Development of a Colorado NSDI Transportation Layer

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The Status Quo

• CDOT annually updates a 152k segment local roads GIS layer/database covering 330 local jurisdictions.
• New roads are table-digitized from plat maps.
• Attributes for new roads and attribute changes for existing roads are key-entered to a tabular database.
• For major roads, there is a link and a one-to-one relationship between Arcs and database rows.
• For local roads, there is no link and segmentation differs between the Arcs and database rows.
The Vision

- CDOT and many Colorado local jurisdictions jointly maintain a single, shared GIS layer for local roads.
- Local agencies update the GIS layer and attributes as part of their normal business processes. All road arcs will be linked to database rows and be 1-to-1.
- CDOT periodically receive updates from local agencies and completes statewide tasks:
  - Area integration functions;
  - Producer of last resort for non-participating jurisdictions;
  - Inter-jurisdictional reconciliation; and,
  - Statewide data development efforts.
CDOT’s mandate on local roads

• Local Road Mileage Certification Program:
  – Mileage used to allocate of Gas Tax $ (HUTF).
  – $250M/year used by local govts. to maintain roads.
  – Requires annual update of DB and GIS layers.

• Transportation Planning:
  – Covers Highways and major local roads on the National Highway Planning Network.
  – Requires current GIS and road characteristic data.
Local Government Responsibilities

- Review existing roads inventory & GIS data
- Provide information on system changes:
  - Jurisdiction changes (e.g. Annexations)
  - Condition changes (e.g. Good to Fair)
  - Characteristic changes (e.g. widened, resurfaced)
  - New facilities and abandonments
- Certify system as of 12/31 of each year.
“Traditional” Methods

- CDOT sends maps and database listings to 330 Towns, Cities and Counties in Colo.
- Local govts. handwrite on listings, fill out forms, sketch on maps & send plats to CDOT.
- CDOT staff key-enter updates to database and table-digitize new roads into GIS layers.
- CDOT reports certified public road mileages to the Treasurer and FHWA for $ allocation.
- CDOT distributes GIS products via Internet.
Digital Methods

- Database only

- GIS data layer update alternatives:
  - Two separate GIS Databases Maintained; or,
  - Integrated/shared State/local DB and GIS.
Digital methods used for tabular inventory in 2002 update cycle

- CDOT developed a VBA for Access application to allow local agencies to update their attribute data: AHUT – the Access Highway User Tax editor.
- Of 183 jurisdictions with changes, 50, including most of the larger ones, used AHUT to report them.
- Reported changes were successfully posted to the master database.
- Some problems with back end processing...
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Italicized attributes cannot be edited by local agencies.
Benefits of using digital methods for tabular inventory updates

- Elimination of handwriting changes on inventory printouts and filling out system change reports.
- Reduction of data entry errors.
- Enhanced control of database contents.
- Ability to get mileage totals or new inventory report immediately upon completion of annual update.
- Availability of the database for maintenance over the year.
- Easier to synchronize segmentation with local GIS or tabular databases so that they can be linked.
- Asset inventory as a starting point for GASB 34.
Two separate GIS Databases Maintained

- Local govt. provides GIS or CAD data in known datum, projection and coordinate system. **VERY IMPORTANT!**
- CDOT snaps our GIS roads/cities layers to local digital data and copies any new features to CDOT layers.
- Thereafter, GIS or CAD update files are sent in annually.
- CDOT would like to use all available digital centerline and/or city limits data for the annual update!
- 12 Counties and 28 Cities have provided CDOT with their GIS or CAD centerlines and/or boundaries to date
Benefits of using digital methods for GIS data layer updates

- No need to find/copy/send plats.
- No need to draw new roads/boundaries on map.
- Improved accuracy.
- Opportunity for Roads/Public Works staff to enhance coordination with local GIS group.
Digital methods in development for GIS Data Layer updates

Integrated/shared State/local DB and GIS

- Many variations are possible, depending on:
  - local data availability,
  - system compatibility,
  - local capabilities, etc.

- Completed Projects: Broomfield, Lone Tree & Weld
- In progress: Breckenridge and Otero Co.
- In discussion: Rifle, Garfield Co., Montrose City & County, Montezuma Co., Denver, Greeley.
Broomfield Pilot Project

- CDOT road layer was registered to city CAD dataset, and links were added to arcs.
- One row to many arcs relationship was dissolved to create one-to-one.
- Broomfield is maintaining the GIS layer and used AHUT for DB update.
Lone Tree Pilot Project

- Local centerline layer was linked to AHUT table, and sent to CDOT.
- Result was one-to-many (not dissolved).
- Lone Tree is maintaining the GIS layer and used AHUT for DB update.
Weld Co. Pilot Project

• County staff assembled a road layer from various sources (incl. CDOT).
• AHUT was used for their attrib. upd.
• Segments on AHUT inventory and GIS layer were synchronized by county staff.
• Result was a one-to-one relationship.
• County will maintain GIS layer and will use AHUT for future DB updates.
Breckenridge Pilot Project

- City area of County road layer is being linked to DB table by City staff.
- Segments on AHUT inventory and GIS layer are being synchronized by City staff.
- Result will be one-to-one relationship.
- City will maintain GIS layer and will use AHUT for DB update.
Otero Co. Pilot Project

- New GIS Program in county will initially use CDOT GIS layers and AHUT DB.
- Segmentation on GIS layer and DB will be synchronized by county staff.
- Over time, GIS layer will be improved using GPS data, etc.
- Otero Co. will maintain GIS layers and will use AHUT for DB update.
Benefits of developing an Integrated State/Local DB and GIS

- Most HUTF reporting requirements can be met as byproducts of ongoing local activities. (e.g., PMS, centerline layer)
- Improved accuracy of HUTF information.
- Reduced workloads for both local agencies and CDOT.
- Availability of CDOT website for distribution of local GIS data.
Proposed Roles as per the NSDI - National Spatial Data Infrastructure

- **Local Governments:**
  - “Data producer” and “Custodian”.
  - “Data distributor” via whatever method, if desired.

- **CDOT:**
  - “Area integrator”, collating and homogenizing local layers into a seamless, statewide coverage.
  - “Producer of last resort” where no local producer.
  - “Data distributor” via the CDOT web site.
The Next Logical Step...

- CDOT plans to form a Colorado Local Roads Data Committee to organize efforts.

- Potential roles for CoLRDC:
  - Standards development for local road data content, structure and coding.
  - Design of mechanisms to facilitate data exchange and shared data maintenance.
  - Provision of technical assistance to members in data development & maintenance.
  - Work with organizations like County Assoc., Municipal League, GIS Colorado, etc
Benefits of a local roads data committee

- Increased efficiency at all levels of government.
- Reduced costs at all levels of government.
- Use of a common, consistent DB across jurisdictions.
- Improved accuracy/data quality.
- Improved service to other agencies and the public.
Summary

• CDOT has successfully run a centralized program for 20 years (Since Arc 3.0!)
• Higher accuracy local data is becoming increasingly available.
• Pilot projects have proven that CDOT and locals can maintain a shared GIS layer.
• We are ready to “scale it up”!
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