Title 13 privacy restrictions and the fact that they are not a granting agency. They are prevented from issuing grants due to legislation, but they can enter into contractual arrangements.
- There is no explicit A-16 theme for Addresses, nor is there an identified national steward for Addresses under A-16. Should this deficiency be corrected quickly with addresses as a theme, or should they be incorporated into another theme (e.g. into the A-16 Transportation layer as a National Geospatial Data Asset (NGDA) dataset)? The National Geospatial Advisory Committee (NGAC) has recommended that a new theme be identified.

RECOMMENDATIONS:

- 1) NSGIC will work with other willing partners to identify several economic incentives that have a high impact to state and local governments. Anecdotal examples of their values will be clearly demonstrated in a 2-page document that will try to establish the relationship between local efforts and the NAPD. NSGIC will work with other national organizations

whose members can have a positive impact on coordination and cooperation for building the NAPD (e.g. NCSL, NLC, NASCIO, NACo, NGA, etc.). Examples of those incentives include:

- a. Streamlined sales tax,
 - b. Crash analysis/public safety (look at # of crash locations before and after),
 - c. Cost of “homemade” geocoding services (savings and credits/duplication),
 - d. Health (Medicaid/Medicare fraud, targeting services),
 - e. Redistricting of voters (eliminate having to do fieldwork),
 - f. School data (bus routing, school siting, etc.),
 - g. Red Cross and FEMA individual assistance requests in disasters, and
 - h. Rapid damage assessments in disasters.
 - i. Missed addresses add up monetarily and adversely impact the distribution of Block Grant and other federal funds.
- 2) An abbreviated Data Standard based on the FGDC Standard needs to be developed to show only those “Core Elements” that must be uniform in all addressing efforts.
 - 3) A Data Model and Exchange Standard must be agreed to, and heavily promoted to ensure that additional models and standards are not continually developed to meet individual needs.
 - a. We should simplify this effort by creating categories for participation like:
 - i. Tier 1: Core Elements
 - ii. Tier 2: Mandatory Elements for Specific Applications
 - iii. Tier 3: Optional Elements
 - b. We should not complicate this job when the Core Elements are universal and relatively easy to achieve. We can focus on necessary exceptions later.
 - 4) A simple data workflow process model must be developed that demonstrates the importance for local government address authorities to assign and locate (X & Y Coordinate) the address, and update the address repositories. The key is to have statutes and workflows that support the local maintenance of the address point database as new addresses are created.
 - 5) The role of the states as aggregators of local data must be recognized and promoted. We should not expect the local jurisdictions with legacy systems to adopt a uniform model or change their workflow process unless they are adequately incentivized.
 - 6) Twenty-two states already have address data aggregation efforts underway. Many of them have already developed tools to do this work and to support the workflow process. NSGIC and other organizations should look closely at the existing efforts through webinars and conference presentations to see which models are worthy of duplication. This should be viewed as a sharing opportunity to improve government efficiency.
 - 7) NSGIC will gather ROI information from these early adopters where/if it exists and publicly distribute that information.
 - 8) FGDC should add addresses as a theme in OMB Circular A-16 and designate a data steward.

3 TRANSPORTATION FOR THE NATION (TFTN)

SUMMARY OF THE DISCUSSION: Building on the initial successes of the Transportation for the Nation (TFTN) initiative at USDOT, and the MAP-21 Act which requires submission of the road centerline data that is maintained by the states, this discussion explored the remaining issues and the work that needs to be completed. Participants offered their suggestions for incremental improvements to build an authoritative national road centerline database.

