STATEWIDE NG9-1-1 TRAINING
GIS CONCEPTS 2
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OVERVIEW
ABOUT THIS EXERCISE

The Oklahoma NG9-1-1 Toolkit is a set of tools intended to assist users for preparing their GIS data for NG9-1-1. The Toolkit is meant to be approached like a toolkit in real life; as each user’s data is unique so will the approach to NG9-1-1 readiness. Many tools may be executed in different orders if the parameters are met.

Always consult the ReadMe and/or Toolkit Manual for additional assistance.

This exercise is a suggested workflow which is fully customizable by each end user. The topics covered in this exercise are centered around the following areas:

✓ Section 1: Preparing local data and building a new NG9-1-1 compliant geodatabase
✓ Section 2: Pre-validation data preparation, standardization, and populating mandatory values
✓ Section 3: Validation and geometry data quality assessments

HELPFUL LINKS

B1: GIS Standard Concept Course
https://www.youtube.com/watch?v=5DkgocdYrWo

OK GIS Standard, Toolkit Manual, and Toolkit Download
http://www.okmaps.onenet.net/address_standards.htm

State of Oklahoma Data
https://okmaps.org/OGI/search.aspx

PREPARING DATA FOR NG9-1-1

The Toolkit can be downloaded from the link posted above in Helpful Links. Unzip the Toolkit but leave it in its native folder structure. This is critical to preserve functionality. Review the readme location and documentation before running the toolkit.

Scenario: You are a GIS Analyst who is managing your county’s GIS data within a geodatabase. The source geodatabase is called OK_SourceData_Initial.gdb and includes the following layers:

- Road Centerlines (Centerlines)
- Address Points (SSAP)
- Emergency Service Zones (ESZ)
- Discrepancy Agency Boundary (DISCREPANCYAGENCY_BOUNDARY)*
- PSAP Boundary (PSAP_BOUNDARY)*

*These layers are managed by the State and downloaded from the link posted above in Helpful Links.

You are going to use the OK NG9-1-1 Toolkit to assess the data and prepare it to meet OK-compliant standards.
Before You Begin
Before preparing data for NG9-1-1, it is helpful to do an assessment to understand the level of effort required.

- Assess the data
  - Identify gaps
    » Missing layers
    » Missing fields
  - Be mindful of what applications are consuming the data
    » Legacy fields
- Review the OK Standard
  - Consider if you will adopt the schema or create an ETL process

Is the GDB Standards-compliant?
The geodatabase requires a specific schema with domains and feature datasets. To determine if our source geodatabase is Standards-compliant, let’s run the Check Template within the Validation tools.

- Expand Validation Tools, click Check Template, and input **OK_SourceData_Initia.gdb**.
- Check the boxes for Check Layer List and Check GDB Domains.

Results will be exported into two tables: FieldValuesCheckResults, and TemplateCheckResults. Examine the tables.
SECTION 1

PREPARING LOCAL DATA AND BUILDING A NEW NG9-1-1 COMPLIANT GEODATABASE

OK_SourceData_Initial.gdb // NG911.gdb
CREATE GDB - OK_SOURCEDATA_INITIAL.GDB

Create GDB creates a geodatabase with Standards-compliant feature datasets and domains. Create GDB can also create feature classes and bring existing Standards-compliant data into the geodatabase.

In our scenario, we already have several data layers, two of which are already compliant because they were provided by the State.

- Open the Create GDB Tool
- Choose the TOOL OUTPUTS folder for the new geodatabase
- Name the new geodatabase NG911 (the Standards-compliant spatial reference is already selected)
- Because we already have an ESZ layer, we will create ESBs using Dissolve ESZ later.
- We can also use the Create GDB Tool to import in the parameters boxes for both the PSAP and Discrepancy Agency
- Point to the folder location for PSAP and Discrepancy Agency and select those data sets

• Click OK to run

The new geodatabase NG911.gdb has been created. Examine the contents. NG911.gdb is now Standards-compliant.
FIELD MAPPING

We are going to field map our existing non-compliant data into the Standards-compliant geodatabase *NG911.gdb*. Only the **Centerlines** feature class will be mapped for this portion of the exercise.

The following layers within *NG911.gdb* are already Standards-compliant because they were downloaded from the State:

- DISCREPANCYAGENCY_BOUNDARY
- PSAP_BOUNDARY

Field map Centerlines into *NG911.gdb*:

- Open **Road Field Map**
- For **Road Layer**, choose **Centerlines** from *OK_SourceData_Initial.gdb* and click **Add**
- Choose *NG911.gdb* for the Output Geodatabase

Note that any source field names that are identical to Standards-compliant fields will be automatically populated. If source data fields are not provided in the field mapping, those fields will be created with Null values.
The Standards-compliant ROAD_CENTERLINE feature class is now field mapped into NG911.gdb. Examine the attribute table for ROAD_CENTERLINE.
**DISSOLVE ESZ**

Use Dissolve ESZ* to dissolve the geometry of the polygon feature class based on individual service types. The tool assumes that all service areas are defined in separate fields within the attribute table. The tool will only work if there are individual fields defining service types.

