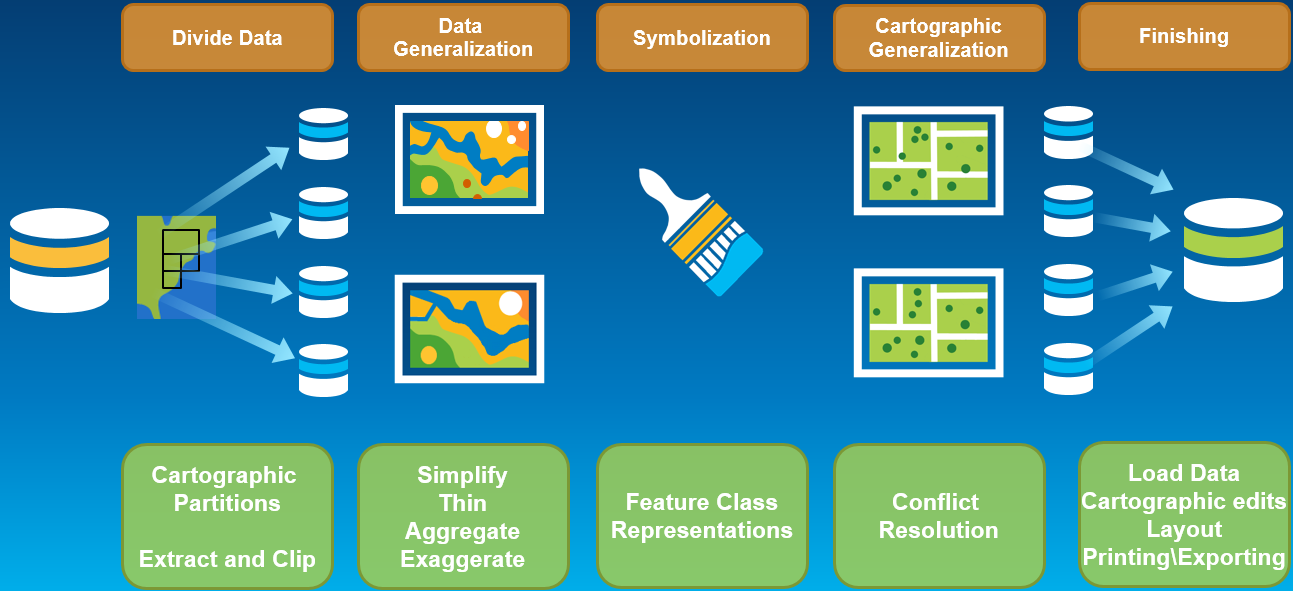
## Generalization Approach

The first step in producing a map at a specific scale is to produce data at that scale. Traditionally, mapping agencies engage in data collection activities at that scale to produce the data. However, this can be a time consuming and expensive process. Cartographic generalization focuses on taking large scale data and simplifying it though automated methods so that it is appropriate for smaller scales.



The next step in producing a map at a specific scale is to symbolize the data with symbology appropriate for that scale and output product. After the data is symbolized, cartographic generalization and conflict resolution occurs. This ensures that there is clarity and separation between the symbols on the output map product. Because feature class representations are typically used for symbology, cartographic generalization is specific to that symbology and map product.

Out-of-the-box, Esri provides geoprocessing tools, python scripts and python site packages with the building blocks an organization needs to automate generalization of their data. Esri provides these components rather than a completed set of tools because the schema of the large scale data, the desired output scales and the expected results are unique. With these components, anyone can combine the generalization tools using Model Builder and\or Python until the desired output is achieved.

## Civilian Topographic Map (CTM) Generalization

Many generalization tools are provided out-of-the-box so it can be confusing and difficult to get started with generalization. The CTM generalization samples illustrate how to generalize data in the CTM schema. While these models are designed specifically for the CTM schema they can be adapted to other data schemas.

The CTM generalization models work on 5 themes of data: transportation, buildings, hydrography, land cover and elevation. The table below describes the rules applied to the specific feature classes in each of these themes.