KEY TAKEAWAY POINT: *Next Generation 9-1-1, highway safety, tracking infrastructure assets, and the distribution of federal transportation funds are significant functions and business drivers that should motivate all levels of government to develop Transportation for the Nation.*

ISSUES IDENTIFIED:

Next Generation 9-1-1 is a key business driver and user of authoritative street centerline data. We must consider the issues of this community and their business requirements (e.g. address ranges and community names) as the All Roads Network Of Linear-referenced Data (ARNOLD) effort proceeds, including:

- Since NG 9-1-1 is sponsored out of USDOT, it should be easy to establish the connection.
- We need to start looking at the states and what roles they should play with NG 9-1-1 to get data from local governments, and to manage that data (e.g. edge matching, etc.). Doing so will help with conflation at the state level. We need to leverage the fact that every Public Safety Answering Point (PSAP) will need to internally identify who is the addressing authority to be the single point of contact (POC). We can then begin to deal with the issue of authoritative data between locals and states.
- If a single set of road centerlines is to be used for NG 9-1-1, each state DOT will need to be involved to make this happen. In addition, there are local/regional/state connections that must be developed and maintained.
- No two states are created equal. If the organizational framework is not there, this will not work. Private/Public partnerships may be able to help with this. Stewardship with local government will also be important. Funds coming to the state can help to make certain there are functioning programs, but we can also look at private industry to assist with building the required infrastructure.
- We must extend and encourage NSGIC's relationship with NENA as they are in the process of developing GIS data standards for road centerlines. We need to comment actively on the proposed NENA "GIS Data Standard for NG 9-1-1," because NENA standards are drastically different from what any state DOT would require. Not just with regard to 'mapping' but also because the state DOTs will have to conflate their data with a NG 9-1-1 schematic which requires significant normalization and quality controls.

The All Roads Network Of Linear-referenced Data (ARNOLD) is part of the Highway Performance Monitoring System (HPMS), which comes in as a patchwork quilt, because there is no requirement that road centerlines be connected across jurisdictional boundaries. We need to develop methods and workflow processes that allows for transactional updates.

- Public private partnerships (PPP) should be considered in order to help solve this issue.
- Systems like OpenStreetMap and GeoComm’s Web DMS allow for road centerline data to be edited in place with a flexible, accommodating data structure. These technology stacks, which can be implemented with an exclusive authoritative user base, eliminate the need to reconnect data across jurisdictional boundaries, allow for strong maintenance of feature identifiers, and are capable of enforcing quality control logic across the entire system. They also allow for crowd-sourced feedback, markup, etc. from a wider base of data users.
- Portland TriMet already uses OpenStreetMap. They were able to update their real-time transportation system effectively, and they were also able to (even with budget cuts) hire a full-time person dedicated to OSM maintenance.
- Mechanisms must also be put in place to get private roads, public lands roads (USFS, BLM, etc), and other roads that may not qualify under current ARNOLD definitions.
- In production of the Broadband Map, crowdsourcing helped. As state GIS coordinators, we are tasked with defining the data stewards and what is authoritative data, but there are definitely times when crowdsourcing can be a meaningful part of the overall solution.
- A number of states are working with their 911 community to coordinate the incorporation of all public roads into ARNOLD in a timely manner. This should be considered as a best practice moving forward.

Other related issues were discussed by the participants including requirements, best practices, communications and partnerships that will need to be considered as we move forward, including:

- **Best Practices**
 - Could we define a set of best practice case studies, each with roles and responsibilities? “Here are options for how it SHOULD be done.”
 - We need to have the Linear Referencing System (LRS) on top of local roads, because it has value and is a requirement for many states. The individual address is an ‘event’ on the LRS. LRS, even at the local level, is a ‘driver’ with a reinforced connection to NG 9-1-1.
 - NG 9-1-1 is a way for the DOTs to get a jump start on getting all the local roads. The original TFTN strategic plan was based on a great deal of stakeholder input. The DOTs and the 9-1-1 community need to come together in order to look at the standards. GIS will be at the front end, and not at the back end. All of this data will need to be normalized.
- **Other Issues**
 - The State Highway Administrations are reaching out to people beyond the DOT community. Edge-matching issues will still need to be addressed. Could a national set of agreement points at state boundaries be an early deliverable as part of the ARNOLD process? USDOT continually receives requests for the data, which means that there are many more potential use cases than originally thought. This will require maximum flexibility.
 - USDOT is a partner with Census which uses road centerlines for the creation and maintenance of Census aggregation units (blocks, block groups, tracts).
 - Census has worked very hard for the past several years with USGS in order to make sure that TIGER data is used as a part of the National Map. One of the weaknesses of

