A Summary of
State DOT GIS Activities

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Introduction

This is the 10th year that the GIS-T Symposium has conducted a survey of GIS activities at State DOTs. This year, 41 states plus the Commonwealth of Puerto Rico responded to the e-mail survey. The responses were tabulated and are presented in a separate summary table.

A number of revisions were made to questions in this year's survey, and several new questions were added. New questions asked about (1) awareness and importance of GIS professional certification among core staff; (2) maintenance of geo-spatial data other than road centerlines; (3) perceived benefits and difficulties of selected GIS applications; and (4) maintenance of physical mile markers on state roads.

GIS Organizational Structure and Development Stage

Of those states responding, only one State DOT (WV) reported that they do not have an officially recognized GIS unit within the agency. The most prevalent organizational structure for GIS units in State DOTs (57%) continues to be a GIS core unit, providing technical support to a much larger group of end-users throughout the agency. Another 31 percent of the State DOTs report having an "enterprise" organizational structure, with agency-wide data integration.

Most GIS core units are located either in Planning (34%) or Information Services (51%). However, there appears to be a trend toward consolidating the GIS core staff in information services, particularly in those State DOTs where GIS responsibilities were shared among two or more departments.

The allocation of GIS staff time across core functions shows slightly more effort being devoted, on average, to road centerline (18%) and LRS (17%) maintenance and enhancement activities, and slightly less to end user support and training (13%) and end user applications (12%). However, the distribution of staff activities varies considerably across agencies.

The number of GIS core staff showed a slight increase among those agencies that responded to this year's survey, with 18 agencies reporting increases and 11 agencies reporting decreases. Average core staff size for all responding agencies was 7.4.

A new question on this year's survey asked if any GIS core staff was a certified GIS professional, and whether GIS certification would be an important consideration in future hiring. Eight (20%) of the responding State DOTs had a GIS certified professional on their staff, but only four agencies indicated that GIS certification would be an important consideration in future hiring.

A question on GIS budgets was revised this year to focus on the amount of GIS application development work that was outsourced. While there was considerable variation across agencies, on average about 39 percent of all GIS application development was outsourced, with an average annual expenditure of $315,000 per agency.

GIS Software

Nearly 90 percent of the responding State DOTs use GIS software from at least two vendors, and 50 percent report having software packages from 3 or more different vendors. All of the "single vendor" State DOTs use GIS software from ESRI.

This year, respondents were also asked to identify what software product was used "principally" by GIS core staff for desktop/workstation applications, and for web applications. Of those state DOTs who responded, 63 percent use ESRI's ARC/INFO® or ARC GIS®, and 34 percent use Intergraph's GeoMedia® as their principal desktop software. For web applications, 66 percent of those responding use ESRI's ARC IMS®, and 34 percent use Intergraph's Web Map®.

Road Centerline Networks and Other Geo-Spatial Databases

The foundation of most transportation GIS activities is the underlying road centerline network base map. All but one State DOT (WV) who responded to the 2005 survey reported that they had developed and are maintaining a digital road network base map. Both the spatial accuracy and coverage of these base maps continues to increase. Over half of the State DOTs who responded have road network base maps with a spatial resolution of 1:12,000 scale or better. Much of the increased accuracy has been achieved through the use of high-resolution orthoimagery or kinematic GPS. With respect to road network coverage, half of the State DOTs report that their road networks include all public roads, and another 29 percent include both State and county routes.

States DOTs were asked if they maintained and/or enhanced any other statewide geo-spatial data layers, beyond the road centerline network. Over 80 percent of those responding reported that they also maintained other geo-spatial data. Most State DOTs (94%) are responsible for maintaining other transportation features, such as rail lines, airports, etc. Other "framework" geo-spatial data maintained by State DOTs include political and administrative boundaries (57%); geodetic control points (51%), and orthoimagery (46%). State DOTs are less likely to maintain other framework layers, including elevations (17%), water features (14%), and cadastral or land parcels (11%).

Primary sources for geo-spatial data used by State DOTs are other state and local agencies (identified by 80% of those responding), followed by statewide geo-spatial clearinghouses (54%), and federal geo-spatial data (46%). Less common sources include data purchased from commercial data vendors (29%), data provided or purchased from GIS software vendors (27%), and data acquired from the Geo-Spatial One-Stop (17%).

Maintenance of Mile Markers

At the request of Sandia Laboratories, State DOTs were asked if they (1) maintain physical mile markers on some or all of their roads, and (2) maintain a database of the actual coordinates for these mile markers. Over 76 percent of those responding stated that they do maintain a database of mile marker locations, and that they do routinely replace mile markers that are knocked down or destroyed. Most state DOTs maintain mile markers only on state and U.S. signed routes.

Benefits and Costs of GIS Applications

Another new set of questions this year asked State DOTs to identify what GIS application areas (1) have resulted in the greatest benefits to the agency; (2) proved most difficult to implement; and (3) were likely to be of greatest value in the future. Nearly two-thirds of those responding identified enterprise data integration as having the greatest current benefits to the agency. Enterprise data integration was also most cited by respondents (39%) as being most difficult to implement, followed closely by business systems integration (34%) and integration of engineering/CAD data (34%). Applications having the greatest future potential benefits were asset management (41%) and enterprise data integration (39%).

Current Activities

Respondents were asked to list up to five of their highest priority current GIS activities. Listed activities were grouped into similar categories and then ranked based on the number of times that they were cited among the top five activities. Table 1 lists those GIS activities cited five or more times by the State DOTs.

GIS Activity	# of Citations
Development of web-based GIS application	26
Development of data warehouse / Enterprise GIS	21
Roadway inventory management application	12
Road centerline Basemap maintenance / enhancement	11
Migration to new GIS hardware and software	11
Business systems integration	11
Crash locations / safety analysis system application	11
Development / enhancement of linear referencing system	10

Traveler advisory / information system application	8
Map production / publication	7
Strategic planning / highway needs assessment application	7
GPS data collection / integration with GIS	7
ITS / traffic management applications	6
Integration of imagery data with GIS	6
Realty / ROW management application	6
Cultural / environmental mitigation application	5
Engineering / CAD data integration with GIS	5

Table 1. High priority GIS activities at State DOTs

Summary
Increasingly, State DOTs are recognizing geo-spatial location to be the common basis for integrating databases throughout the agency. Most agencies are currently engaged in activities related to development of an enterprise data warehouse, and more agencies seem to be locating their GIS core staff organizationally within their information systems group. Enterprise data integration is seen as producing the greatest agency benefits from geo-spatial technology, but it is also cited as one of the most difficult applications to implement.

Web-based applications continue to grow, resulting in more widespread use of GIS technology for data visualization throughout the agency, but with perhaps decreasing emphasis on applications involving more sophisticated spatial and network analysis.

Current GIS core staff activities continue to include the enhancement of the road centerline network, LRS, and other geo-spatial data maintained by the State DOT. However, many agencies are also exploring methods to collect and integrate other types of data -- especially imagery, GPS locations, and engineering/CAD drawings – into their enterprise data warehouse.