

AASHTO
GEOSPATIAL INFORMATION SYSTEMS
TRANSPORTATION SYMPOSIUM

SUMMARY REPORT



Nineteenth Annual

**GEOSPATIAL INFORMATION SYSTEMS FOR
TRANSPORTATION SYMPOSIUM**

To provide a forum for transportation officials from State, Province, Federal, and
Municipal Agencies to discuss GIS and transportation issues

March 27 - 29, 2006

Workshops – March 26, 2006

Columbus, Ohio

2006 GIS-T SYMPOSIUM REPORT

COLUMBUS, OHIO

Overview of the GIS-T Symposium

The nineteenth annual Symposium on Geographic Information Systems for Transportation (GIS-T) was held in Columbus, Ohio from March 26 through March 29, 2006. The Symposium focuses on providing a forum for transportation professionals interested in the design and use of Geographic Information Systems for Transportation. It brings together individuals from education, the private sector, and all levels of government for a full day of workshops and three full days of activities. The Symposium offered Continuing Education Units (CEU's) to participants who attended technical sessions. This year's Symposium included a Student Paper Contest and a session for the winning papers to be presented. The Symposium also provided an excellent avenue for participants to network with peers to discuss emerging issues of their particular concerns.

"Taking Flight" was chosen as the theme for this year's Symposium. The theme was in reference to aviation/space history of Ohio and the upward progress GIS is achieving within the transportation industry. Technology providers were able to meet with participants of the Symposium through one-on-one interviews in the technology hall, as well as through the "Birds of a Feather" session. These discussions were beneficial in conveying latest trends and technology achievements by the industry suppliers. Google Earth provided a virtual tour, which offered participants an opportunity to see how Google Earth was used during this last year's hurricane recovery efforts.

Throughout the course of the Symposium, a variety of key issues surfaced by means of a pre-symposium survey (state summary), session papers, a panel discussion, and the Symposium wrap-up. This report will identify some of the key emerging issues and discuss how their impact might affect the GIS -T Community.

Technical papers presented at the Symposium are available along with their abstracts through the GIS-T web page (<http://www.gis-t.org>). The state roll call, state summary and state contacts list can also be obtained from this site.

Emerging Issues and Technologies Impacting the Transportation Information Technology Community

Although many issues related to GIS in Transportation were identified and examined during the course of the Symposium, a few emerged as new or overarching.

These issues include:

- Enterprise Data Integration
- Business Systems Integration
- Public Information Portals
- Asset Management
- CAD/GIS Integration
- Corridor/System Planning

- Location Based Services
- Measuring the Value of GIS
- Knowing the Challenges Facing Executive Decision-Makers
- Challenges for the Future of Geospatial Technology and Transportation
- Emergency Response and Evacuation using GIS
- Multi-Modal Transportation
- Hiring and Keeping Good Employees

Over the next year the geospatial technology industry will continue to discuss and take action to gain knowledge and expertise in the above areas.

The 2006 GIS-T Symposium

Symposium Background

The GIS-T Symposium is organized by AASHTO and co-sponsored by the Highway Engineering Exchange Program (HEEP), the Urban and Regional Information Systems Association (URISA), the Federal Highway Administration (FHWA), the Federal Transit Administration (FTA), the Bureau of Transportation Statistics (BTS), Transportation Research Board (TRB), National Association of Regional Councils (NARC), American Metropolitan Planning Organizations (AMPO) and the American Society of Photogrammetry and Remote Sensing (ASPRS). The Symposium originated to provide:

- Education,
- Information sharing with other transportation agencies,
- Vendor displays of new and current technology, and
- Information for individuals who are facing similar problems in other transportation organizations.

The Symposium is managed by a Task Force and organized by a Planning Committee. The Task Force is a seven-member group representing DOT's by AASHTO regions, FHWA and AASHTO. The Task Force members are also Planning Committee members. The Planning Committee is a larger group comprised of subcommittees for each of the Symposium organizing tasks, e.g. program development, local arrangements, exhibits, workshops, student paper contest and poster session. This year's Symposium continued the focus on opportunities and issues of applying GIS technology to the business of transportation agencies.

Symposium Structure

The Symposium registration started on Saturday evening, March 25, 2006. The registrant demographics were 579 total attendees, from 45 states and 2 Canadian provinces (Manitoba & Ontario).

