2018 GIS-T State Survey Summary
March 20, 2018
Purpose of Survey

• Input for future GIS-T Symposium activities
  • Roundtable
  • Workshops
  • Survey questions

• GIS-T research topics

• Status of State DOTs in different areas
  • Organizational Issues
  • Data
  • Hardware
  • Software
  • Human Resources
  • Funding Resource

• What is going on?
1. Organization You Are Representing
2. Contact Information: Title
3. Please describe your most recent GIS related projects, and/or applications
4. Please describe up to four GIS related projects, applications, and/or issues that are of interest to your organization.
5. What research is needed in geospatial data and technologies for transportation?

- More research is needed in enhancing transportation enterprise GIS/LRS.
- Standard GIS Transportation Model for dual carriageway.
- Real-Time IoT and DSRC data integration.
- Autonomous vehicles, intersection inventory, data warehouse and sharing.
- Cross-mode comparison of transportation costs (distance with volume/ridership).
- Integration of NHD Flowlines and road/rail LRS data to readily identify hydrologic relationships of structures.
- Lidar feature extraction.
- Standardization of data models, etc.
- Data collection.
- Integration of local roads - how do we maintain them but not let that process overshadow the higher functionally classified roads.
- Development of statewide all-roads routable networks for transportation planning and analysis.
- Role of geospatial data in supporting CAV technology.
- Use of 3D Web visualizations CAD/GIS conversion.
- LiDAR.
- Improvement to integrate the data stored in different applications/software packages that need to have an ability to connect to spatial data for display. How do we get the Esri partners and others to make their data more available and ready to use in GIS applications.
- Integration of vehicle collected data - from smart phones, autonomous vehicles, etc.
- What geospatial can the DOT provide to improve safety, particularly with vehicle autopilot capabilities.
- Local data acquisition, data sharing.
- Portal for ArcGIS and how to roll it out to the department.
- Impacts of UAV, AV’s and CV’s.
- Location Intelligence/GIS tools for safety analysis. Standard Location Intelligence/GIS analysis/reporting tools that run on HPMS data, at the state or national level.
- Using crash statistics in GIS applications to save lives.
- Design and development of a LRS.
- Real time GIS and network analysis for autonomous vehicles.
- Architecture, Interface, Best practices, Safety/MIRE, integration, Change management.
- Autonomous vehicles and what data infrastructure will be needed. GPS machine control.
- Enable more users to harness big data on a daily basis.
- One stop permit pulling for oversize over weight. Alternate sources for aadt’s (via social media or outside sources - to fill in large gaps in such data. Better extraction from LiDAR data to bring costs down.
- True 3D GIS operations Merger of LRS and Addressing True CAD/GIS integration.
- How to treat data as an asset. Data standards Training plans for staff. Best practices for data management, collection and analysis.
6. Would your agency be interested in hosting a GIS-T Symposium within the next few years?

![Pie chart showing interest levels]

- **Yes**
  - Arkansas
  - District of Columbia
  - Florida*
  - Montana
  - Minnesota
  - Oregon
  - Pennsylvania
  - South Carolina
  - Texas
  - Utah**

- **No**

- **Not Sure**
7. Roundtable Suggestions
8. Future GIS-T Workshop Suggestions

- NPMRDS
- CAD-GIS integration - making it simple for CAD data to fall in the right GIS coordinate system.
- Overcoming Data editing challenges with maintaining an LRS within Esri Roads and Highways
- MLRS
- how to calculate GIS use-monetize
- Enterprise data warehouses
- HPMS changes, USDOT initiatives,
- "Big Data", large volume temporally deep and real-time data integration; UAV sensor-integration; V2I/V2V integration
- NG911 and DOT LRS integration, LRS Synchronization "“ Event Mgmt.
- Pavement Management
- Innovations such as Solar roadways and Intelligent Pavement design
- Advanced LRS solutions and best practices.
- How to implement and manage a LRS, and potential alternatives.
- GIS Technical Staff Development Strategies
- Upcoming Federal Requirements
- GIS best practices on all related transportation topics from data collection, manipulation, updates, analysis and reports
- Asset management, GIS for maintenance, Bike/Ped
- More hands-on training opportunities like model builder and collector application development.
- HPMS (Field data collection, integration, QAQC, reporting)
- NPMRDS
- CAD-GIS integration - making it simple for CAD data to fall in the right GIS coordinate system.
- Overcoming Data editing challenges with maintaining an LRS within Esri Roads and Highways
- MLRS
- how to calculate GIS use-monetize
Organizational Issues

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9. How is GIS deployed in your agency?