using private data is that it can't be made publicly available. This means that using TIGER data in the National Map, is a viable option because it can be placed in the public domain. This is a good example of coordination at the Federal level across agencies, and it may be important to do a better job of advertising these coordination success stories, such as the value of state-contributed content to the TIGER realignment that took place in preparation for the 2010 census.

- **Communications**

- One USDOT unit needed routing applications for the Federal highways. As soon as they found out the data was available, they became the most important customer. Additional people will be coming for addresses, similar to this example. Routing is particularly important for DOTs for their need to route oversize/overweight trucks.
- Involving the Bureau of Indian Affairs (BIA) and the Bureau of Land Management (BLM) in order to get their road networks is a challenge. Something should be done at the Federal level to assist with this problem.
- Dealing with independent and unaffiliated tribal nations is also a challenge, but their data should be considered authoritative (as they do not always recognize the authority of Federal agents/agencies on their land).
- It saves money when other agencies are able to use existing data sources without having to recreate them. How do we increase the use of the data after it is put together? It's important that early conversations between USDOT/HPMS and the Census Bureau succeed. Can Census, DHS and USGS use ARNOLD to save resources?
- We haven't seen much from U.S. Postal Service and others regarding this data. USPS is the only federal agency with requirements driven by daily field operations. We should reach out to determine their requirements.
- We are well aware of the silos between the Federal government and States, but there are also silos between states and their local governments. Is it possible that some cross-cutting, large benefit (e.g. infrastructure or services) can be defined that erodes these barriers?

RECOMMENDATIONS:

- 1) We must develop information on the value of ARNOLD to Federal, state and local agencies and then provide that information to executives and legislative bodies. It is important that each entity understands the value of their contribution to others, as well as the return they receive on their own investment.
 - a. Understanding where value propositions are high or low will help to design appropriate incentives.
 - b. We need to step up coordination efforts with all affected stakeholders, including public works departments, 9-1-1 authorities, and DOTs.
 - c. Based on our experience with the State Broadband Mapping Initiative, the states could initially build ARNOLD within a year if we had the appropriate budget and clear direction from the Federal government.
- 2) The original TFTN plan examined different types of data that would be in the public domain versus those data that are out of the public domain. We need to identify innovative ways to license commercial data and services for value added products. Data outside of the public

domain could be licensed or sold. Data currency might be a 'driver' with the release of data into the public domain after a given period of time.

- a. Several examples exist regarding public private partnerships and this isn't a major challenge. The challenge will be defining the product and what needs to be created. Then we will need to identify the silos and other issues. There is no need to go into licensing discussions until the product is clearly defined.
- 3) Future Standards, Data Models, and Data Exchange Standards need to be developed with input from the entire stakeholder community, but we need to start with minimal and/or core elements. Organizations can always exceed those standards to meet their own organizational requirements.
- a. The scope of the standards have to come first, including metadata, geometric representation, attributes, connectivity, accuracy, content, data structure/schema, and other factors.
 - b. The standards that have caught on (e.g. Shapefile; GeoJSON) have been simple and de facto, and were put together relatively quickly. If the standards process goes to a national committee, it could take a very long time to produce a viable standard.
 - c. One regional effort is currently building a centerline between DC, VA, and MD which is a relatively homogeneous geographic area. The first step is edge matching, and then making it interoperable. Routable centerlines were a requirement for Fairfax VA. They all got together and worked on the data to identify where each partner would maintain the data.
 - d. NSGIC and USDOT need to partner closely with other national organizations like NENA and AASHTO to promote common standards and models.
- 4) We should review existing transactional GIS editing systems (e.g. OpenStreetMap, GeoComm's GeoLynx, etc.) that allow one location for uploading, editing, quality control, feedback, markup, and issue tracking. Both of these systems can be adapted to an authoritative user environment. User 'roles' could determine the level at which different users participate in the development, review, and publishing of content. It could be an excellent opportunity for partnerships that would accelerate our efforts.
- 5) Various forms of 'addressing' are required to meet all business requirements, including:
- a. Linear Referencing System (LRS) on top of local roads, because it has value and is a requirement for many states. This includes milepost offset information.
 - b. Address ranges are required on local roads.