Workshops were conducted on the Sunday prior to the Symposium. This year seven half-day workshops were held with 159 participants attending the workshops. A Sunday evening technology hall reception was held in the hotel ballroom to kick-off the Symposium. Forty-seven GIS exhibitors; including software companies, consultants, data and equipment vendors were present this year. The technology hall displaying vendor exhibits were available through Wednesday, with a second reception Monday evening.

The Symposium started Monday morning with a welcome from Cash Misel, Ohio Department of Transportation (ODOT) Assistant Director and Chief Engineer. Mr. Misel stated the importance of spatial technologies in ODOT. He discussed how ODOT has made good use of GIS, including testifying in front of the legislature. Mr. Misel specifically mentioned GPS, LiDAR and Google Earth.

Daniel Burrus, a world leader in technology forecasts and business strategies, gave a motivating and humorous keynote speech on viewing the future of geospatial technology. Mr. Burrus address included the following thoughts and strategies:

- Perform a personal time audit – determine who is using up your time. How can you get some of that time back to use on good stuff? Are there guidelines to help employees know when and how to apply technology? Would it help if people used those guidelines before sending the 10 page e-mail with copies to 50 people just in case they are interested?
- Consider trust in decision-making. Think of a trust meter on your desk. Is the decision you are about to implement increasing or decreasing the trust that the people affected will have in you? If the answer is, decreased trust, then you better not implement (at least not in that way).
- Learn to tell the future by understanding trends.
 - o Cyclical trends – It is now spring and summer is coming next.
 - o Hard trends – the world’s population is growing.
 - Many hard trends are marked by permanent change. We will not stop using e-mail for example.
 - o Soft trends – In the ten years following the death of Elvis there was a steady increase in the number of professional Elvis impersonators. When graphed, we could have determined that by 2007 one out of three Americans would be a professional Elvis impersonator. Clearly something changed to stop the trend.

The key is to list the trends that you are aware of and then figure out the relative certainty of the trend continuing. Then position your activities to provide value timed for the change. A problem is only an opportunity if you know about it before it’s a problem in the first place.

- o Spend time thinking about the future – you are going to spend the rest of your life there. Failing to plan is planning to fail.
- o Think both/and not either/or. The future will hold
 - Digital and analog
 - Wireless and wired
 - Paper and paperless

The winners will be the people who can bring together the right mix of technologies to accomplish important things.

Mr. Burrus had specific examples related to the GIS business. For instance, Google Earth will help to turn young people on to geography, potentially helping to prepare our future workforce with both computer and geographic savvy. He invited us to use the resources that he provides on his web site: www.burrus.com.

Bruce Spear of the FHWA presented the State Summary. The Roll Call of States and other Transportation Agencies followed the State Summary. The Roll Call of States is a tradition that provides an opportunity for a representative from each agency to introduce his or

herself and any other delegates from the agency. Each state was called alphabetically starting with the 2006 host state. Roll Call allows all attendees to connect faces with names and helps people to make contacts and initiate conversation over the course of the Symposium. Frank Winters, AASHTO Region 1 Representative and Roll Call facilitator, challenged participants to use the Roll Call information to start conversations with at least three people they had not met. West Virginia DOT received a warm round of applause for attending the Symposium for the first time and for getting their GIS program off the ground. Copies of the Roll Call of States slide show, GIS State Contacts and the State Summary are available at <http://www.gis-t.org>.

Monday afternoon consisted of two paper sessions with four concurrent technical tracks.

A poster exhibit displaying posters from the DOT's, MPO's and Regional Councils started with a poster session Monday evening before the technology hall reception. The poster exhibit provides an opportunity for organizations to share their techniques and applications with peers in the transportation GIS Community. Attendees were able to view the maps for the duration of the Symposium.

The evening ended with a "Birds of a Feather" session. During this session, attendees with the same software network among themselves with representatives from their software companies. The attendees determine the agenda in these facilitated informal sessions and present vendor and transportation challenges.

