Integration of Generalization and Text Placement in ArcGIS

ICA MPMG Seminar, Sept. 2000

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Topics

- **GIS-based cartography with ArcGIS**

  Multi-purpose, multi-scale mapping from master databases
  ArcGIS - the new generation of ESRI GIS software

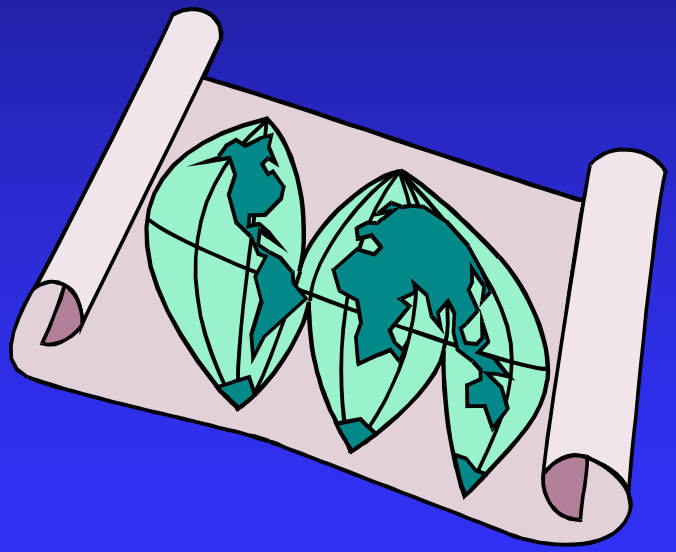
- **Map generalization**

  In Workstation ArcInfo, ArcToolbox, and ArcGIS

- **Text placement**

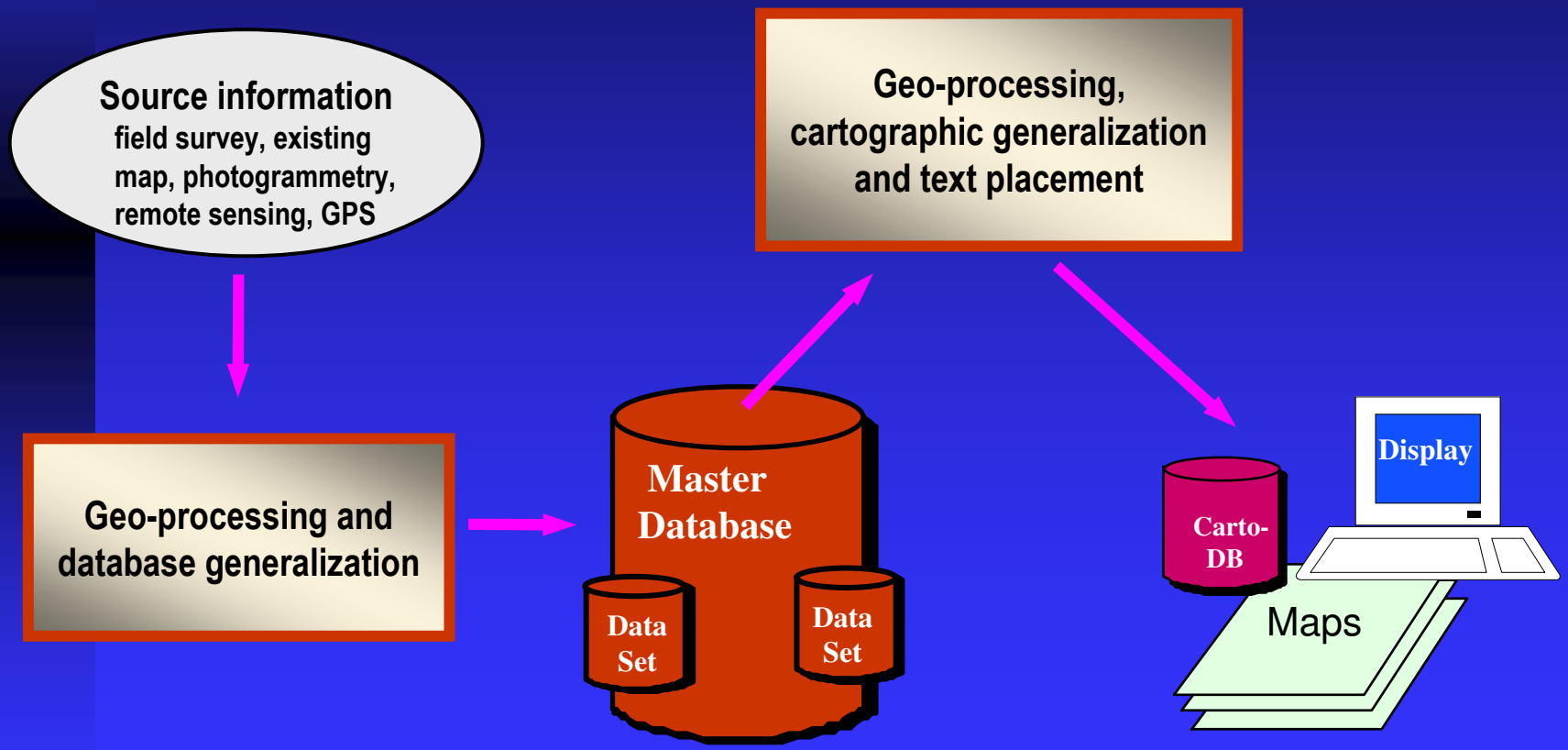
  Dynamic labeling, feature linked annotation, and Maplex

