
Aggregating Utah's Statewide Roads Dataset

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AGRC

Automated Geographic Reference Center

- State of Utah's map technology coordination office (est. 1984)
- gis.utah.gov

SGID

State Geographic Information Database

- one-stop access point to hundreds of statewide data layers (developed, aggregated and acquired)
 - utah.maps.arcgis.com (web services)
 - gis.utah.gov/data (data downloads)
-

SGID >>> Statewide Roads >>>

Goal

Provide a seamless, standardized, and regularly updated statewide dataset

Data Sources

City agencies

County agencies

VECC (Valley Emergency Communications Center)

UDOT

Data Users

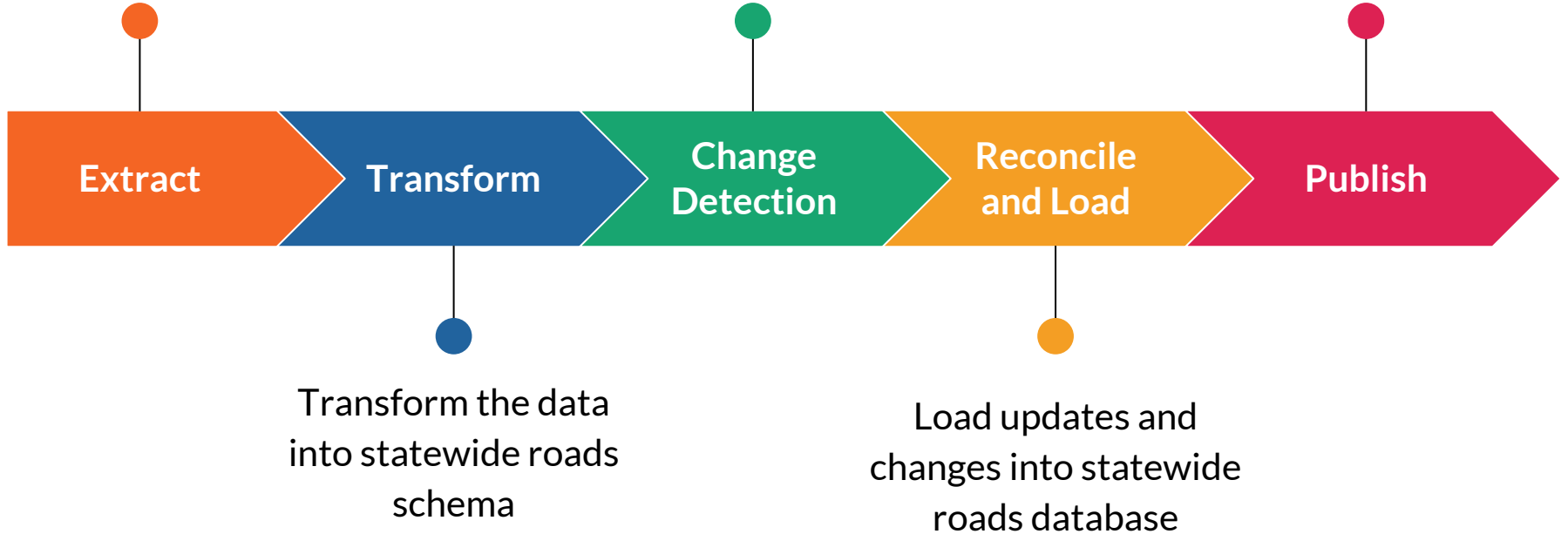
Blue Stakes of Utah (811)

911 Community and Dispatch Centers

Extract the roads data from the authoritative data sources

Detect Changes between existing statewide roads data and source data

Publish the data to SGID and FTP sites (web services)



Extract

Transform

Change
Detection

Reconcile
and Load

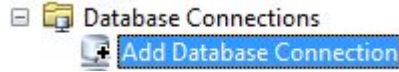
Publish

Extract the roads data from the authoritative data sources...

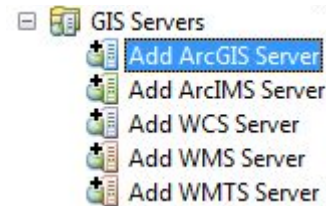
Current Forms of Data Extraction

- Email request
- AGRC-hosted and provided AGOL Feature Layer Service
- FTP/Website Download page
- Direct Connection to agencies SDE Geodatabase
- ArcGIS Server Distributed Geodatabase (Geodata Service)

SDE

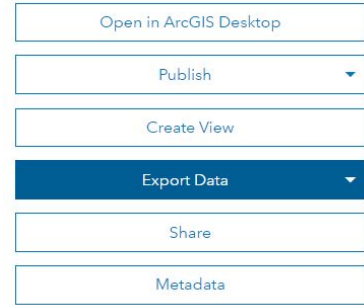


GeoService



AGOL

Feature Layer (hosted)