Tuesday morning started with a panel discussion, GIS Efforts in Hurricane Emergency Response, moderated by Marvin Koleis, Colorado DOT. Panelists included:

- Dr. James Mitchell, Louisiana DOTD
- Jim Patterson, Texas DOT
- James Brown, Mississippi DOT
- Shoreh Elhani, GIS Corps
- Dick Kotapish, GIS Director Lake County Ohio – GIS Corps

In contrast to the impressions left by media accounts, the discussion included stories of the GIS community actively aiding in the response. Highlighted were specifics about the contraflow evacuation plans, and the importance of assuring that FEMA and the state emergency workers agree on a common search grid reference system. Also highlighted was the importance of considering the personal family obligations that emergency staff is facing during an event.

Three more paper sessions with four concurrent technical tracks were offered throughout the day.

Wednesday's schedule consisted of two paper sessions with four concurrent technical tracks before lunch. During lunch, awards were handed out and prize drawings were held followed by the Tennessee DOT, next year's host state, inviting Symposium participants to Nashville, Tennessee for the twentieth annual GIS-T Symposium. The afternoon featured a demonstration by Google Earth followed up by a Wrap-Up session, where the Symposium is "debriefed" by all interested attendees. This is where ideas for next year's Symposium theme and session topics are first discussed.

Workshops

This year seven half-day workshops were held as part of the Symposium experience. Following last year's format, attendees had the ability to mix topics rather than attend a single all day session. All GIS -T workshop registrations included a choice of any two of the below listed half-day workshops. Thirty percent of the registered Symposium individuals participated in the workshops.

Transportation Spatial Database Design

Although almost all data maintained by transportation agencies falls within the common definition of spatial data, the data used by GIS applications is generally separate from that used by the mainstream applications of the agency. Enterprise database design must accommodate the multiple functional sources of spatial data. This has traditionally been accomplished by making data extracts from the enterprise systems for input into a functional area's GIS dataset. Such a one-way data flow has limited ability to help manage the agency interactively. It also generally fails to overcome the "stovepipe" organizational structure of transportation agencies.

This workshop showed the students how to develop an integrated multimodal database design for transportation agencies that not only serves to break down cross-functional barriers but also offers the opportunity for GIS to come out of the backroom and be a viable real-time agency management tool. This workshop was not illustrative of any particular vendor's product but included guidance on how to deploy the general design in a number of common GIS platforms and relational database management systems. Al Butler of MilePost Zero was the instructor for this workshop. Seventy-four participants registered for this workshop.

Datums & Projections: Demystifying the Geodetic Reference Frame

This workshop detailed fundamental geodetic survey concepts of horizontal (NAD 27, NAD 83, WGS 84) and vertical datum's (NGVD29 and NAVD88), reference ellipsoids, geoid models, global coordinate systems and datum transformations. Also discussed were the elements of the two most commonly used coordinate map projection systems, Universal Transverse Mercator and the State Plane Coordinates, their relationship to geographic coordinates and use in Geographic Information Systems. David Doyle from the National Geodetic Survey conducted the workshop. Twenty-two participants registered for this workshop.

URISA Workshop - Addresses and IS/GIS Implementation: Key to GIS Success

Street addresses are the key, user-friendly geospatial identifier used by everyone, but addressing processes are usually poorly organized at the local level. This workshop helped attendees understand the addressing process, managing address data, and organizational challenges. It guided the participants in developing a Master Address Repository that serves the needs of the entire organization.

Specific topics included:

- What is an address? What are the types of address?
- How are addressing systems structured, and addresses assigned?
- How do you develop a Master Address Repository?
- Geo-coding and managing addresses in the GIS

- Organizational Issues with Addressing
- Addressing Standards and Ordinances

The workshop's intended audience was GIS managers and staff members who assign, maintain or use addresses. This workshop focused on managing address workflows, address data, and use.

URISA is working on developing the address content standard on behalf of FGDC. This draft standard has completed the public review process. As part of this workshop the instructor talked about the new standard. The attendees received a preview of the new addressing standard that will ultimately establish data standards for content, classification, quality and exchange. Martha Lombard of Spatial Focus, Inc. and past President of URISA and Ed Wells, the incoming President of URISA taught this workshop. Fourteen participants registered for this workshop.

The Visualization Toolbox: The Practical Primer for Transportation

People are significantly influenced by visual media. As a medium, people prefer to access information if it is in a visual format rather than text or traditional technical drawings. These applications provide the most effective communication methods and techniques for sharing information, gathering knowledge and collaborating on decision making pertaining to a particular project or event.

