A Summary of
State DOT GIS Activities

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Introduction
This is the 12th year that the GIS-T Symposium has conducted a survey of GIS activities at State DOTs. The survey was administered using a web-based survey instrument that was begun last year, and resulted in a 100 percent response, with all 50 States plus the District of Columbia and the Commonwealth of Puerto Rico responding. The responses were tabulated and are presented in a separate summary table.

One new question was added this year on whether the State DOT had developed or was planning to develop a GIS strategic plan.

GIS Organizational Structure and Development Stage
A majority of the States (55%) report having an organizational structure consisting of a GIS core unit, providing technical support to a much larger group of end-users throughout the agency. The second most prevalent structure (25%) is an "enterprise" GIS organization with agency-wide data integration. However, the number of States reporting this type of organization actually declined from last year's survey. Only one State (HI) reports that, although they have "pockets" of GIS applications, there is no agency-wide coordination of geo-spatial data or services.

The organizational location of GIS core units seems to be equally split between Planning (33%) and Information Services (34%). Another 25 percent of States report that their core unit is located in two or more departments. Even in those States that have instituted an enterprise GIS, there is no significant difference in where the GIS core unit is located.

Nearly half of the States (46%) report that they already have developed a Strategic Plan for implementing GIS within their agency, and another 38 percent report that they are currently developing such a plan. Only five States (IN, MA, NM, ND, & RI) report that they do not expect to develop a Strategic Plan.

The average staff size of the GIS core unit rose slightly from last year's survey, increasing from 7.0 to 7.6. Over 90 percent of the States responded that at least one staff member has a geography or cartography background, and a majority of States (69%) also reported having staff with an information technology or computer science background. GIS professional certification still remains a relatively minor factor in current staff hiring. Only 21 percent of the States reported having a certified GIS

professional on staff, and only six States (CA, GA, MD, MT, NC, & VA) indicated that certification would be a factor in future hiring decisions.

The allocation of GIS staff time across core functions shows a fairly even distribution of 16 - 17 percent for LRS maintenance, data warehousing, technical support, and web application, with slightly more time spent on base map maintenance (23%). However, the distribution of staff activities varies considerably across agencies, and even within an agency from one year to the next.

On average, States outsource about 40 percent of their GIS application development work, with an average annual expenditure of about $406,000 per agency.

GIS Software
The percentage of States who reported using use GIS software from two or more vendors increased significantly, from 75 percent last year to 85 percent in this year's survey. All of the "single vendor" States use GIS software from ESRI.

Respondents were also asked to identify what software products were used "principally" by GIS core staff for desktop/workstation applications and for web applications. For desktop operations, 71 percent of those responding use ESRI products, 23 percent use Intergraph products, and 2 percent use Caliper products as their principal GIS software. For web applications, 63 percent of those responding use ESRI's ArcIMS® or ArcGIS Server®, and 25 percent use Intergraph's WebMap®.

Most States use commercial relational database management software (RDBMS) in combination with GIS software to manage their geo-spatial data. Oracle® is used by 73 percent of the States, either alone or in combination with other database software. Other commercial database software used by the States include SQL Server® (40%), and Microsoft Access® (21%). Only two States (LA & NE) report using DB2, and only one State (OH) reports using Sybase.

ArcSDE® (75%) and Oracle Spatial® (44%) are the principal software packages used to manage the geo-spatial attributes in enterprise data warehouses. A significant number of States (27%) report using both spatial data managers in combination.

Road Centerline Networks and Other Geo-Spatial Databases
A key component of most transportation GIS activities is the road centerline network database. All States reported that they maintain a digital road centerline database. Both the spatial accuracy and coverage of these databases continue to improve. Two-thirds (67%) of the States report that their road centerline databases have a spatial resolution of 1:12,000 scale or better. Much of the improved accuracy has been achieved through the use of high-resolution orthoimagery and/or kinematic GPS. With respect to coverage, 62 percent of the States report that their road centerline database includes all public roads, and another 23 percent include all State and county routes.

The majority of States (73%) distribute their road centerline database free of charge to whoever wants it. Most other States (21%) have policies that allow the data to be shared with other public agencies, but place restrictions on its use for commercial purposes and/or redistribution. Only one State (OR) does not distribute their databases outside their agency.

States were asked if they maintain any other statewide geo-spatial data layers, beyond the road centerline database. Seventy-five (75) percent of those responding reported that they also maintain some other geo-spatial database, generally other transportation networks or features, such as rail lines, airports, etc. Other "framework" geo-spatial data maintained by State DOTs include political and administrative boundaries (52%), orthoimagery (42%), and geodetic control points (38%). State DOTs are less likely to maintain other framework layers such as elevation (19%), water features (27%), or land parcels (13%).

The primary sources of geo-spatial data used by State DOTs are other state and local agencies (identified by 92% of those responding), followed by statewide geo-spatial clearinghouses (75%), and geo-spatial data maintained by federal agencies (50%). Less common sources include data purchased from commercial data vendors (28%), data acquired through the Geo-Spatial One-Stop (28%) and data provided or purchased from GIS software vendors (23%).

Benefits and Costs of GIS Applications
Several questions introduced in 2005 regarding the perceived benefits and costs of geo-spatial technology were asked again in this year's survey. Enterprise data integration continues to be cited by most States as yielding the greatest current benefits (69%), but also being the most difficult and costly to implement (48%). Asset management and corridor/systems planning were rated as having the next greatest current benefits (42%). Asset management was also cited as being the second most difficult to implement (34%), followed by CAD/GIS integration (33%). Asset management and enterprise data integration were also seen as having the greatest expected future benefits (62%)

Current Activities
Respondents were asked to list up to four of their current GIS activities for the State roll call. Listed activities were grouped into similar categories and then ranked based on the number of times that they were cited by the respondents. 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	31
Migration to new GIS software / hardware	20
Data warehouse / enterprise GIS	16
Road inventory management	15
Road centerline database development / enhancement	13
Environmental /cultural analysis	12
Orthoimagery data collection / integration	10
Map production and publication	10
Photolog / videolog data collection and integration	9
Location referencing system maintenance	8
Traveler advisory / information systems	8
Truck routing and permitting	7
Roadside maintenance project planning	7
ITS / traffic management	6
Project management	6
Safety / crash analysis	5
GPS data collection / integration	5

Table 1. High priority GIS activities at State DOTs

Summary

GIS has finally become an important tool for data management and integration, analysis, and visualization in every State DOT. The key question is no longer <u>whether</u> the agency should invest in GIS, but rather how much of the agency's program data should be integrated using geo-spatial technology. Many State DOTs are currently investigating or are actively developing an enterprise GIS data warehouse. Enterprise data integration is seen as yielding the greatest agency benefits from geo-spatial technology, but it is also cited as one of the most difficult applications to implement.

Web-based GIS applications continue to grow, facilitating information exchange both to the traveling public and to DOT field staff. GIS also seems to be used more frequently in specific analysis and planning applications, particularly environmental studies, safety/crash analysis, and project management.

GIS core staffs continue to function effectively in either planning or information management organizational divisions. Important GIS core staff activities continue to include the maintenance and enhancement of the road centerline database, linear referencing, and migration of legacy applications to new and upgraded commercial software. Increasingly, however, application-specific geo-spatial analyses and map products are being carried out by end-users throughout the agency, both with and without assistance from GIS core staff.