The source data contains an existing ESZ boundary feature class which includes fields delineating the service type for Fire, Law, and EMS. Use the Dissolve ESZ tool to create individual ESBs based on those service types. The outputs are separate Standards-compliant feature classes for Fire, Law, and EMS ESBs.

**Run Dissolve ESZ before field mapping the source ESZs into the Standards-compliant schema.**

Examine the fields within the ESZs. Notice that service types are stored in separate fields.

- In the Toolkit, open **Dissolve ESZ**
- For Combined Input, choose the ESZ feature class from **OK_SourceData_Initial.gdb**
- For the Output Geodatabase, choose **NG911.gdb**
- In the drop down for **EMS Field**, choose **MEDICAL**
- In the drop down for **FIRE Field**, choose **FIRE**
- In the drop down for **LAW Field**, choose **POLICE**

- Click OK to run

The Standards-compliant feature class ESBs for Fire, Law, and EMS are created in **NG911.gdb**.
If the ESZ data does not define service types in separate fields, choose one of the following options:

If one or more ESBs exist:
Use the ESB field mapping tools for each service type. If any ESBs are missing, create the missing feature class during Create GDB or run Add Blank FCs.

If service types are in one field:
If the ESZ service types are defined in one field, the user should do a select by service type and export individual feature classes then perform ESB field mapping.

If the service type is unknown:
If the service type within the ESZ layer is unknown, the GIS staff should work with the PSAP authority for assistance defining the ESZ using the information in the attribute table or by geometry.

If the user has no ESZs:
If no ESZs exist, GIS staff should work with the PSAP to define and create them.
SECTION 2

PRE-VALIDATION DATA PREPARATION, STANDARDIZATION, AND POPULATING MANDATORY VALUES

OK_StandardData_Initial.gdb
POPULATE MANDATORY FIELDS

**OK_StandardsData_Initial.gdb** is Standards-compliant and contains all required feature classes and fields. The next step is to populate data within the Mandatory fields.

The Toolkit has several tools which populate some fields in the data. However, some will need to be populated manually. For this exercise, we are only populating fields within two feature classes.

- Open ArcMap and add **ROAD_CENTERLINES** and **ESB_FIRE_BOUNDARY** from **OK_StandardsData_Initial.gdb** to the map

**Populate ESB_FIRE_BOUNDARY:**

- Start an editing session and open the attribute table for ESB_FIRE_BOUNDARY
- Populate the following fields:
  - Country: “US”
  - State: “OK”
  - Agency_ID: “cog.acog.ok.gov”
  - Agency: “ACOG”
  - DiscrpAgID: “cog.acog.ok.gov”
  - NGUID_FIRE: See Assign Unique NENA ID section

**Populate ROAD_CENTERLINE:**

- In the same editing session, open the attribute table for ROAD_CENTERLINE
- Populate the following fields:
  - Agency_ID: “cog.acog.ok.gov”
  - DiscrpAgID: “cog.acog.ok.gov”
  - NGUID_RDCL: See Assign Unique NENA ID section
  - Legacy fields: See Fix Street Type and Direction section
    - LgcyPreDir
    - Lgcystreet
    - LgcyType
    - LgcySufDir
ASSIGN UNIQUE NENA ID

Every record within every NG9-1-1 data layer requires an NGUID (NENA Globally Unique ID). Use Assign Unique NENA ID within Enhancement Tools to populate this value.

- Open the **Assign Unique NENA ID** tool
- For Layer Name, choose **ROAD_CENTERLINE**
- For Feature Class, navigate to **OK_StandardsData_Initial.gdb** and choose **ROAD_CENTERLINE**
- In NENA Unique ID Field, choose **NGUID_RDCL**
- In Data Agency [Agency_ID], choose **Agency_ID**

![](image)

- Click **OK** to run
- Open the attribute table for **ROAD_CENTERLINE** and verify the **NGUID_RDCL** field is populated with a unique value
- Run the tool for **ESB_FIRE_BOUNDARY**
This tool fixes the Street Type and Direction fields to be correctly formatted to current standards. Additionally, the tool has an option to copy the values to legacy fields before adjusting the data to meet the Standard.