Technical media is the output medium of visualization information. It is a process of developing and providing information content and delivery tailored to meet specific customer and project needs. Technical media content delivery includes multi-medial, animation, and simulation prepared for either video, CD, or the World Wide Web.

Visualization has become a core technology useful throughout the project development process to support decision making, communication and coordination. This workshop covered the wide range of visualization services and deliverables now available, from static to dynamic applications, and what is required to provide them.

The "Visualization Workshop" covered:

- The current range of Visualization applications
- What it takes and what's involved to provide these various applications
- Mandated use in planning from the SAFETEA-LU legislation
- Emerging trends & challenges facing DOT's

This workshop was presented by Ben Williams of FHWA's Resource Center, also the Symposium Workshop Chair and Mark Taylor of FHWA's Central Federal Lands Division. Sixty participants registered for this workshop.

Internet Security – The Newest Wild Frontier

In this presentation, the security team of the Nebraska State Patrol (NSP) gave a hands-on demonstration of the security measures and counter measures used in the industry. Their discussion with demonstration covered the following topics:

1. Website Security and Defacement
2. Wireless Security and Tools for Wireless Applications/Device Manipulation

3. Network Discovery and How To Protect Against It
4. Citrix and Remote Terminal Services Security and Hacking Techniques
5. Why Google Is Your Friend and Your Worst Nightmare
6. Protecting Your SQL server By Knowing How To Break It
7. Viruses and Worms and Trojans, Oh My
8. Social Engineering – Employees Are The Weakest Link
9. Your Network Is Secured, But What About That Laptop or USB Key?
10. Think someone Can't Tap Your VOIP Communications? Think Again
11. Cyber Warfare

The workshop presenters consisted of Scott McFall, Terry Pell, and Jeb Barger, who have a knack for all the things concerning computer security. Jeb Barger, Infrastructure Tech Senior, is the Nebraska law Enforcement Intelligence System (NeLEIS) Administrator. Terry Pell, IT Supervisor, also works for the Nebraska State Patrol, and is the Network Administrator for the agency. Scott McFall, IT Division Commander, is the agency security officer. All three individuals work as a team to keep the NSP's infrastructure up to date and secure from both outside and inside intruders. They have investigated hacks across the state, giving many security classes to state and local agencies, and have been asked to speak at international Symposium. Seventeen participants registered for this workshop.

Google Earth in Transportation: Earth 101

This workshop taught participants the skills needed to prepare KML files so that they can combine their GIS data with Google Earth imagery and distribute the result in house or to the general public.

Google Earth provides more than the ability for personal exploration of our planet, it also provides the tools and mechanisms that enable developers to layer custom data onto the earth, animate that data, and create bidirectional links between resources on the web and locations on the earth. These capabilities permit the easy construction of a personalized planet – one with all the richness of the standard Google Earth imagery, terrain, roads, and local information that is extended by custom data of importance to customers, constituents, employees, businesses, and decision makers worldwide.

The Google Earth 101 training course provided all the background, instruction, examples and confidence needed to personalize Google Earth for your needs in the transportation arena. Instructors Andria McCool and Jessica Wei of Google Earth provided an introduction to Google Earth and the types of data that are built into the standard database; examples of text, marker, line, area, volume and image annotations that can be authored in the client software; and overview of data importation tools for easy ingestion of Geographic Information System (GIS) data; and a step by step analysis of several typical application types within the transportation domain, including:

- Vehicle tracking
- Proposed roadway construction visualization
- Public policy communication
- DOT facility mapping
- Traffic monitoring and webcam visualization
- Call center intelligence
- Construction progress evaluation

Attendees left with the understanding to implement or direct the implementation of these types of applications that leverage their own data. One hundred fourteen participants registered for this workshop.

Applying Raster Analysis in a Vector World: Grid-based Map Analysis Techniques and GIS Modeling

This intermediate level workshop discussed and demonstrated several techniques for data mining and spatial analysis using numerous examples, such as suitability analysis, optimal path/corridor routing, visual impact assessment and landscape structure analysis. The discussion focused on concepts, procedures and practical considerations in successfully applying grid-based analysis tool for mapping both numerical and contextual relationships among map layers. The material presented encapsulated numerous “Beyond mapping” columns by the instructor published in GeoWorld magazine and compiled into the online book Map Analysis (www.innovativegis.com/basis/. Select Map Analysis book). Participants received a workbook and CD containing background reading, Power Point slides, exercises, software and appropriate databases for completing the workshop demonstrations as homework.