**NUMBER OF RESPONSES**

- We have no GIS function in our agency
- We have a single unit responsible for all agency GIS functions, applications, and...
- We have more than one unit responsible for GIS functions, applications, and...
- We have more than one unit responsible for GIS functions, applications, and...
- We have integrated most agency databases through an Enterprise GIS, and have...
- Other (please specify)
10. Has your agency...

**NUMBER OF RESPONSES**

<table>
<thead>
<tr>
<th>Question</th>
<th>Not Sure</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessed itself with a GIS Capability Maturity Model?</td>
<td>2</td>
<td>20</td>
<td>28</td>
</tr>
<tr>
<td>Done a Benefit/Cost Analysis on a GIS application/effort?</td>
<td>1</td>
<td>28</td>
<td>29</td>
</tr>
<tr>
<td>Done a Return on Investment Study on a GIS application/effort?</td>
<td>2</td>
<td>20</td>
<td>28</td>
</tr>
<tr>
<td>Formed a GIS coordinating group?</td>
<td>39</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Completed a Data Governance Plan?</td>
<td>2</td>
<td>20</td>
<td>28</td>
</tr>
</tbody>
</table>
11. Over the past year, where has your agency benefited the most from geo-spatial technology?
12. Over the past year, where has geo-spatial technology proved most costly and difficult to implement?

![Bar Chart]

- CAD/GIS integration
- Corridor and/or system planning
- Asset management
- Enterprise data integration
- Public information web portals
- Location based services
- Other (please specify)
13. Where do you see geo-spatial technology adding the most value to your agency in the future?

- CAD/GIS integration
- Corridor and/or system planning
- Asset management
- Enterprise data integration
- Public information web portals
- Location based services
- Other (please specify)
Emphasis Areas

Over the past year, where has your agency benefited the most from geo-spatial technology? Please check no more than two.

- CAD/GIS integration
- Corridor and/or system planning
- Asset management
- Enterprise data integration
- Public information web portals
- Location based services
- Other (please specify)

Over the past year, where has geo-spatial technology proved most costly and difficult to implement? Please check no more than two.

Where do you see geo-spatial technology adding the most value to your agency in the future? Please check no more than two.
Data

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14. What is your agency's status regarding GIS data and services consolidation?

- Our agency consolidated GIS data across all/some offices
- Our agency consolidated GIS services across all/some offices
- Our agency consolidated both GIS data and services across all/some offices
- We are in the process of consolidating
- We have considered consolidating but have not move forward with it at the moment
- Other (please specify)
15. If your agency has consolidated GIS data, services or both, what was/were the primary reason(s) for this?