GIS-based Cartography with ArcGIS



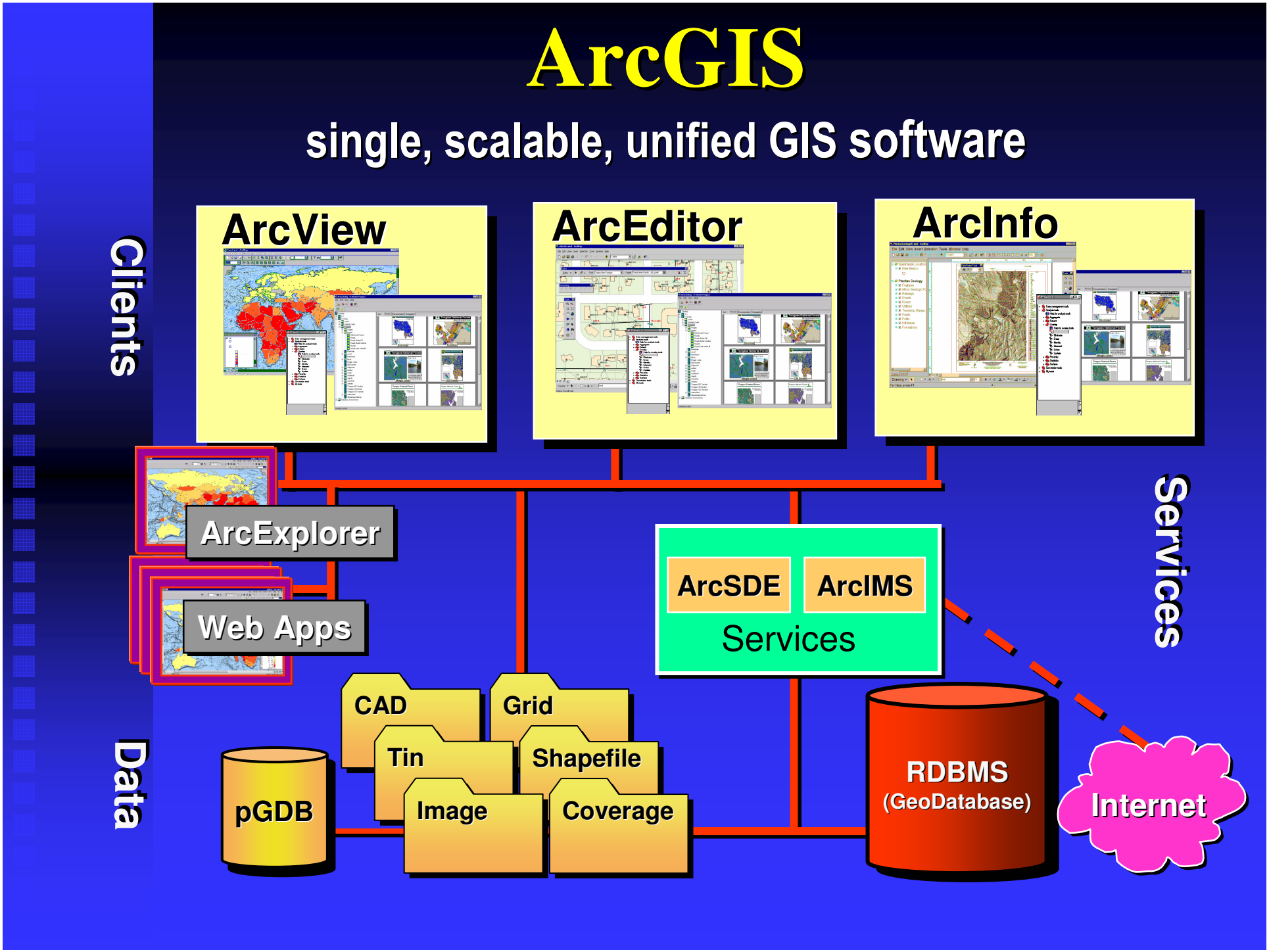
GIS-based cartography

Today's cartographers compile databases and maps



ArcGIS

single, scalable, unified GIS software



ArcView 8.1

**Desktop mapping GIS software,
a powerful tool for the management, display,
query, and analysis of spatial information**