The workshop was interactive with numerous real-time demonstrations and animated slide sets that reinforce the basic concepts, procedures and applications presented. The first portion of the workshop established the concept of Maps as Data by introducing the fundamentals of spatial statistics, with emphasis on interpolation of point data and “numerical relationships” among mapped data. The next, and largest portion of the workshop, focused on Spatial Analysis emphasizing techniques used in investigating “contextual relationships” within and among map layers, such as suitability analysis, optimal path/corridor routing, visual impact assessment and landscape structure analysis. The final portion focused on GIS Modeling procedures required in constructing sound applications models and the future directions of geospatial technology. The instructor, Dr. Joseph K. Berry is the Principal of Berry and Associates / Spatial Information Systems, consultants and software developers in Geographic Information Systems (GIS) technology. Dr. Berry also serves as the Keck Scholar in Geosciences at the University of Denver and is a Special Faculty member at Colorado State University. Twenty-eight participants registered for this workshop.

State GIS Activities

This is the 11th year that the GIS-T Symposium has conducted a survey of GIS activities at State DOT's. This year, the survey was combined with an information request for the State Roll Call, and administered using a web-based survey instrument. The response rate improved over last year, with 48 States plus the District of Columbia and the Commonwealth of Puerto Rico completing the survey. These responses were tabulated and are presented in a separate summary table.

A new question was added this year about the technical background of GIS core staff, and two questions on database management software used for enterprise GIS were reinstated after being dropped from last year's survey. Questions on the maintenance of physical mile markers on state roads were dropped from this year's survey.

GIS Organizations Structure and Development Stage

The most prevalent organizational structure for GIS units in State DOT's (49%) continues to be a GIS core unit, providing technical support to a much larger group of end-users throughout the agency. Another 32% of the States report having an "enterprise" organizational structure with agency-wide data integration. Four States (AR, ID, ND & SD) report that, although they have "pockets" of GIS applications, there is no agency-wide coordination of geospatial data or services.

The organizational location of GIS core units is about equally split between Planning (47%) and Information Services (49%). This appears to reverse a trend over the past few years toward consolidating GIS core units in Information Services. Even in those States that have instituted an enterprise GIS, there is no significant difference in where the GIS core unit is located.

The allocation of GIS staff time across core functions shows more staff time being devoted to road centerline base map maintenance and enhancement (22%), end user support and training (17%) and web applications (15%), compared to last year. However, the distribution of staff activities varies considerably across agencies, and even within an agency from one year to the next.

The number of GIS core staff shows a moderate decrease, compared to last year's survey. The average GIS core staff size for all responding agencies was 7.0, down from 7.4 as reported last year.

GIS professional certification is a small but growing factor in hiring of GIS staff. Twelve (24%) of the States reported that they had at least one certified GIS professional on their staff, and five additional (10%) States reported that certification would be considered in future hiring of GIS staff.

A new question in this year's survey asked about the principal technical backgrounds of GIS core staff. Most of the States (84%) responded that at least one staff member has geography or cartography background, and at least one staff member has an information technology or computer science background (75%). Staff with engineering or planning backgrounds (37% each) is the other principal disciplines identified.

States reported a small increase in the percentage of GIS application development work that was outsourced from 39% to 43%. Not surprisingly, the annual amount spent on GIS Contracts increased by a similar percentage, from an average of \$315,000 to \$342,000 per agency. These relatively modest increases may reflect caution by States in starting new work, due to uncertainty in the amount of transportation planning and research (SPR) funds, prior to passage of SAFETEA-LU.

GIS Software

Seventy-four percent (74%) of the States 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" 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, 73 percent of those responding use ESRI products, 25 percent use Intergraph products and 2 percent use Caliper products as their principal GIS software. For web applications 70 percent of those responding use ESRI's ArcIMS® and 26 percent use Intergraph's WebMap®.

Most States use commercial relational database management software (RDBMS) in combination with GIS software to manage their geospatial data. Oracle® is used by 70 percent of the States, either alone or in combination with other database software. Other commercial database software used by the States include SQL Server® (36%), Microsoft Access® (32%), DB2 (6%) and Sybase (4%).