4. GEOSPATIAL RESPONSE FOR EMERGENCY MANAGEMENT

SUMMARY OF THE DISCUSSION: The Emergency Management Community has become dependent on geospatial technologies to deal with Homeland Security issues, and to plan for, mitigate, respond to, and recover from natural and manmade disasters. The constant development of new technologies and systems has outpaced the ability of the states to coordinate with all Federal partners. The Federal Shutdown was discussed, because it impacted states by preventing access to many of the Federal Systems that they utilize. Participants in this session offered suggestions for incremental improvements to the geospatial response to emergencies.

KEY TAKEAWAY POINT: *We must find ways to make the work of coordinating less than the cost of duplicating efforts.*

ISSUES IDENTIFIED:

In recent years, **there has been a proliferation of viewing systems** (user software) designed to provide a common operating picture (COP) for Homeland Security and Emergency Management. While it might be useful to have a baseline viewing system with open source software that could be modified as required by the user community, the continued development of multiple Federal platforms is wasteful and confusing for the states.

- Developing viewers is more easily recognized as an achievement (visible) than creating data. It is also much less costly than data production. However, it increases duplication of effort, waste and the future costs of implementation and training. Platforms have been created by at least DHS, FEMA, NOAA, Census Bureau, EPA and USGS.
- We must reduce the number of systems being developed to improve coordination and emergency response.
- There is a lack of Federal guidance on what systems should be used or what should be developed in the future. In addition, requirements analyses are either not being conducted, or are not inclusive of the entire stakeholder community.
- Interoperable data is more important than systems development and data development and management should be the focus of future efforts.
- Some systems are built to handle unique types of data. This is unwarranted and it increases the complexity and expense due to required use and training on all of these different systems.

The most important aspect of providing a COP is to provide access to authoritative national data layers that are related to critical infrastructure, natural hazards, security risks, and the types of data required for routine response to emergencies and natural disasters. Some of these data must be securely maintained. However, the majority of the data layers in the Homeland Security Information Program (HSIP) should be made publicly available. In addition, there are often higher precision or more complete data available in local and state government agencies. We must

develop transactional systems that can enable local, state and Federal agencies to develop truly authoritative national data layers for Homeland Security purposes. This data must build on data developed at the local and state government levels and not duplicate those efforts.

- There are three main types of data, and we need a data matrix that shows the datasets that are important for each type of major event. The types are:
 - Data in emergency operations center (comprehensive view)
 - Data for first responders (more localized)
 - Data/Information for the public
- Data needs should be defined based on repeatable business requirements, workflows, and emergency support functions, with consideration to their use before, during and after events.
- There is duplication of effort in the collection of both critical infrastructure and other data that is often caused by the inability to effectively share data. It must stop and all efforts should be put into developing authoritative data.
- We need access to proprietary data during an emergency (e.g. utility data, etc.).
- How do we roll-up critical infrastructure data from local to Federal government, instead of reverse? Local government has a need for higher precision levels and we can't develop authoritative national data without meeting their needs.
- We need better coordination of post-event remote sensing.
- Why isn't there a DHS equivalent to the EPA's Exchange Network? A consistent national database should include the best available data from state and local agencies that are willing to share. Don't let the 'lowest common denominator' mentality prevent the incorporation of better data.

We must collectively improve our ability to communicate between levels and branches of government both before and during emergencies. Communications with the public are equally important and the general public can provide a great deal of information about the operational status of infrastructure (e.g. grocery stores, gas stations, power failures, etc.).

