The Durango-La Plata County e911 CAD Geobase

An comprehensive approach to leveraging multiple GIS data layers for 911 dispatch and mapping
The Durango-La Plata County e911 CAD Geobase

Background

The Durango-La Plata County Emergency Communication Center (DLPECC) built a comprehensive Geographic Information System (GIS) framework for dispatch and emergency response that utilizes a series of cascading geocode searches through stacked map layers for address validation.
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- The regional public safety GIS framework was developed in an attempt to quickly and efficiently leverage the best available normalized, standardized, rule-based, certifiable and detailed digital spatial data to the 911 Communication Center for rapid dispatch to first responders and other emergency personnel.
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- The DLPECC computer-aided dispatch (CAD) geographic network of addresses and streets is built on the Spillman v-6.1 Sentryx Geobase module and a published ArcGIS Server v 9.3.1 map document running a composite address geolocator map service.
The Durango-La Plata County e911 CAD Geobase

- “Geobase” is a proprietary term used by Spillman Technologies to reference the bundled software and data set used to geocode and validate addresses.
- **Not** strictly a “geodatabase”.
- DLPECC uses a hybrid of geodatabase feature classes and shapefiles in its Geobase architecture.
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- The foundation of Spillman’s CAD Sentryx Geobase is the core address locator map services in ARCGIS but with public safety enhancements administered through the Spillman Software.
The Geobase design represents a logical assemblage of GIS data themes that are critical to location identification in real-time 911 emergency dispatch.

They are the **bedrock** GIS layers needed for:

- Rapid and thorough address validation
- Call mapping and incident reporting
- Vehicle routing
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- DLPECC’s Geobase consists of an ordered array of point and line map themes composited into a multi-level address locator for near-instantaneous address verification, cross-reference CAD mapping and dispatch.
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- When the Spillman address utility is run in CAD to verify a location, the software uses the composite geocode service stored in the ArcGIS server to find and display an exact match address or supply a filtered list of all qualifying address candidates.
The composite geolocator acts like a single address locator as it cascades downward through a logical series of stacked GIS themes looking for all potential address matches.
Upon selection of a matched address, the dispatcher auto-populates the 911 call window with the validated address and all corresponding agency codes, city codes, zip codes, cross-streets, aliases, alerts, and location narratives related to the selection.
The efficiency and completeness of the returned streets and addresses are a function of the ordered layers used in the Spillman geobase design.
The Durango-La Plata County e911 CAD Geobase

- Locators are individually created in ArcCatalog
- Published as a composite on the ArcGIS server
- Integrated into the Spillman Sentryx Geobase.
The DLPECC Sentryx CAD design currently uses **eight foundational geobase elements** that are individually and sequentially queried through the cascading geocode process.
The Durango-La Plata County
e911 CAD Geobase

<table>
<thead>
<tr>
<th>Common Place</th>
<th>Address Point</th>
<th>Intersections</th>
<th>County Roads</th>
<th>Road Centerlines</th>
<th>Landmarks</th>
<th>Mile Markers</th>
<th>Minor Subdivision</th>
</tr>
</thead>
</table>
The Durango-La Plata County e911 CAD Geobase

- Spillman v6.1 Sentryx Geobase software provides the screens that facilitate easy lookup of these address and intersection parameters.
- Any foundational element can be searched individually based on its own unique address locator style.
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1st Foundational Geobase Element
Common Place Point (Alias)
1st Foundational Geobase Element

Common Place

- Common place point feature class locator is a **single field w/alternate names** custom style built using a Spillman Toolbar.
  - A place name alias or common reference to a known address (e.g., County Courthouse = 1060 E 2nd Av)
    - Alternate Common Names (e.g., LPC Courthouse, La Plata County Courthouse)
    - Category Code (i.e., GOVT)
    - Class (i.e., Government)
    - Acronym (i.e., LPC)
1st Foundational Geobase Element
Common Place

<table>
<thead>
<tr>
<th>ADDRESS</th>
<th>CALL</th>
<th>CLASS</th>
<th>ALTERNATE CLASS</th>
<th>ALTNAME1</th>
<th>ALTNAME2</th>
<th>ALTNAME3</th>
<th>STREET</th>
<th>CITY</th>
<th>STATE</th>
<th>ZIP</th>
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<tr>
<td>123 Main St</td>
<td>123</td>
<td>456</td>
<td>789</td>
<td>1011</td>
<td>1213</td>
<td>1415</td>
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<td>789 Oak St</td>
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[Image of a spreadsheet with data]
## 1st Foundational Geobase Element