The ROAD_CENTERLINE and ADDRESS_POINT feature classes contain fields to populate legacy data to continue supporting existing applications. In this exercise, the legacy fields have already been populated for ADDRESS_POINT, so we will run the tool on ROAD_CENTERLINE.

- Open and run **Fix Street Type and Direction**
- Choose **ROAD_CENTERLINE** for Feature Class
- For Street Type Field, select **StreetType**
- For PreType Field, select **PreType**
- For Directional Prefix Field, select **PreDir**
- For Directional Suffix Field, select **SufDir**
- Check the boxes to copy the values to the Legacy fields

- Click **OK** to run
- Open the attribute table for **ROAD_CENTERLINE** and verify the Legacy Fields are populated
**FIX DOMAIN CASE**

Fix Domain Case adjusts any data with domain values and changes the case to UPPER. This is a good tool to use for QC and standardizing the data.

- Open **Fix Domain Case** and select *OK_StandardsData_Initial.gdb*

![Image of Fix Domain Case tool]  

- Click **OK** to run
- Open the attribute table for ROAD_CENTERLINE and verify the values in the state and Country fields now have the proper domain values and are UPPER case.
CALCULATE PARITY

Calculates the Parity_L and Parity_R fields within ROAD_CENTERLINE.

Parity represents the even or odd property of the address number range on the Left or Right side of the road segment relative to the FROM Node. Appropriate values can be O=Odd; E=Even; B=Both; Z=Address Range 0-0.

- Open **Calculate Parity** and select **ROAD_CENTERLINE** in **OK_StandardsData_Initial.gdb**

- Click **OK** to run
- Open the attribute table for **ROAD_CENTERLINE** and confirm **Parity_L and Parity_R** fields are populated
FIX MSAGCOMM SPACES

- Open Fix MSAGComm Spaces
- Select OK_StandardsData_Initial.gdb

- Click OK to run
**CALCULATE FULLNAME AND FULLADDR**

Calculate FullName and FullAddr uses the following fields within ROAD_CENTERLINE and ADDRESS_POINT feature classes to calculate the FullName field within ROAD_CENTERLINE and ADDRESS_POINT or FullAddr within ADDRESS_POINT.

For the FullAddr field, the fields used for the calculation are: AddPre, Address, AddSuf, PreDir, PreMod, PreType, PreTypeSep, Street, StreetType, SufDir, SufMod, BldgName, BldgUnit.

For the FullName field, the fields used for the calculation are: PreDir, PreMod, PreType, PreTypeSep, Street, StreetType, SufDir, SufMod.

- Open **Calculate FullName and FullAddr**
- For **Input Feature Class**, click the folder icon and select ROAD_CENTERLINE feature class in OK_StandardsData_Initial.gdb, and then click **Add**

- Click **OK** to run
- The FullName field should now be populated within ROAD_CENTERLINE
ADD/VALIDATE NG911 TOPOLOGY

Creates and adds layers and rules to topology. Topology rules included are listed below. Reference the ReadMe for further information.

**Polygon Layer Rules** - All polygon feature classes must individually conform to the rule:
- Must Not Overlap (Area)

**ESB and PSAP Layer Rules** - The ESB_EMS_BOUNDARY, ESB_FIRE_BOUNDARY, ESB_LAW_BOUNDARY, and PSAP_BOUNDARY must individually conform to the rule:
- Must Not Have Gaps (Area)

**ROAD_CENTERLINE Layer Rules** - The ROAD_CENTERLINE layer must conform to the following rules:
- Must Not Overlap (Line)
- *Must Not Have Dangles (Line)*
- Must Not Self-Overlap (Line)
- Must Not Self-Intersect (Line)
- Must Be Single Part (Line)

Note: the rule(s) in *italics* may be marked as exceptions on a per-feature basis.

- Open **Add/Validate NG911 Topology**
- Select **OK_StandardsData_Initial.gdb**
- Check the box to Validate Topology

![Add/Validate NG911 Topology](image-url)

- Click **OK** to run
- Open ArcMap and add the topology and layers into the map
- Review the Instructor examples of marking topology exceptions in ArcMap
**FIX SUBMIT**

Required field indicating if a feature is a record for submission.

- Open **Fix Submit** and select *OK_StandardsData_Initial.gdb*

  ![Image of Fix Submit window]

- Click **OK** to run
- Open the attribute table for one of the feature classes and verify SUBMIT field is populated
POPULATE GEOMSAG_L AND GEOMSAG_R

These fields are directly correlated to a locality’s MSAG and the Submit field. If a record is marked “Y” for submission, the GeoMSAG_L and GeoMSAG_R fields should also be marked “Y” for submission.

CURRENTLY, MSAG and TN Tools do NOT function as intended.