- We must more effectively communicate to the public through mobile applications, including Twitter and other social media.
- How do we get information out to mainstream news outlets that can effectively get it out to the public?
- Communications between the FEMA and the states must be improved so that the states can better understand FEMA's activities.
- Better communications are needed between the Emergency Managers and First Responders.

RECOMMENDATIONS:

- 1) The DHS and FEMA should convene a series of meetings with state and local government officials and seek assistance with surveying them (if required) to:
 - a. Obtain business requirements for geospatial viewing and analysis systems. Those requirements should be built into one system that can provide true Common Operational Data (COD for those with their own viewing systems) and a Common Operational Picture (COP for those without a viewing system).

- b. Eliminate the proliferation of viewing systems. Access to individual agency data and platforms must be organized and available through DHS (secure) and/or the Geospatial Platform (public) to respectively meet the needs of the intelligence and law enforcement communities and the emergency management and first responder communities.
 - c. Determine the feasibility of building an Exchange Network-like system for use in building and maintaining HSIP data and other critical infrastructure information.
 - d. Provide source code for publicly-financed efforts (e.g. on GitHub) so that successful systems aren't completely reinvented multiple times.
- 2) All levels of government must continue working to improve data access and reduce duplication of effort. A large part of the problem is that individual agencies have unique requirements and are not coordinating on common data development needs (e.g. HAZUS, HSIP, and USGS Structures).
- a. NSGIC will identify model data sharing guidelines to improve data sharing within the states in advance of an emergency.
 - b. The federal government should implement consistent data sharing guidelines among all federal agencies.
 - c. Individual states should consider implementing Executive Orders and legislation based on these guidelines. In addition, they should consider standardized Executive Orders for use during disasters that eliminate all barriers to data sharing between government agencies and appropriate utilities/private sector companies that need the data.
 - d. Congress should consider legislation to improve data sharing during an emergency or disaster event.
 - e. Utility data access should be set up ahead of time and the following examples can be reviewed and duplicated.
 - i. Oregon firefighting teams get information through the Oregon Department of Forestry.
 - ii. West Virginia has contacts set up across the State using 811 information (same as Miss Utilities and other 'Call Before You Dig' systems).
 - iii. Connecticut passed legislation requiring that utilities provide infrastructure data to State and local government agencies.
 - iv. Maine's Public Utilities Commission has access to utility data.
 - v. Maryland receives utility outage feeds from power companies in a standardized format.
 - f. DHS should complete work on making as many Homeland Security Information Program (HSIP) data layers as possible public through the Geospatial Platform. FEMA should define its own requirements for state and local data during emergencies and disasters.
- 3) Communication tools and procedures should be improved and widely shared to facilitate effective communications and information sharing between government agencies and with the public.
- a. After Action Reports should be improved and more widely used as a training tool.
 - i. NSGIC has created an online template that will be distributed to all states for comment and improvements prior to implementation.

- ii. DHS will seek NSGIC's review of its Federal After Action Reports.
 - b. NSGIC should borrow the Standard Operating Guidelines (SOG) template from the National Alliance for Public Safety GIS Foundation (NAPSG) to create SOG's for the State GIS Coordinators.
 - c. Increase the use of the Harvesting Module in the GIS Inventory to increase participation by the Public Safety Community.
 - d. Encourage use of the Emergency Management Assistance Compact (EMAC) for state to state support for GIS resources during disasters. This encouragement should include completion of the typing of GIS resources by the FEMA National Integration Center, adoption of the typing information in the National Incident Management System (NIMS), and outreach and promotion of it through the Emergency Management Assistance Compact (EMAC).
 - e. Encourage state-level GIS Coordinators to participate in training and live events at their respective Emergency Operations Centers (EOC's).
 - f. Increase the development and sharing (e.g. GitHub) of simple mobile applications for use by emergency responders and the public.
- 4) FEMA should incorporate GIS into the National Incident Command System (NICS) as a unique Emergency Support Function (ESF).