- A single authoritative GIS data and service provider services our agency best.
- Concentrate expertise, streamline workflows
- We have always operated this way, so it wasn't something we actively had to do recently.
- This was the initial structure in the agency when GIS was first deployed.
- reduce duplication, data integrity
- Data Integrity
- Increased efficiency and reduce replication of data
- Consistent support, services, and data. Reduce redundant work. Maximize limited resources.
- Enterprise data needed to support decision making, single source
- Trying to get everyone on the same map.
- Desire to create a single authoritative source for Department data, the product of which is TED. Many offices still maintain their own data, but in a coordinated/managed effort that is also on-going.
- IT staff were consolidated including some GIS developers into IT. The core group of GIS/LRS management remain in Transportation Planning.
- Eliminate duplicated data collection efforts and reduce cost
- WisDOT has a GIS Core Services group, located in the IT Bureau, that provides access to GIS data and services to department staff and enterprise application deployments.
- Reduce data redundancy, provide consistent workflows, build an enterprise approach to GIS
- Efficiency and standardization of the data and services our office provides and stewards.
- to provide spatial data access and a download tool for our organization and partners.
- Management of department data was simplified by going through one GIS agency
- Each major division has their own GIS team and IT Division provides support service and product support.
- Source for the department to find reliable authoritative data.
- Efficiency, performance & customer service
- Unify access to a single enterprise database was the key driver. Having folks with loads of shapefiles/fgdbs on their local machine was not the preferred route and was leading to problems.
- As part of IT consolidation some of this has occurred, to bring costs down and leverage purchasing providing more support for other agencies.
- Information integrity and consistency. For us, we have consolidated certain management functions, not necessarily the actual editing and maintenance of "GIS" data. "GIS" data is just another component of information about something, and is not handled separately.
- The business need for statewide, authoritative datasets
- Efficiency, plain and simple. Need to eliminate duplication of effort and data and to provide consistent results from all applications and services.
- Originally designed to be centralized, growing out of digital cartography.
- Single point of truth and location for GIS data.
15. If your agency has consolidated GIS data, services or both, what was/were the primary reason(s) for this?

• Single authoritative source, everyone on the same map
• Eliminate duplication of data and effort, streamline workflows
• Efficiency, bring costs down
• Leveraging purchasing power
16. If your agency has not consolidated GIS data, services or both, what is/are the primary reason(s) for this?

• Some business programs want to keep their ownership of data and have their own services.
• Consolidation reduces the connection of data owners to the data and causes more problems than it solves.
• Difficulty integrating into a data warehouse.
• Lack of clearly defined roles and responsibilities
• Limited access/unreliable access to enterprise geodatabases.
• Data and systems are centralized for purposes of standardization and consistency. Data maintenance and reporting are distributed to distracts for upkeep. Some reporting is conducted from the centralized office.
• GIS technology is more modern than other DOT technologies supported by IT. GIS technology is forcing IT to change and update legacy technology and patterns. GIS is primarily used for transportation planning functions and HPMS.
• The federated model works best for the scale of the Agency and focused GIS staff in core Sections and Bureaus.
• We still live in a world of separate data silos, but are trying to promote more communicate, reduce duplication of effort, and share workflows and methods.
• To keep this in the subject matter experts hands.
• The lack of formal data governance policies in the agency make the implementation of consolidated GIS data for difficult and "grass roots" in nature.
17. Is there an effort to consolidate GIS data, services, or both across all/some state government agencies?

- Just GIS data: 2 responses
- Just GIS services: 1 response
- Both GIS data and services: 12 responses
- There is an effort to consolidate ALL Information Technology, including GIS: 6 responses
- There is an effort to consolidate ALL Information Technology, EXCEPT for GIS: 4 responses
- No effort at this time: 13 responses
Be specific the level of roadway(s)
project as part of your agency's digital
roadway inventory.

- Only U.S. highways
- State
- All public routes (i.e., all signed routes plus local streets)
18. Please specify the level of roadway(s) maintained as part of your agency's digital road base map. 

- Only U.S. and State highways (i.e., U.S. and state signed routes) (14%)
- U.S. state, and local streets (i.e., U.S. state and county signed routes) (34%)
- All public routes (i.e., all signed routes plus local streets) (52%)

A digital road base map is not maintained or used by our agency.
18. Please specify the level of roadway(s) maintained as part of your agency's digital road base map.

- A digital road base map is not maintained or used by our agency, 0
- Only U.S. and State highways (i.e. US and State signed routes), 4
- U.S., State, and county routes (i.e., U.S., State and county signed routes), 2
- All public routes (i.e., all signed routes plus local streets), 34
19. Is the data distributed outside your agency?

- Yes, it is distributed free of charge (e.g., via the agency website or state geo-data clearinghouse)
- Yes, it is distributed free to other government agencies or data partners for non-commercial...
- Yes, it can be purchased (e.g., directly from the agency or from a state geo-data clearinghouse)
- No, it is restricted to internal agency use only
- Other (please specify)
20. Does your agency have any formal data sharing agreements with any other public agencies or private data providers?

