Using Cartographic Representations in ArcGIS 9.2

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Instructor
Using cartographic representations - Overview

1. Introducing cartographic representations
   - Why do I need them?
   - How are they stored and maintained?

2. Working with representations
   - How do I symbolize my data with them?

3. Editing representations
   - How do I modify individual symbols?

4. Using geoprocessing with representations
   - Managing representations
   - Refining symbology
1. Introducing cartographic representations
What is representation in ArcGIS 9.2?

- An intelligent way to symbolize features
- A solution to some common cartographic challenges that required workarounds in the past
- A storage model that stores symbol information in the geodatabase for re-use and sharing
What are representations?

- **Representations are:**
  - properties of a feature class
  - stored in the geodatabase
  - managed through a layer
  - sometimes called *feature class representations*

- **Representations are NOT:**
  - a new data type
  - a new layer type

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Why should I use representations?

- To produce a better map
- To meet exacting cartographic specifications
- To generate multiple cartographic products from a single set of master feature classes
- To make a clear, unambiguous, and elegant map
- To reduce the time spent on manual adjustment
- To avoid ‘bailing out’ of GIS in favor of a graphics package to refine cartographic display
How are representations stored?

Inside the geodatabase

<table>
<thead>
<tr>
<th>Shape</th>
<th>Field1</th>
<th>Field2</th>
<th>Field3</th>
<th>RuleID1</th>
<th>Override1</th>
<th>RuleID2</th>
<th>Override2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Rules

Explicit Fields

Overrides for exceptions

Representation 1

Representation 2
How are rules stored?

- In the feature class extensions table

Feature table

<table>
<thead>
<tr>
<th>Shape</th>
<th>Field1</th>
<th>Field2</th>
<th>Field3</th>
<th>RuleID</th>
<th>Override</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Feature Class Extensions table

<table>
<thead>
<tr>
<th>Class</th>
<th>Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
When would I not use representations?

- When standard symbology is sufficient
- When data and map are still in progress
- When I only have an ArcView license
- When I want to web publish it using ArcIMS (AXL)
## Representation licensing: Desktop

<table>
<thead>
<tr>
<th>Capability</th>
<th>ArcGIS Desktop</th>
<th>Extensions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ArcInfo</td>
<td>ArcEditor</td>
</tr>
<tr>
<td>View / Print Representations</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Define Representation Rules</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Edit Representations (Overrides)</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Create/Delete FC Representations</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Representation GP Tools</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
## Representation licensing: Server/Engine/Mobile

<table>
<thead>
<tr>
<th>Capability</th>
<th>Server</th>
<th>Embedded</th>
<th>Mobile</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>ArcIMS</td>
<td>ArcIMS ArcMap Server ArcGIS Server</td>
<td>ArcGIS Engine Runtime Engine RT + GDB Update Extension</td>
</tr>
<tr>
<td>View / Print Representations</td>
<td>No</td>
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<td>Yes</td>
</tr>
<tr>
<td>Define Representation Rules</td>
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<td>No</td>
</tr>
</tbody>
</table>
2. Working with representations
What can representations do?

- Representations are an advanced way to symbolize features cartographically according to rules.

Data courtesy of Gobierno de la Rioja
What can representations do?

- Representations can draw features *differently* from their spatial geometry

Rivers are drawn smooth although geometry is jagged
What can representations do?

- Representations can be **data-driven** to tailor symbols to features

Streets are drawn with a single symbol

<table>
<thead>
<tr>
<th>ID</th>
<th>Type</th>
<th>Casing</th>
<th>Fill</th>
<th>RuleID</th>
<th>Override</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Street</td>
<td>1</td>
<td>0</td>
<td>StreetSym</td>
<td>&lt;null&gt;</td>
</tr>
<tr>
<td>2</td>
<td>Major Road</td>
<td>3</td>
<td>2</td>
<td>StreetSym</td>
<td>&lt;null&gt;</td>
</tr>
<tr>
<td>3</td>
<td>Minor Road</td>
<td>2</td>
<td>1</td>
<td>StreetSym</td>
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</tr>
<tr>
<td>4</td>
<td>Minor Road</td>
<td>2</td>
<td>1</td>
<td>StreetSym</td>
<td>&lt;null&gt;</td>
</tr>
<tr>
<td>5</td>
<td>Street</td>
<td>1</td>
<td>0</td>
<td>StreetSym</td>
<td>&lt;null&gt;</td>
</tr>
</tbody>
</table>

The size of the casing and fill is driven by attributes
What can representations do?

- Feature classes can support **multiple representations** to display features differently on different maps without creating additional files.

*The same data represented two ways*

*Both versions are stored in the data, not in map documents or layers*
What can representations do?

- Representations can be customized for individual features by **overriding properties** of the representation rule to improve display.

  - Symbols are offset from their **spatial location** to avoid conflicts.
  - The rule for one park is **changed to not draw trees near the park edges**.
What can representations do?

