Building a GIS from the Beginning: Part 1: Gathering your data

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Before you start

Determine

Type of Database

Feature Datasets

Types of Feature Classes

Projection to be used
Building a GIS Part 1

Topics of discussion

Determine type of database
Parts of a database
Data sources
Creating a database
Adding features to a database
Projections

Represents how features from a round Earth are displayed on a flat map

3611 Projections around the world

Universal Transverse Mercator
State Plane Coordinate System
Web Mercator
See Attachment 1

Map of 5 state projection
Universal Transverse Mercator

Good for long distances
North & South
Zones 01 to 19 for USA
State Plane Coordinate System

Good for Smaller more contained systems

124 or 125 State Projections (NAD83)

East & West

WKID

Unique Identifier

See Attachment 2 WKID Codes
Web Mercator

Good for large areas
Web mapping standard
One projection of the world
Choosing an ArcGIS Database

Three standard types

SDE Database

File Geodatabase

Personal Geodatabase

Each appears very similar in ArcCatalog and have similar functionality
SDE Database

Large Enterprise system

Hardware requirements

Multiple editors

Allows links to many other systems
File Geodatabase

Small to massive Datasets

Up to 1 Terabyte

Single Editor

Read only features
Personal Geodatabase

Small to large datasets
Up to 1 Gigabyte
Single Editor
Parts of a database: Database

Database

Structured set of data

Features
Relationships
Tables
Grids
Photos
Tins
Etc.
Parts of a database: Feature Dataset

Feature Dataset

Groups related Feature Classes

- Electric
- Land base
- etc...

Contains Projection information
Parts of a database: Feature Class

Groups similar types of features

Stores tabular and spatial information

Points
  Transformers
  Switches

Lines
  OH Primary
  UG Primary

Polygons
  Parcels
  Lakes
Parts of a database: Feature Class

Field

Column in the table of a table or feature
Allows separation of individual Attributes
Domains are assigned to Fields

(Domains define what can be entered as an attribute)

Attribute

A specific value entered in a field that helps define a feature
Parts of a database: Feature Class

Subtype
Classifies specific features in a feature class
Assigned in ArcCatalog
Example:
  Transformers
  Overhead
  Underground
  Step
Parts of a database: Tables

Tables contain tabular data

Can be linked to features

Requires a unique ID in both feature and table

One entry can be linked to multiple features

Join

Relate

Relationship Class
Join performed in ArcMap in an MXD
Attribute must exist in both table and feature
Can update fields in a feature from join
Allows Search by Attribute of JOINED table
Allows Symbology based on attributes in JOINED table
Can JOIN to many tables or features
Relate

Relate performed in ArcMap in an MXD
Allow you to see structured data using identify tool
Can RELATE many tables and features
Cannot update feature attributes on a relate
Domains are coded values in a database
Can be assigned to a Field in a Feature Class or Table
Controls what can be entered in as in an attribute in a field.
Example: Phase only allows A, B, C, AB, AC, BC or ABC
Parts of a database: Geometric Network

Created in ArcCatalog

Connects point and line features from a source to the end

Think of it as a DOT to DOT puzzle
Parts of a database: Geometric Network
Parts of a database: Geometric Network
Parts of a database: Geometric Network
Parts of a database: Geometric Network
Parts of a database: Geometric Network
Data Sources

Shapefile

Note: Shapefiles are cross platform and version compatible. However they have naming restrictions for fields limited to 10 Characters

AutoCad

Geodatabases

Tables

Excel

CSV or TAB delimited

MS Access

Online Sources
Data Sources: Online provided by ESRI
Online Data provided by ESRI and other GIS users
Online Data from GIS Servers

- GIS Servers
  - Add ArcGIS Server
  - Add ArcIMS Server
  - Add WCS Server
  - Add WMS Server
  - Add WMTS Server
  - arcgis on atlas.resources.ca
  - arcgis on tasks.arcgisonline
  - IEM MRMS WMS Service on mesonet.agron.iastate.edu
    - IEM MRMS WMS Service
      - NMQ Q3 1 Hour Precipitation
      - NMQ Q3 24 Hour Precipitation
    - LMIC WMS server
    - LMIC WMS server (aerial photography) on geoint.lmic.state.mn.us
    - TIGER Pysical Features
    - WMS on tigerweb.geo.census.gov
    - WMS
    - Census Current (2014) WMS
  - My Hosted Services
Other data types supported

- DBMS
- Spreadsheets
- CAD
- Smallworld
- Images
- PDF
Demo

Create a database
Create and add features

Best Practices

Use names that make sense
Avoid spaces or special characters
Other than underscore “_”

Avoid really long names
Demo: Creating a Database

In ArcCatalog

Create the database

Create Feature Dataset(s)

Create or add Feature(s)
Demo: Adding Features to a Geodatabase

**Shapefile:** Road centerlines provided by the state. [http://www.mngeo.state.mn.us/](http://www.mngeo.state.mn.us/)

**AutoCAD:** Parcel data provided by the county

**Geodatabase:** Electric Dataset provided courtesy of BENCO Electric Cooperative

**Geometric Network:** From Electric Dataset

**Table:** Comma Delimited table from contractor of Pole locations. See attachment 3

**User:** Manual roads created by the user
In case of DEMO failure 😞

The following slides are the demo portion.