- Yes, 21
- No, 10
- Not Sure, 8
21. Please specify, if any, those geo-spatial databases that are maintained by your agency and routinely shared with other state agencies or disseminated to the public.

Number of Responses

- Databases are not routinely shared with others
- Orthoimagery
- Political Boundaries
- Transportation Features
- Water Features
- Cadastral
- Elevation Data
- Geodetic Control
- Other (please specify)
22. What other sources do you routinely use to obtain geo-spatial data that you don't maintain yourself?

- Other state or local government agencies
- Statewide geo-spatial data clearinghouse
- Federal agency Web Sites
- NSDI Geo-Spatial One Stop Web Portal
- Data provided by commercial GIS software vendors
- Data purchase from commercial sources
- Other (please specify)
23. Does the roadway transportation data include source data from local governments?

- Yes, 27
- No, 11
- Not Sure, 1
24. Does your data include commercial data?

- Yes, 7
- No, 27
- Not Sure, 5
25. Does your agency share a GIS road network with your State's E911 system? If not, do you plan to do so in the future?

- The GIS road network is currently shared, and used in E911 activities: 8
- The GIS road network is currently shared, but not used in E911 activities: 7
- Plans are underway to share the GIS road network for use in E911 activities: 10
- The GIS road network is not shared and there are no current plans to do so: 8
- Not Sure: 6
Hardware

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26. What activities, if any, within your agency take advantage of commercial IT cloud-based GIS or geospatial services/technologies?
27. Please describe any efforts to use geospatial technologies that take advantage of mobile devices?
Software

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28. What GIS software products are used in your agency?
28. What GIS software products are used in your agency?

Line of Business Users

ArcGIS Online

TransCAD

GeoMedia

Google Earth

MicroStation

Collector

ArcGIS Desktop

ArcGIS Pro

ESRI Collector

ESRI Operations Dashboard

ArcGIS Platform

Kearmap

Google Maps

ImageStation

ArcGIS Server

ESRI ArcMap

ArcGIS Server

Trimble GeoX / construction

ESRI Big Data Store

GeoCortex Essentials

Oracle Spatial

Web App services, Geo-Emi, FIA

GIS Analyst

ArcGIS Collector

GIS software tools
29. Which relational database management system (RDBMS), if any, do you use to maintain geo-spatial data in your enterprise GIS?

- Oracle, 31
- SQL Server, 25
- Access, 9
- DB2, 2
- Sybase, 1
- A RDBMS is not used, 0
- Other (please specify), 0
30. Which, if any, spatial data management software do you use in your enterprise GIS?

- Arc SDE, 33
- Oracle Spatial, 23
- Other (please specify), 0
- Spatial data management software is not used, 0
31. What software product(s) are used by your agency for web mapping applications?
Human Resources

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32. How large is your GIS staff? (e.g. 5 FTE) in the office in which you work?

<table>
<thead>
<tr>
<th></th>
<th>Number of Full-Time Employees</th>
<th>Number of Part-Time Employees</th>
<th>Number of On-site Contractors</th>
<th>Number of Off-site Contractors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maximum</strong></td>
<td>26</td>
<td>45</td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>10</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td><strong>Median</strong></td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Minimum (&gt;0)</strong></td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
33. Where in your agency is the GIS core staff primarily located?

- Planning, 23
- Information Services, 20
- Engineering, 7
- Mapping/Surveying, 3
- Other (please specify), 0
34. What are the principal technical backgrounds of your GIS core staff?

- Geography/Cartography, 33
- Planning, 16
- Information Technology/Information Systems/Computer Science, 29
- Engineering/Surveying, 9
- Business/Public Administration, 1
- Other (please specify), 0
GIS Professional Certification

Is anyone on the GIS core staff a Certified GIS professional?
- Yes: 67%
- No: 30%
- Not Sure: 3%

Will GIS Professional Certification be an important consideration in hiring future GIS core staff?
- Yes: 25%
- No: 42%
- Not Sure: 33%
37. Does your agency have any of the following Civil Service job titles under which GIS professionals are hired?