FTP/Download

Utah County GIS Data Layers and File Download

Layer Name	Shapefile (zip files)	Table	File Geodatabase	Metadata Summary (.pdf format)
Road Centerlines - <small>Line segments representing centerlines of all roadways or carriageways in the vicinity of Utah County. Typically, this information is compiled from orthomagey or other aerial photography sources. This representation of the road centerlines supports address numbering and mapping. It also serves as</small>	10.6 MB		7.59 MB	View

Email



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Transform the data into statewide roads schema...

Schema Transformation

- Each agency has unique set of needs for roads data
- Variety of schemas throughout the State
- Transform the data into SGID Schema
- Python Scripts

Python Scripts

```
for field in fields:
    if not arcpy.ListFields(fc, field[0]):
        arcpy.AddField_management(*((fc,) + field))

#
# check if field is in the field list before we calc values
flds=[]
fldObj=arcpy.ListFields(fc)
for fld in fldObj:
    flds.append(fld.name)

#then loop through your list of variables that the search cursor is looking for:
missingvar=["PREDIR", "Pre_Dir", "STREETNAME", "Street_Nam", "STREETTYPE", "Type", "SUFDIR", "Suf_Dir", "MODIFYDATE", "GPS_Date", "FULLNAME",
            "L_F_ADD", "Left_From", "L_T_ADD", "Left_To", "R_F_ADD", "Right_From", "R_T_ADD", "Right_To"]

for v in missingvar:
    if v not in flds:
        print "missing field: " + v
#
print "done with checking for missing fields"

#index
#index
rows = arcpy.da.UpdateCursor (fc, ["PREDIR", "Pre_Dir", "STREETNAME", "Street_Nam", "STREETTYPE", "Type", "SUFDIR", "Suf_Dir", "MODIFYDATE",
                                   "L_F_ADD", "Left_From", "L_T_ADD", "Left_To", "R_F_ADD", "Right_From", "R_T_ADD", "Right_To"])
print "Begin calculating values over..."
for row in rows:
    if row[1] != None or row[1] != '0':
        row[0] = row[1][:1].upper()
        if row[1].startswith('L'):
            row[0] = 'L_' + row[0]
```

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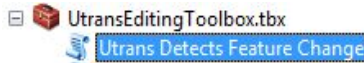
Publish

Detect Changes between existing statewide roads data and source data...

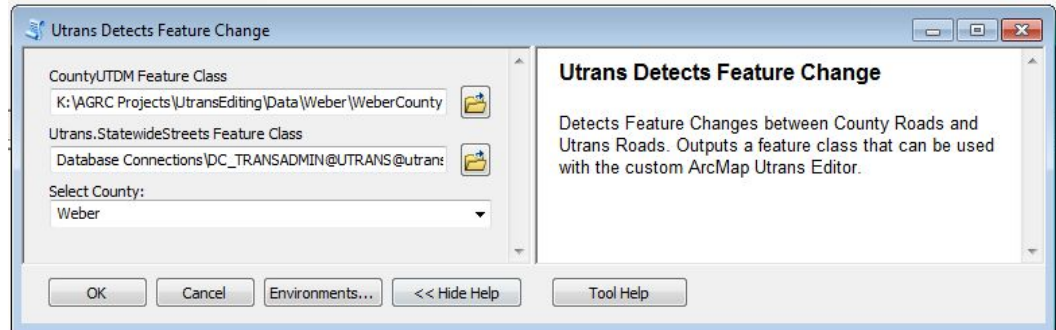
Detect Feature Changes

- Compare (transformed) source data to existing SGID data - feature by feature
- Python tool built around ESRI's Detect Feature Change geoprocessing tool
 - search distance, spatial change tolerance, compare fields
- Tool outputs a feature class indicating change type
 - New, Deleted, Attribute, Spatial, Attribute and Spatial, None

ArcCatalog



Python Tool



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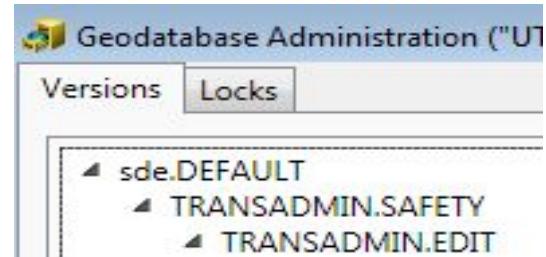
Publish

Load updates and changes into statewide roads database...