These slides were created in case there are issues performing a live demo or for the user to download the presentation from MWEUUG for future reference.
Create the database: ArcCatalog

In ArcCatalog

Navigate to the folder you wish to create your database

Either create a new folder or right-click on the folder you wish to create your database

Select New > Personal or File Geodatabase
Create the database: ArcCatalog
Name the Database: ArcCatalog

• Type in a name

You have created a database.
Create a Feature Dataset: ArcCatalog

Right click on your database and select New>Feature Dataset

Give it a name

Click Next
Feature Dataset: Select Projection

VERY IMPORTANT STEP

This needs to be correct. If your projection is the wrong one any data you add in the future may not line up where it is supposed to.
Feature Dataset: Select Projection

VERY IMPORTANT STEP

Previous projects you have used may appear in the Favorites.
You can select a favorite
You can navigate to a favorite
You can search by WKID code
Feature Dataset: Select Projection

- Select Favorite
- Select Next
Feature Dataset: Select Projection

Search by WKID code

<table>
<thead>
<tr>
<th>WKID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>102691</td>
<td>NAD_1983_StatePlane_Minnesota_North_FIPS_2201_Feet</td>
</tr>
<tr>
<td>102693</td>
<td>NAD_1983_StatePlane_Minnesota_South_FIPS_2203_Feet</td>
</tr>
<tr>
<td>2254</td>
<td>NAD_1983_StatePlane_Mississippi_East_FIPS_2301_Feet</td>
</tr>
<tr>
<td>2255</td>
<td>NAD_1983_StatePlane_Mississippi_West_FIPS_2302_Feet</td>
</tr>
</tbody>
</table>

Select the projection and select next
Feature Dataset: Select Projection

Ignore Vertical Coordinate system unless you are intending to go forward with 3D

Accept the default XY Tolerance

You have created a Feature Dataset
Create a Feature Dataset with parameters from another

Create a Land base Feature Dataset

When it asks for Projection select the Import option
Create a Feature Dataset with parameters from another

Create a Land base Feature Dataset

When it asks for Projection select the Import option

Navigate to the first Feature Dataset and select Add

The projection from the selected Feature dataset will automatically be applied to the new
Add Shapefile: Road Centerlines

Method 1

Right click on your Land base Feature Dataset and select Import Feature Class (single)
Add Shapefile: Road Centerlines

Method 1

For input features navigate to your shape file and select Add

In Output Feature Class give them a name roads

Click OK
Method 2

Add your roads to ArcGIS

Right Click  Data>Export Data
Add Shapefile: Road Centerlines

Method 2

Navigate to your Feature Dataset and change the Save as type to File and Personal Geodatabase feature class

Change the Name

Click Save
Add AutoCAD: Parcel Data

Method 1 with AutoCAD
This method will preserve data if is available
Open the drawing in AutoCAD
Type
  mapexport
The Export Location Dialog window will appear
Method 1 with AutoCAD

This method will preserve data if is available

Open the drawing in AutoCAD

Type

mapexport
Add AutoCAD: Parcel Data

Method 1 with AutoCAD

Navigate to where you want to store the resultant Shapefile and name it.
Add AutoCAD: Parcel Data

Method 1 with AutoCAD

Export Window

Select Polygons for Object Type

For layers select the AutoCAD layer in which your parcels are

Click the Data tab
Add AutoCAD: Parcel Data

Method 1 with AutoCAD
Choose Select Attributes
Expand Object Data and choose the Fields you want to include.
Click OK
Click the Options tab
Add AutoCAD: Parcel Data

Method 1 with AutoCAD
Check the box to treat closed Polyline’s as Polygons
Click OK
AutoCAD will export your parcels
Add the shapefile to your database as before
Add AutoCAD: Parcel Data

Method 2 with ArcGIS

You can open your DWG in ArcGIS

Open another feature to ensure your parcels are properly located

If they are you can export the parcels to your database just as you did your road centerlines