- IT GIS titles, 16
- GIS titles not tied to IT, 18
- Cartography/mapping titles, 10
- Geographer titles, 2
- Geoscience/Remote Sensing, or other related...
- Other (please specify), 0
38. What percent of your GIS staff's time is spent in each of the following transportation GIS functions?

<table>
<thead>
<tr>
<th></th>
<th>Road Base Map – Development / Enhancement</th>
<th>Locational Referencing System (LRS) – Development / Maintenance</th>
<th>Data Warehouse - Development / Maintenance</th>
<th>GIS Technical Support and Training</th>
<th>End-user Application Development</th>
<th>Web Application Development</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maximum</strong></td>
<td>40%</td>
<td>60%</td>
<td>40%</td>
<td>70%</td>
<td>20%</td>
<td>40%</td>
<td>55%</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>13%</td>
<td>19%</td>
<td>12%</td>
<td>15%</td>
<td>9%</td>
<td>14%</td>
<td>5%</td>
</tr>
<tr>
<td><strong>Median</strong></td>
<td>10%</td>
<td>20%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Minimum (&gt;0%)</strong></td>
<td>3%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>4%</td>
</tr>
</tbody>
</table>
39. What percent (%) of your GIS application development (end-user and/or web) is outsourced?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum</td>
<td>100%</td>
</tr>
<tr>
<td>Average</td>
<td>29%</td>
</tr>
<tr>
<td>Median</td>
<td>20%</td>
</tr>
<tr>
<td>Minimum</td>
<td>0%</td>
</tr>
</tbody>
</table>
Funding Resources

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40. What is the approximate annual amount ($) expended by your agency for GIS application development contracts?

Number of Responses

- Over 5,000,000
- 2,500,000 - 5,000,000
- 1,000,000 - 2,500,000
- 750,000 - 1,000,000
- 500,000 - 750,000
- 250,000 - 500,000
- 100,000 - 250,000
- 50,000 - 100,000
- 0,000 - 50,000
41. Approximately how much money ($) is spent annually on all GIS services?

<table>
<thead>
<tr>
<th></th>
<th>Hardware</th>
<th>Software</th>
<th>Services</th>
<th>Data</th>
<th>Other</th>
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</thead>
<tbody>
<tr>
<td><strong>Maximum</strong></td>
<td>$800,000</td>
<td>$650,000</td>
<td>$1,000,000</td>
<td>$1,500,000</td>
<td>$1,200,000</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>$52,527</td>
<td>$172,024</td>
<td>$116,476</td>
<td>$112,439</td>
<td>$83,110</td>
</tr>
<tr>
<td><strong>Median</strong></td>
<td>$10,000</td>
<td>$100,000</td>
<td>$500</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td><strong>Minimum (&gt;$0)</strong></td>
<td>$600</td>
<td>$10,000</td>
<td>$500</td>
<td>$10,000</td>
<td>$15,000</td>
</tr>
</tbody>
</table>
Survey Suggestions

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42. Survey question suggestions

- NA
- It would be good to include break out of mobile development vs web.
- None at this time.
- UDOT is heavily invested in ArcGIS Online configurable apps, any custom development but be completed by State Department of Technology Services or an IT consultant. Answer to #38 represents UDOTs investment in configurable apps. Answer to #39 represents all custom development primarily completed by Utah Department of Technology Services. This is an important distinction for our DOT.
- For question 8, please clarify what is meant by "GIS Core staff" - is this people who by their mission provide services to other parts of the DOT (for example, app dev, training, GIS vendor license mgmt, etc)?
- Great updates to survey! What features in Asset Management System vs GIS 3D Design
- GIS-T is a great forum for the advancement of GIS in transportation and sharing of ideas. I appreciate the survey and all the work that Mark Sarmiento puts into the compilation. Since all DOTs are structured different it is difficult to answer the staffing questions. Iowa is Federated so the core team is small but have 40 people in office doing great work.
State Survey

• This presentation and survey results on AASHTO GIS-T website
  • www.gis-t.org

• Contact
  • Mark Sarmiento, mark.sarmiento@dot.gov