Create User Versions for Editing

- Each editor creates a version in the roads editing database
- All edits are done via user's version
- User reconcile and post to parent version

SDE Editing Database



... user version

... user version

... user version

... user version



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Load updates and changes into statewide roads database...

ArcMap Editing Environment

- Custom editor tool
- ArcObjects SDK and C#
- Tool provides a UI for the change detection output files
 - Iterate through changes
 - Visual inspection (features and attributes)
 - Update | Import | Ignore
 - Feedback loop

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Load updates and changes into statewide roads database...

Change Type:
New, Attribute, Spatial, Attribute and Spatial

County
Segment

AGRC
Segment

The screenshot shows the 'AGRC Custom UTRANS Editor' window. At the top, it says 'Remaining: 310' and 'Update Change Type: Attribute'. The interface is divided into two main sections: 'Selected County Road Segment' and 'Selected UTRANS Road Segment'. Each section has 'Primary Attributes' and 'Alias Attributes'.

Selected County Road Segment Primary Attributes:

L_F_ADD	L_T_ADD	PREDIR	STREETNAME	STREETTYPE	SUFDIR
375	399	W	BLACKBRUSH	WAY	
376	400				
R_F_ADD	R_T_ADD				

Selected UTRANS Road Segment Primary Attributes:

L_F_ADD	L_T_ADD	PREDIR	STREETNAME	STREETTYPE	SUFDIR
375	399	W	BLACKBRUSH	DR	
376	400				
R_F_ADD	R_T_ADD				

Alias Attributes (County Segment):

ALIAS1	ALIAS1TYPE	ACSNAME	ACSSUF
			N
ALIAS2	ALIAS2TYPE		

Alias Attributes (AGRC Segment):

ALIAS1	ALIAS1TYPE	ACSNAME	ACSSUF
		510	N
ALIAS2	ALIAS2TYPE		

At the bottom, there are controls for 'Did You Split A Line?' (Update DFC ObjectID), 'CARTOCODE' (11 - Other Local, Neighborhood, Rural Roads), 'Change Status Field' (COMPLETED), and a 'Save in UTRANS' button. A footer note reads: 'UTRANS Database Version: "UTAH\GBUNCE".GregBunce'.

User can double-click the field name to transfer values from County segment.

Save Button: checks for expected values, formats, spatially assigns attributes (zip codes, address grid, cities, etc.)

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<https://youtu.be/jZqsOUCc6XU>
<https://youtu.be/hbYOEnn9vMk>

Load updates and changes into statewide roads database...

AGRC Custom UTRANS Editor

Remaining: 310

Update Change Type: **Attribute**

Selected County Road Segment

Primary Attributes

L_F_ADD	L_T_ADD	PREDIR	STREETNAME	STREETTYPE	SUFDIR
181	199	S	ACANTILADO	CIR	
182	200				
R_F_ADD	R_T_ADD				

Alias Attributes

ALIAS1	ALIAS1TYPE	ACSNAME	ACSSUF
ALIAS2	ALIAS2TYPE		

Selected UTRANS Road Segment

Primary Attributes

L_F_ADD	L_T_ADD	PREDIR	STREETNAME	STREETTYPE	SUFDIR
195	257	S	ACANTILADO	DR	
196	258				
R_F_ADD	R_T_ADD				

Alias Attributes

ALIAS1	ALIAS1TYPE	ACSNAME	ACSSUF
ALIAS2	ALIAS2TYPE		

Did You Split A Line?

CARTOCODE: 11 - Other Local, Neighborhood, Rural Roads

Change Status Field: COMPLETED

Save in UTRANS

Prev Next

UTRANS Database Version: 'UTAHGBUNCE': GregBunce

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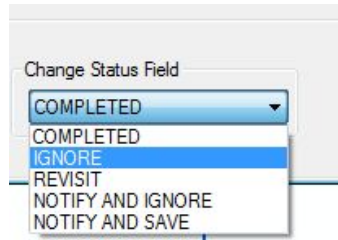
Publish

Load updates and changes into statewide roads database...