ArcSDE® (80%) and Oracle Spatial® (48%) are the principal software packages used to manage the geospatial attributes in enterprise data warehouses. A significant number of States (28%) report using both spatial data managers in combination.

Road Centerline Networks and Other GeoSpatial Databases

A key component of most transportation GIS activities is the road centerline network database. All States that responded to this year's survey reported that they maintain a digital road centerline database. Both the spatial accuracy and coverage of these databases continue to improve. Nearly two-thirds (64%) of the States reported that their road centerline databases have a spatial resolution of 1:12,000 scale or larger. Much of the improved accuracy has been achieved through the use of high-resolution orthoimagery and/or kinematic GPS. With respect to coverage, 60 percent of the States report that their road centerline database includes all public roads, and another 22 percent include all State and county routes.

The majority of States (68%) distribute their road centerline database free of charge to whoever wants it. Most other States (22%) have policies that allow the data to be shared with other public agencies, but place restrictions on its use and/or distribution. Two States (KS & OH) sell their road database, and three States (CT, HI, & OR) do not distribute their databases outside their agency.

States were asked if they maintain any other statewide geospatial data layers, beyond the road centerline database. Seventy two percent (72%) of those responding reported that they also maintain some other geospatial database. Over two thirds (68%) of the State DOT's maintain other transportation networks or features, such as rail lines, airports, etc. Other "framework" geospatial data maintained by State DOT's include political and administrative boundaries (50%), geodetic control points (36%), and orthoimagery (32%). State DOT's are less likely to maintain other framework layers such as elevation (14%), water features (22%), or land parcels (10%).

The primary sources of geospatial data used by State DOT's are other state and local agencies (identified by 92% of those responding), followed by statewide geospatial clearing houses (66%), and geospatial data maintained by federal agencies (58%). Less common sources include data purchased from commercial data vendors (18%), data provided or purchased from GIS software vendors (22%), and data acquired through the GeoSpatial One-Stop (28%).

Benefits and Costs of GIS Applications

Several questions introduced last year regarding the perceived benefits and costs of geospatial technology were continued in this year's survey. Similar to last year's responses, enterprise data integration was cited by a majority of the States as yielding the greatest current benefits (54%), but also being the most difficult and costly to implement (54%). CAD/GIS integration was cited as the next application having the greatest current benefits (32%) and most difficult to implement (32%). Asset management was most cited as the application having the greatest potential future benefit (56%), followed by enterprise data integration (48%).

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 they were cited by the respondents. Table 1 lists those GIS activities cited five or more times by the State DOT's.

GIS Activity	# of Citations
Development of web-based GIS applications	44
Linear referencing system development / enhancement	15
Enterprise data warehouse	14
Road inventory management system / attribute data	13
Migration to new GIS hardware and software	13
Road centerline database development / enhancement	13
Data sharing partnerships / coordination	12
Orthoimagery data collection / integration	10
Traveler advisory / information system application	10
Development of other geospatial databases	10
Safety / crash analysis	9
ITS / traffic management applications	8
Project management applications	8
Environmental / cultural mitigation applications	7
Bridge management applications	7
GIS strategic planning / needs assessment	6
GPS data collection / integration	5

Table 1 - High priority GIS activities at State DOT's

GIS has become recognized in nearly every State DOT as an important tool for data management and integration, analysis, and visualization. The key question is no longer whether the agency should invest in GIS, but rather how much of the agency's program data should be integrated using geospatial technology. Most State DOT's are either investigating or are actively developing an enterprise GIS data warehouse. Enterprise data integration is seen as yielding the greatest agency benefits from geospatial 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 safety and crash analysis, environmental impact studies, and traffic and bridge management systems.

The recent trend of relocating the GIS core unit from Planning to Information Services seems to have abated. GIS core staff seems to function effectively in either organization structure. 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 geospatial analyses and map products are being carried out by end-users throughout the agency, both with and without assistance from GIS core staff.

Student Paper Contest

In 2006 the GIS-T Symposium sponsored a student paper contest. The contest was open to essays on Geospatial Information Systems for Transportation as well as technical research papers around developing solutions for current GIS-T issues. Papers relating to any field of geospatial science were considered. Students were encouraged to display original thought and creativity in the development of the essays, which included a comprehensive bibliography on which the paper was based.