- Making maps with representations can be **automated** using geoprocessing

Buildings oriented to the nearest linear symbol

Bridges created at intersections and rivers automatically masked
Representation rules

- A representation is a collection of representation rules
  - Convert existing symbology to rules
  - Build new representation rules

- Rules create and symbolize dynamic geometry independent of spatial geometry

- Rules can be managed in ArcCatalog or ArcMap

- Representation rules can be shared using styles
Representation rule properties

- Symbol layers
  - Marker
  - Stroke
  - Fill

- Geometric effects
  - Dynamically alter display geometry

- Marker placement styles
  - Place representation markers relative to input geometry
Rule properties can be mapped to fields
Geometric effects

- Can dynamically change the feature geometry before the symbols are applied
- Process the geometry of all symbol layers, or just one
- Can convert from one geometry type to another
- Can work sequentially; the result of one effect becomes the input to the next in a chain
- Can be extensible: write your own
Sample geometric effects

Simplify effect on groves

Before

After

Bear Control Area

No effects

Simplify and Dashes effects

Donut effect on states
Marker Placement styles

- **Position markers**
  - Along lines and polygon outlines
  - Within polygons
  - In relation to points
- **Can be extensible: write your own**

Markers spaced evenly inside polygon feature

Markers spaced evenly along line

Markers offset from feature coordinates
Representation markers

- Representation markers symbolize:
  - point representation geometry
  - significant locations in line or polygon representations as defined by representation control points or marker placement styles

- Representation markers can be created and modified using the Marker Editor

- Representation markers can be stored in a style, then managed using the Style Manager
The Marker Editor

- Interact with all elements of a representation marker
Demonstration: Working with representations
3. Editing representations
What is a representation override?

- Overrides are exceptions to the rules
- Overrides are made while editing
- Property overrides
  - Symbol layer properties
  - Geometric effect properties
  - Marker placement style properties
- Geometry overrides
  - Change the shape or position of the feature representation independently of the feature's geometry
How do you edit representations?

- The representation rule properties of individual features can be modified in an edit session
  - update rule properties by typing new values
  - or, interactively with the representation editing tools
- each modification becomes an override to the representation rule
  - shown with a paintbrush icon
Overriding representation geometry

- Geometry can be edited using the tools on the Representation toolbar
- Stores an override copy of geometry in the Override field,
- ... or (unusual) modifies feature geometry in Shape field
  - Only makes sense for specific data model and workflow
  - This setting is a property of the representation; it is set when the feature class representation is created
Overriding representation geometry

- Edit representation geometry without affecting feature geometry
More symbol control: free representations

- If the data model doesn't accommodate the graphical need for a unique feature, use a free representation to symbolize

- A free representation is a full override
  - It has an independent rule that can be restructured
  - The rule itself can be changed, not just the properties
  - The dynamic graphics created by the rule can be captured, stored, and modified
  - New geometry elements can be added to the feature; they will be recognized only by the free representation
Free representations

- If the data model doesn't accommodate the graphical need for a unique feature, use a free representation to symbolize.

- Unique representation for a feature
  - For complete control over feature display
  - Disengages feature from rule
  - Independent copy of the rule in the Override field
  - Structure of the rule can change
  - Try more complex rules and overrides first
Free representations

Automated rule

Override Grid Angle and Offset properties

Edited free representation
3. Editing representations

When to edit representations?

- Only edit/override once rules are right
  - Decide which layers in the map could be improved with more control over the symbols
  - Convert the existing symbology of those layers to feature class representations
  - Adjust the representation rules to refine the depiction
  - Map properties to fields to customize

- Now do edits
  - Override as necessary
  - Create free representations as a last resort
Demonstration: Editing representations
4. Processing representations
Geoprocessing tools for representations

In ArcGIS 9.2, ArcToolbox has three new toolsets in the Cartography toolbox:
- Graphic Quality
- Representation Management
- Symbolization Refinement
Graphic Quality toolset

- Detect Graphic Conflict tool
  - Finds areas where representation symbology overlaps, even if data does not
Representation Management toolset

- **Select Feature by Override tool**
  - Select features that have property overrides, shape overrides, or both

- **Update Override tool**
  - Moves overrides from the Override field into the explicit fields as defined by the representation rule

- **Plus lots more:**
  - Create Representation
  - Drop Representation
  - Remove Override
  - ...
Symbolization Refinement toolset

- **Calculate Polygon Main Angle tool**
  - Finds dominant direction of a polygon

- **Create Overpass tool**
  - Creates overpass masks and builds parapets

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ModelBuilder

- Good for automation
Demonstration: 
Processing representations
ESRI Cartography Resources: Educational Services

- Training: [http://training.esri.com](http://training.esri.com)
  - Two day course: Managing Cartographic Data in the Geodatabase
  - Free podcasts:
    - Best Practices: Working with Cartographic Representations
    - Planning Your Geodatabase for Cartography with ArcGIS 9.2
    - Using Geoprocessing Tools for Cartographic Representations
ESRI Cartography Resources: On the Internet

Thank you

Questions and comments?