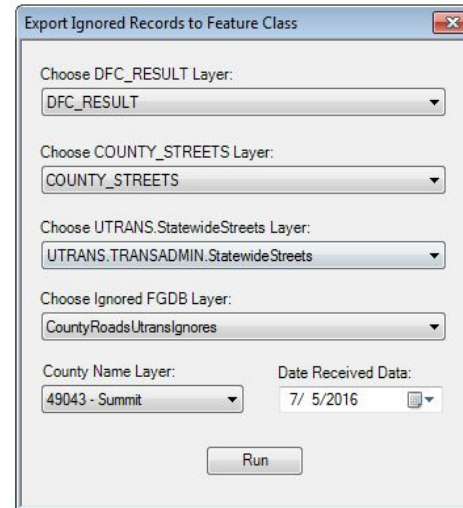
Ignore Process

- When ignoring a difference, log the transaction
- The idea is to not flag/inspect the segment again if we've ignored it in the past
- When we get the agency's data again, and if their data and our data is exactly the same (spatial and attributes), we have the option to utilize the ignore log to remove segments from the process

Ignore option
on editor tool



Additional custom
tool to preserve
and log the
segments we have
ignored



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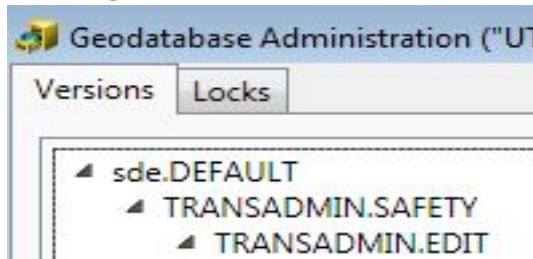
Publish

Publish the data to SGID and FTP sites...

Roll-up the editing database

- Push all user versions to the Edit version (reconcile and post)
- Roll all versions to sde.DEFAULT
- Delete all child versions

Editing Database



... user version
... user version
... user version
... user version

SGID Database

The screenshot shows the 'Contents' window in ArcGIS. It displays a list of data layers with their names and types. The 'SGID10.TRANSPORTATION.Roads' layer is highlighted in blue. A red arrow points from the 'Editing Database' screenshot to this window.

Name	Type
SGID10.TRANSPORTATION.LRSRouteCharacteristics	SDE Table
SGID10.TRANSPORTATION.PortsOfEntry	SDE Feature Class
SGID10.TRANSPORTATION.Railroads	SDE Feature Class
SGID10.TRANSPORTATION.Roads	SDE Feature Class
SGID10.TRANSPORTATION.Roads_FreewayExits	SDE Feature Class
SGID10.TRANSPORTATION.RoadsShieldLines	SDE Feature Class

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Publish the data to SGID and FTP sites...

Perform final quality checks

- Null values and empty ranges
- Range parity and order
- Missing spatial attributes
- UniqueID

Convert Nulls/Blanks to Empty String (or Zero if double or int field)

This tool checks for blank and null values in the specified fields, with the option to convert them to empty string or Zero if the field is Double, Short Int, or Long Int.

The tool will honor the layer's definition query. In order to update the values, the user must be editing.

Choose GIS layer to work with
UTRANS.TRANSADMIN.StatewideStreets

Select Features that have Blanks or Nulls

Choose Field to Check: PREDIR

Nulls Only

Select Blank or Nulls

Convert the Selected Features' Blanks and Nulls to Empty String (or Zero if integer field)

Choose Field to Update Values: PREDIR

Update Selected Fields

Progress Bar...

Nulls and Blanks

Check Address Ranges

Choose GIS layer to work with
UTRANS.TRANSADMIN.StatewideStreets

Check Address Ranges

Left From: L_F_ADD

Right From: R_F_ADD

Left To: L_T_ADD

Right To: R_T_ADD

Check for Odd/Even Parity

Check Range Value Order

Check for Decimals in Field

Choose Field: L_F_ADD

Check for Decimals

Round Decimals

Check Ranges

Assign Attributes Spatially

Choose GIS layer to work with
UTRANS.TRANSADMIN.StatewideStreets

Choose Fields to Assign

City Right: R_CITY	City Left: L_CITY
Zip Right: ZIPRIGHT	Zip Left: ZIPLEFT
County COFIPS: COFIPS	Address System: ADDR_SYS
USPS Name: USPS_PLACE	Address Quad: ADDR_QUAD
USNG_UniqueID: UNIQUE_ID	GRID1MIL: GRID1MIL
GRID100K: GRID100K	MIDX: MIDX
MIDY: MIDY	

Assign Attributes

Assign Spatial

Looking Forward

Shared Editing Environment

- Multi-User Editing
 - trusted editors
- Direct user input and feedback
 - trusted contributors
- Greater Efficiency
 - less processing
- More frequent updates
 - semi-live data, decrease shelf-life

ArcGIS Pro and web editing

Roads as a web service

NexGen911 and GIS (new schema)

Questions?



- Statewide Roads Dataset
 - gis.utah.gov/data/sgid-transportation/roads-system
- Github Repo to custom ArcMap tool (arcobjects, c#)
 - github.com/gregbunce/UtransEditorArcMap
- Contact Info
 - gbunce@utah.gov

**Thank
You!**