Eligibility Requirements included:

- The applicant must be a current enrolled student
- Only one paper contest entry per student
- Willingness to attend and present at the GIS -T Symposium

Submission Guidelines included:

- The paper was to be prepared by one author
- The original work of the author as much as possible (if a faculty member is listed as co-author, a letter from the faculty member confirming that the student was the primary author must be attached)
- Papers must have been submitted electronically in a sharable format
- Papers must have been written in English, utilizing good communication skills
- Paper must have been neither less than 4,000 nor more than 8,000 words (cover page and bibliography not included in the word count)
- A cover letter from a faculty member verifying the author's graduate or undergraduate status and original contribution
- Front page included complete address, telephone, fax and e-mail information
- Winning papers presented at the Symposium and posted on the GIS-T website

Papers were judged by members of the GIS -T Planning Committee and were rated on the following categories:

- Significance of topic
- Literature review
- Conceptualization
- Methodology (if applicable)
- Data analyses (if applicable)
- Interpretation
- Clarity of presentation
- Validity of conclusions
- Reader interest

Out of seven entries three winners were selected and awards were given out. The winners received \$500.00 plus a round trip airline ticket to Columbus, Ohio and two nights stay to

attend the Symposium. The winners presented their paper at the Student Paper Session on Monday, March 27, 2006. Copies of the winning papers can be found at <http://www.gis-t.org>. Winning authors were:

Nora Csanyi

Department of Civil and Environmental
Engineering and Geodetic Science

Ohio State University

Columbus, OH

Paper: TPrecision LiDAR Mapping of Transportation Corridors Using LiDar-Specific Ground Targets

Daoqin Tong

Center for Urban and Regional Analysis and Department of Geography

Ohio State University

Columbus, OH

Paper: Traffic Information Deriving Using GPS Probe Vehicle Data

Kai Han, Master of Science, EIT

Department of Civil Engineering

University of Manitoba

Paper: Developing a GIS-based Decision Support System for Transportation System Planning

Poster Session

The 2006 GIS-T Symposium poster entries showcased how agencies are using GIS technology to display data. Posters were reviewed and the following awards were given to those chosen as the best:

Best Cartographic Presentation:

- Arizona -The Grand Canyon State Map

Honorable Mention Cartographic Presentation:

- Colorado's Statewide Functional Classification
- Underground Miles of Ohio

Best Analytical Application:

- Caltrans Highway Grades of 6% (or more)

Honorable Mention Analytical Application:

- Maine Scenic Byways
- Vermont Railroad Network

Best State Official Published Map:

- Manitoba Official Highway Map

Honorable Mention State Official Published Map:

- Colorado Scenery and Adventure
- Ohio Bicentennial Map

People's Choice Award:

- Province of Manitoba for their "Official Highway Map"

Honorable Mention People's Choice Award:

- Arizona DOT for the "Arizona: The Grand Canyon State" map

Concurrent Sessions

Monday:

State of Ohio	Ohio Field Operations
Student Papers	Web Data Integration
Web Portals	GPS/GIS
Data Collection	Federal Data

Tuesday:

State of Ohio	Intermodal / Multimodal
Environmental	Asset Management
Web Applications	Routing
LRS/LRM	Enterprise GIS & Data
MPO / Local Government	
Database Design and Migration	
Safety / Traffic	
GeoCoding	

Wednesday:

Federal GIS	Asset Data
GIS Analysis	Enterprise GIS
Management Systems	Web GIS
Emergency GIS	GIS Databases

Symposium Summary

The nineteenth annual Symposium on Geographic Information Systems for Transportation (GIS-T) was held in Columbus, Ohio from March 26 through March 29, 2006. The Symposium identified emerging issues and technologies impacting the Transportation Information Technology Community. This year's Symposium had the highest attendee registration ever. The Symposium included a selection of seven workshops, a technology hall with forty-seven vendors, a world leader in technology forecasts and business strategies as keynote speaker, state summary, roll call of states, eighty-four paper presentations, poster session, student paper contest, a "Birds of a Feather" session, a panel discussion, and a Google Earth Virtual Tour.

Technical papers presented at the Symposium are available along with their abstracts through the GIS-T web page (<http://www.gis-t.org>). The state roll call, state summary and state contacts list can also be obtained from this site.