### Common Place

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<td>SALON</td>
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<td>TRAILS</td>
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<td>THTR</td>
<td>THEATER</td>
</tr>
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<td>TIRE</td>
<td>TIRE SHOP</td>
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<td>WHSE</td>
<td>WAREHOUSE</td>
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<td>43</td>
<td>VICE</td>
<td>LIQUOR STORE</td>
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</table>
The Durango-La Plata County e911 CAD Geobase

2nd Foundational Geobase Element

Address Point
2nd Foundational Geobase Element

Address Point

- The single address point positioned over a building rooftop or lot envelope provides the highest positional accuracy of any element in the cascade.
- Built on an ESRI US One Address locator style, it is the 2nd element queried in the Sentryx geocode process and is closely associated with the common place point layers that serves as its alias.
Upon address validated, all previous calls associated with, and all aliases tied to, a given address are auto entered into the address information window.
In addition, all nearby addresses within a 50 yard radius, hazard alerts, contact names, and premise alerts are brought into the information window where viable.
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3rd Foundational Geobase Element

Intersection Point
3rd Foundational Geobase Element
Intersection Point

- The Intersection Point Feature Class is built via the Spillman custom toolbar to geocode as a single field w/alternate names.

- A intersection point is created at each junction or node where a street name, type or directional changes.
The alternate intersection names table is self-generated and joined to the source by a numeric ID. Alternates include:

- Full intersection names in a reverse order.
- Alternate full intersection street names.
- All combinations of partial street names and street types in forward and/or reverse order.
- All combinations of street names and street types at a junction of 3 or more streets.
3rd Foundational Geobase Element
Intersection Point

Caution!

E 8\textsuperscript{th} Av & E 8\textsuperscript{th} St
Or
E 8\textsuperscript{th} ST & W 8\textsuperscript{TH} ST
3rd Foundational Geobase Element
Intersection Point

The DLPECC CAD area consists of 2447 intersections but contains approximately 164,000 alternate name combinations in the Geobase including over 300 appended customizations:

- Intersection aliases (e.g., Farmington Hill Bottom, Elmores Corner)
- Phantom Intersections
Interseciton Point Feature Class with Alternate Names
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4th & 5th Foundational Geobase Element

Transportation Layers
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- Line-based transportation layers generally serve as the backbone of any CAD/GIS system.

- Two transportation elements are used in the Durango-La Plata County CAD Sentryx Geobase design:

  - 4th element - County Roads feature class (route layer).
  - 5th Element - Road Centerline feature class w/alternate names (default geocode layer).
4th Foundational Geobase Element

County Road Lines

- The County Road *(route)* layer and *single field locator* are custom enhancements to the local geobase and are used exclusively for callout requests for extra patrol by the La Plata County Sheriffs Department.

- Built as a subset of the road centerline layer, it only returns the county road name, midpoint location and an occasional descriptive text narrative *(alias)* on usage.
County Roads Feature Class
(Route Layer)
The Roads centerline layer utilizes an ESRI US Streets address locator style for geo-referencing and serves as the default database layer in all Sentryx cascading address queries.

Alternate names are stored with the source data but are integrated and managed through the Sentryx geobase.
Spillman provides tools for ArcGIS 9x that standardize and validate your road centerline data as well as build alternate name tables.
Address points are interpolated along the centerline using left/right (odd/even) address parity and a predefined marker offset.

Agency and administrative codes (e.g. Law Zones) are retrieved into the call window from polygon base layers using the coordinates of the matched address.
When the centerline is the spine dividing two jurisdictional boundaries and the offset is set at zero, both jurisdictions are individually displayed alongside the match address in the validation window.