- Open ArcMap and add ROAD_CENTERLINE from OK_StandardsData_Initial.gdb
- For GeoMSAG_L and GeoMSAG_R, field calculate the value “Y”
SECTION 3

VALIDATION AND GEOMETRY DATA QUALITY ASSESSMENTS

OK_StandardsData_Prepped.gdb
CHECK ROAD ESN VALUES

Check Road ESN Values checks the road centerline ESN values against the ESN values of their spatial location.

Ensures the road centerline $Esn_L$ and $Esn_R$ values match the ESN values of the road’s spatial location. Results will be reported in FieldValuesCheckResults. **This tool only produces Notices, not Errors, and therefore its results will not prevent submission.** ESZ required fields include $NGUID_ESZ$, $ESN$, and $SUBMIT$. Road Centerline require fields include $NGUID_RDCL$, $Esn_L$, $Esn_R$ and $SUBMIT$. There is an option to run an Advanced License Analysis, which is a faster, more through analysis that requires an Advanced License to run.

- Open **Check Road ESN Values** and for NG911 Geodatabase
- Select **OK_StandardsData_Prepped.gdb** and click **Add**

- Click **OK** to run
- Open **FieldValuesCheckResults** to examine the output
**FIX TOPOEXCEPT**

TopoExcept is a Mandatory field for the ROAD_CENTERLINE feature class in the Standard. This tool converts null and blank values to NOT_EXCEPTION.

- Open **Fix TopoExcept** and for NG911 Geodatabase
- For Input Feature Class, select ROAD_CENTERLINE from **OK_StandardsData_Prepped.gdb**
- For Dangles Exception Value, select DANGLE_EXCEPTION
- Check the box to update Null values to “NO_EXCEPTION”

- Click **OK** to run
- Open the attribute table for ROAD_CENTERLINE to verify the TopoExcept field is populated
**FIND ADDRESS RANGE OVERLAPS**

Find Address Range Overlaps identifies road segments where address ranges overlap.

Results are populated in the *FieldValuesCheckResults* table within a feature class called AddressRange_Overlap. This tool only produces Notices, not Errors, and therefore its results will not prevent submission.

- Open **Find Address Range Overlaps** and select **OK_StandardsData_Prepped.gdb**

- Click **OK** to run
GEOCOMPARE

Compares the address points against the road centerline data and calculates RCLMatch and RCLSide fields.

- Open **Geocompare Address Points**
- Select **OK_StandardsData_Prepped.gdb**

- Click **OK** to run (this may take a few minutes)
- A feature class called **AddressPt_GC_Results** is generated
- Open the attribute table for **ADDRESS_POINT** and verify the fields RCLMatch and RCLSide are populated
**POPULATE RCLMATCH: NO_MATCH**

Populates any blank or null RCLMatch features with NO_MATCH.

- Open **Populate RCLMATCH: NO_MATCH**
- Select `OK_StandardsData_Prepped.gdb`

• Click **OK** to run

• Open the attribute table for ADDRESS_POINT and verify blank values are populated with NO_MATCH
**GENERATE FISHBONE ANALYSIS**

Generate Fishbone Analysis is a visual representation of the relationship between address points and road centerlines. Fishbones assist in QA/QC of the data.

- Open **Generate Fishbone Analysis**
- Select **OK_StandardsData_Prepped.gdb**
- Select TOOL OUTPUTS for the Folder for Fishbone Analysis Outputs
- Check the box to Check for Intersecting Fishbones

- Click **OK** to run
- Open the TOOL OUTPUTS folder to see the results from the Fishbone Analysis Tool
• Open ArcMap and add the Output files:
  - **Address_Points_With_LatLon.shp** - output of ADDRESS_POINT which exclude null and zero values in lat/long fields.
  - **Geocode_Results.shp** - endpoint of the fishbone, the attribute table is a combination of ADDRESS_POINT schema and geocode information
  - **Matched_Geocode_Results.shp** - table containing only the matching records
  - **Fishbone_Results.shp** - Fishbone line drawn between ADDRESS_POINT and the matched geocode results point
  - **Fishbone_Intersect** - Marks the location where fishbones intersect
  - **Fishbone_Intersect_Count** - Number of fishbones intersecting at a location
  - **Fishbone_Results_Projected** - Fishbone results projected into SPCS
VALIDATE

The data validation tools perform a variety of basic verification checks against the NG911 Data Model template to determine if the data is ready for submission. Validations may be run against individual feature classes or the entire geodatabase. In this exercise, we will be utilizing the Check all Required function.

- Open **Check all Required**
- Select **OK_StandardsData_Prepped.gdb**

![Check All Required](image)

- Click **OK** to run
- Review the output from the validation check

![Validation Output](image)