You will need to select just the parcels however

A AutoCAD drawing will have a number of features in as polygons
Add Geodatabase: Electric data from consultant

• Method 1 (preferred)
• Navigate to your database in ArcCatalog
• Right Click on the Feature Dataset you want to put your data in
• Choose Import> Feature Class (multiple)
Add Geodatabase: Electric data from consultant

- Method 1 (preferred)
- At Input Features you navigate to your new data
- Select your features
- Click Add
Add Geodatabase: Electric data from consultant

- Method 1 (preferred)
- They should appear one per line as below
- Confirm the output Geodatabase
- Click OK
Add Geodatabase: Electric data from consultant

- Method 1 (preferred)
- A little window should appear with scrolling text to indicate it is working
- For very small amounts of data this will happen very fast
- You can open your database to confirm the features have arrived
Add Geodatabase: Electric data from consultant

• Method 1 (preferred)
• This method is preferred because
• It creates/transfers new domains to the new database
• It maintains subtypes
• It automatically projects your data as it is being imported
Add Geodatabase: Electric data from consultant

- Method 2 (basic use only)
- Open your feature in ArcMAP
- Right click on it and select Data>Export Data
- Navigate to your database
- Name the feature and select OK
- This method will NOT transfer/preserve Subtypes or Domains
- Best used for new basic features that do have domains or subtypes
Add Geodatabase: Electric data from consultant

- Method 3 (NOT RECOMMENDED)
- Simply go to your database source and copy the features
- Paste them into your Feature Dataset
- Not recommended because it will create new Domains with a 1 after them (example Phase1)
- WILL NOT work if the projections are different
- However, if you are populating a new blank database this method if very good
Add Table: Transformer data from billing

- Method 1 in ArcCatalog
- Right click on your database and select Import>Table (Single)
- Select your Table
- Give it a name and hit OK
Build Geometric Network

- Right click on Feature Dataset and select New>Geometric Network
Build Geometric Network

- Enter the name for network or use default
- Click Next
- Select features to be included and click Next
Build Geometric Network

• Select Yes to Enable network Features
Build Geometric Network

• Select Yes to Enable network Features
Build Geometric Network

- Select Substations as the Source Yes
- Select next twice and your network is built
Add Table: Transformer data from billing

• Method 1
• Automatically assigns a unique ObjectID
• Can now be edited in ArcMAP
• Can be used in Relationships
• Fields can be assigned Domains
• Can be SubTyped
• Can be imported from
  – ArcGIS Database
  – MS Excel or Access
  – Tab or Comma delimited text files
Add Table: Transformer data from billing

- Method 2 in ArcMap
- Add your table to ArcMap
- Right click on it and export it to your database
Create Feature: Poles from Contractor

Method 1 (preferred)

The table with your Pole locations can be any Table format

It may look something like this when opened in Excel
Create Feature: Poles from Contractor

Method 1 (preferred)

In ArcCatalog navigate to the location of the table

Right click on the Table and select

Create Feature Class > From XY Table
Create Feature: Poles from Contractor

Method 1 (preferred)
Choose the proper X and Y fields
Specify output shapefile or feature class. You can select to put it in your database
Press the Coordinate System of Input Coordinates button
Create Feature: Poles from Contractor

Method 1 (preferred)
If the XY are in the same format as the example select GCS_WGS_1984
Or WKID 4326
Hit OK
Create Feature: Poles from Contractor

Method 1 (preferred)

The new Pole Feature Class was created (not in a Feature Dataset) as a point feature called XYPoleTable.

Now import it into the Feature Dataset where you want it. You will have to use a different name then the point feature it created.

After verifying new feature is correct you can delete the XYPoleTable.
Create Feature: Poles from Contractor

Method 1 (preferred)

Benefits of this method is that you can now use the original pole table as a data table for the poles

Field names are preserved
Create Feature: Manually

Created Feature Class

In ArcCatalog

Right click on the Feature Dataset you want to create your new empty feature and select New> Feature Class
Create Feature: Manually
Created Feature Class

Enter the name for your new Feature Class
Alias will be automatically populated with Name
Select the type of feature
  Point
  Line
  Polygon

Click next
Create Feature: Manually Created Feature Class

In the New Feature Class window will be OBJECTID and Shape. These are default Fields and cannot be changed.

You can enter any Field names that you want and determine a data type OR Click the Import Button
Create Feature: Manually
Created Feature Class

By using Import you can create a new Feature Class based on an existing Feature Class complete with SubTypes and Domains

Navigate to the Feature Class you want to emulate and click the Add button
Create Feature: Manually

Created Feature Class

When you click the finish button your new feature class will be ready
Create Feature: Manually
Created Feature Class