|  |  |  |
| --- | --- | --- |
| Layer | Generalization Rules | 50K parameters  (in meters) |
| HypsographyCrv |  |  |
|  | Contour interval | 100 |
|  | Index contour interval | 500 |
|  | Minimum space between vertices | 5 |
| TransportationGroundCrv | **(Ramp, Roads, cart track, trails, railway)** |  |
|  | Minimum length of road lines | 300 |
|  | Minimum space between vertices | 7.5 |
|  | Space between roads | ~ 300 |
|  | Merge parallel roads | 30 |
|  | Collapse traffic circles | 100 |
| SettlementSrf | **(Built-up areas)** |  |
|  | Minimum space between vertices | 25 |
|  | Minimum area | 15625 |
| StructureSrf |  |  |
|  | Minimum len\width (small features will become points) | 25 |
|  | Minimum space between vertices | 10 |
|  | Space between features | 20 |
| StructurePnt |  |  |
|  | Space between features | 20 |
| StorageSrf |  |  |
|  | Minimum area (small features will become points) | 625 |
|  | Space between features | 20 |
| StoragePnt |  |  |
|  | Space between features | 20 |
| HydrographySrf | **(All)** |  |
|  | Minimum space between vertices | 5 |
| HydrographySrf | **(Springs, Lakes)** |  |
|  | Minimum distance between features | 30 |
|  | Minimum area | 2500 |
| HydrographySrf | **(Reef, Land subject to inundation)** |  |
|  | Minimum area | 2500 |
| HydrographyCrv |  |  |
|  | Minimum length of river lines | 300 |
|  | Minimum space between vertices | 5 |
| HydrographyPnt | (**Spring, well, cistern)** |  |
|  | Space between features | 20 |
| AgricultureSrf |  |  |
|  | Minimum area (convert to point) | 2500 |
| AgriculturePnt |  |  |
|  | Space between features | 20 |
| CultureSrf |  |  |
|  | Minimum area (convert to point) | 2500 |
| CulturePnt |  |  |
|  | Space between features | 20 |
| RecreationSrf |  |  |
|  | Minimum area (convert to point) | 2500 |
| RecreationPnt |  |  |
|  | Space between features | 20 |
| VegetationSrf |  |  |
|  | Minimum area | 2500 |
|  | Minimum space between vertices | 5 |
| PhysiographyPnt |  |  |
|  | Space between features | 20 |
| AeronauticPnt |  |  |
|  | Space between features | 20 |
| IndustryPnt |  |  |
|  | Space between features | 20 |

## Using the CTM 50K Generalization Models

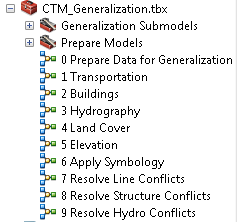
The CTM\_50K\_Generalization.tbx contains the models used to generalize Civilian Topographic Map data so it is appropriate for the CTM 50K products. Any data at a larger input scale can be used in these models. The CTM samples include data collected at 25K over Salt Lake City. This data can be used when testing these models.

1. Make sure you have unzipped the CTM\_ProductLibrary.gdb.zip
2. Make sure you have unzipped the SaltLakeCity.gdb.
3. Make a copy of the SaltLakeCity.gdb and name it SaltLakeCity\_50K.gdb.

*The generalization models are designed to alter the input data. For this reason it is important to make a copy of the input database so you can retain a copy of the large scale data as well as having a database appropriate for the 50K output scale.*

*If using data other than the sample Salt Lake City data that covers a larger geographical extent, you may need to partition the data into smaller sections which allows for data to be processed on multiple machines and to ensure that the generalization can be completed within the hardware constraints of your machine.*

1. Create a new database that will store temporary output from generalization. Name the database something like Scratch.gdb. If you do not wish to create a scratch database, you can use the Default.gdb. You need to use the same scratch workspace for all models as some of the temporary data is used for multiple models.
2. Open the CTM\_50K\_Generalization.tbx



*Inside the toolbox you will see toolsets and a series of numbered models. You will run the numbered models. The models included in the toolsets do not need to be run as they will be called from other models.*

1. Execute the models in order starting from 0.
   1. The Prepare Data for Generalization model must be run first. This model ensures that fields and feature classes used by the other models are added to the database. This model also performs some basic data cleanup to fix errors that could cause failures with tools used in other models.
   2. All the models have two common fields. Use the following values.
      1. Input workspace: SaltLakeCity\_50K.gdb you copied in step 3.
      2. Scratch workspace: scratch.gdb you created in step 4.
   3. Each model has other parameters like minimum area or generalization tolerance that are used by the generalization tools in the model to determine how much generalization to perform on the features. The values entered into these parameters by default are described in the table above. The values are starting points that are work well for 50K generalization of the Salt Lake City CTM data. These values can be increased for more dramatic generalization or decreased to retain more features or feature details.
   4. If desired you can make a copy of the data after running each model to review the changes
2. After running all of the generalization models, add the data from SaltLakeCity\_50K.gdb to ArcMap.
   1. If you ran the Apply Symbology model, all of the features should be symbolized using representations appropriate for the output 50K map.
   2. Some of the generalization tools use the IS\_VISIBLE field on the feature classes to determine whether or not individual features should be visible in the output map. Add a definition query to all layers with the SQL statement “IS\_VISIBLE = 0 or IS\_VISIBLE IS NULL”.