Spillman also allows these roadways to be assigned to a single agency while their left and right address ranges (i.e., properties) be assigned to dual agencies.
Road Centerline with Alternate Street Names
Road Centerline with Alternate Street Names

County Road Routes vs. Road Centerlines
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6th Foundational Geobase Element

Landmark Point
6th Foundational Geobase Element
Landmark

- Landmarks – General site and regional classes for labeling and mapping.
- **Single field** locator style
- Landmark elements are mere location references, *not* known address points.
- Landmarks work where common places don’t.
6th Foundational Geobase Element
Landmark
6th Foundational Geobase Element
Landmark

- **Landmark Subtypes:**
  - Major Town
  - Minor Town or District
  - Major Subdivision
  - Major Hydrologic Feature
  - Minor Hydrologic Feature
  - Campgrounds/Picnic Area
  - Mines
  - Named Sites/Landmarks
  - Wilderness Areas
Landmarks play an important role in dispatch to mountain resort communities and wilderness areas in the northern part of La Plata County.

They provide reference points along the D&SNGRR for helicopter assistance.

Useful for emergency assistance to outdoor enthusiasts and tourists.
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7th Foundational Geobase Element

Highway Mile Marker
Highway mile markers are entered for geo-verification against a single field type locator as a coded string: MM10 HWY550.

DLPECC mile marker point references are snapped to the road centerline relative to the location of existing CDOT mile posts.

Text narrative of the MM reverse-geocode address and block range are attributed with the mile marker feature.
Highway Mile Marker Shapefile
The Durango-La Plata County e911 CAD Geobase

8th Foundational Geobase Element

Minor Subdivision
8th Foundational Geobase Element
Minor Subdivision

<table>
<thead>
<tr>
<th>Minor Subdivision</th>
<th>Location</th>
<th>Points 1</th>
<th>Points 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pine Rock</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lost Creek Village</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horse Mountain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valley Springs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Willow Tree</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Whispering Pines</td>
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<td></td>
<td></td>
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<tr>
<td>Sun Valley</td>
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<tr>
<td>Desert Heights</td>
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<tr>
<td>Red Rock</td>
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<td>Snow Mountain</td>
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<td>Desert Trails</td>
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<tr>
<td>Desert Sunset</td>
<td></td>
<td></td>
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</tbody>
</table>
The Minor Subdivisions Feature plays an important role in dispatch to suburban communities and agricultural areas in eastern and southern La Plata County.

The point layer with a single field locator style provides dispatchers a tool for quick lookup of subdivision locations.

Prime application is for call for extra patrol or surveillance.
Emergency Response Agency and Administrative Polygons

- Jurisdictional and agency bound areas are used by the Sentryx Geobase for point-in-polygon overlay and proximity analysis.
  - City Zone Boundaries
  - Law Zone and Response Areas
  - Fire Zones and Response Areas
  - EMS Zones and Response Area
  - Tribal Regions
  - Zip Code Cloud

- Auto-populate the call window on retrieval
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- Other GIS base layers play an important support role in Sentryx CAD mapping but are not directly integrated with the ArcGIS composite geobase locator model.
- These spatial elements reference critical infrastructure, essential facilities, hazards, political boundaries, structures, PLSS, hydrography and terrain.
Support Layers

- DSNGRR tracks and sidings
- Lakes, reservoirs, rivers, streams and flood plains
- Building footprints
- Fire stations and emergency facilities
- Hiking and biking trails and trailheads
- Bridges and culverts.
- Police and SO reporting districts
- Tribal, county, state and federal land boundaries
- Terrain models and aerial photography
- Parks, open space and recreational areas
- MHPs
- Alleys, unnamed streets and O&G roads
The Durango-La Plata County e911 CAD Geobase

- The CAD geobase and support GIS layers currently serve as the single source from which the DLPECC, SO, SUPD, DPD, IPD, Bayfield Marshall’s Office, four local fire and three local EMS authorities can access all their digital spatial data needed for mobile mapping, AVL and RMS application.
Mobile and Pin Mapping

- Foundational layers are limited to street centerline and address points.
- Alternate street names and location aliases stored in a single table.
- Zones are a function of street layer left/right (odd/even) parity and stored with centerlines.
- Spatial query capabilities in Outfiles
Spillman v-4.6 and Mobile v-4.5
The Road Ahead

- Next immediate goal of Durango-La Plata 911 Communication Center is to complete integration of the CAD system with ESRI Network Analyst and Spillman Quickest Route module to route vehicles and model travel time.
Thank You

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