ArcEditor 8.1

Define and edit custom features and object classes

ArcMap
ArcCatalog
ArcToolbox

And:

- Coverage Editing
- Enterprise Geodatabase Editing
- Utility Network Solvers
- Dimensions
- Feature Linked Annotation

ArcInfo 8.1

the full-featured GIS with tools for automation, modification, management, analysis, and display of geographic information

ArcMap
ArcCatalog
ArcToolbox

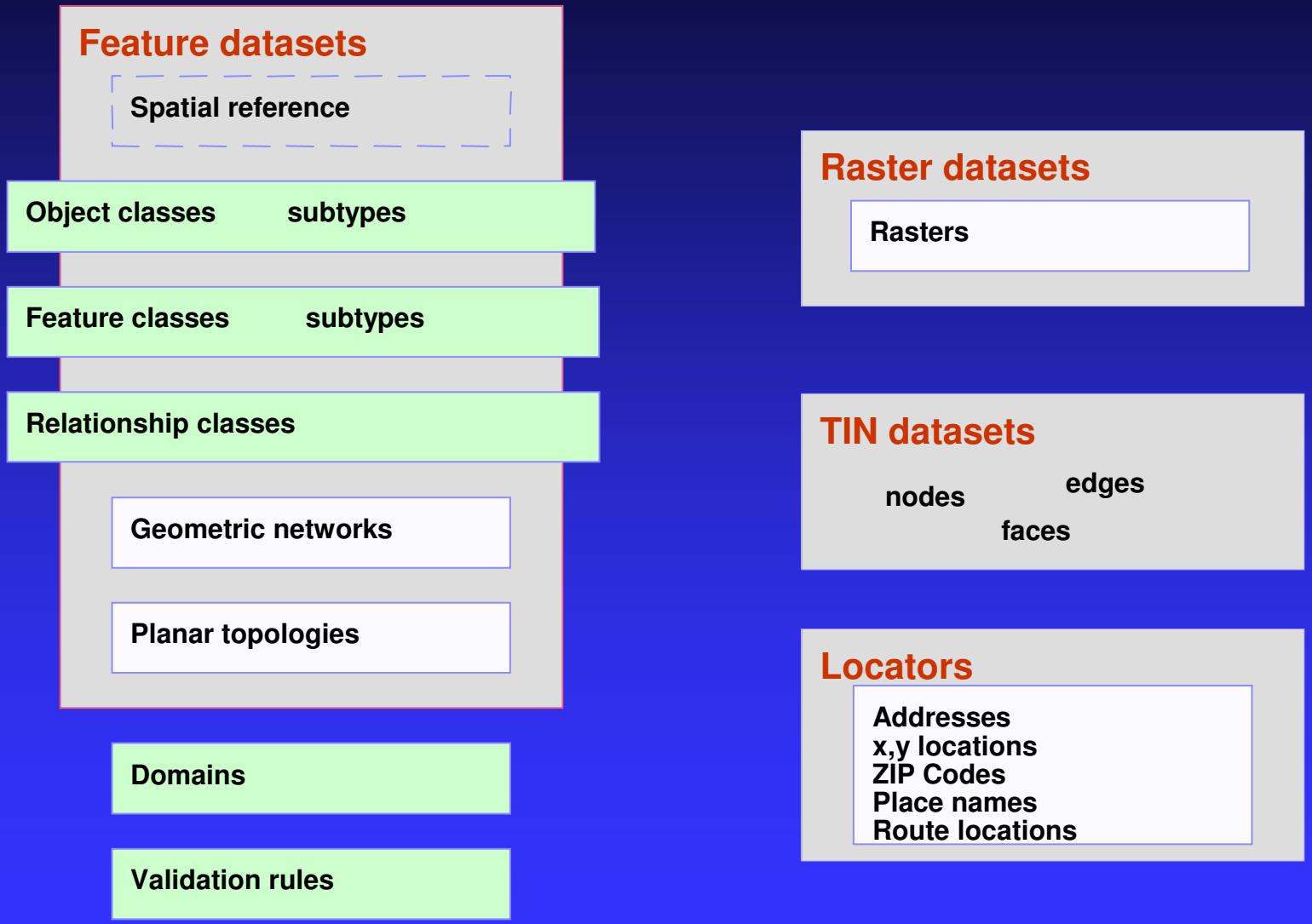
And:

- Coverage Editing
- Enterprise Geodatabase Editing
- Utility Network Solvers
- Dimensions
- Feature Linked Annotation

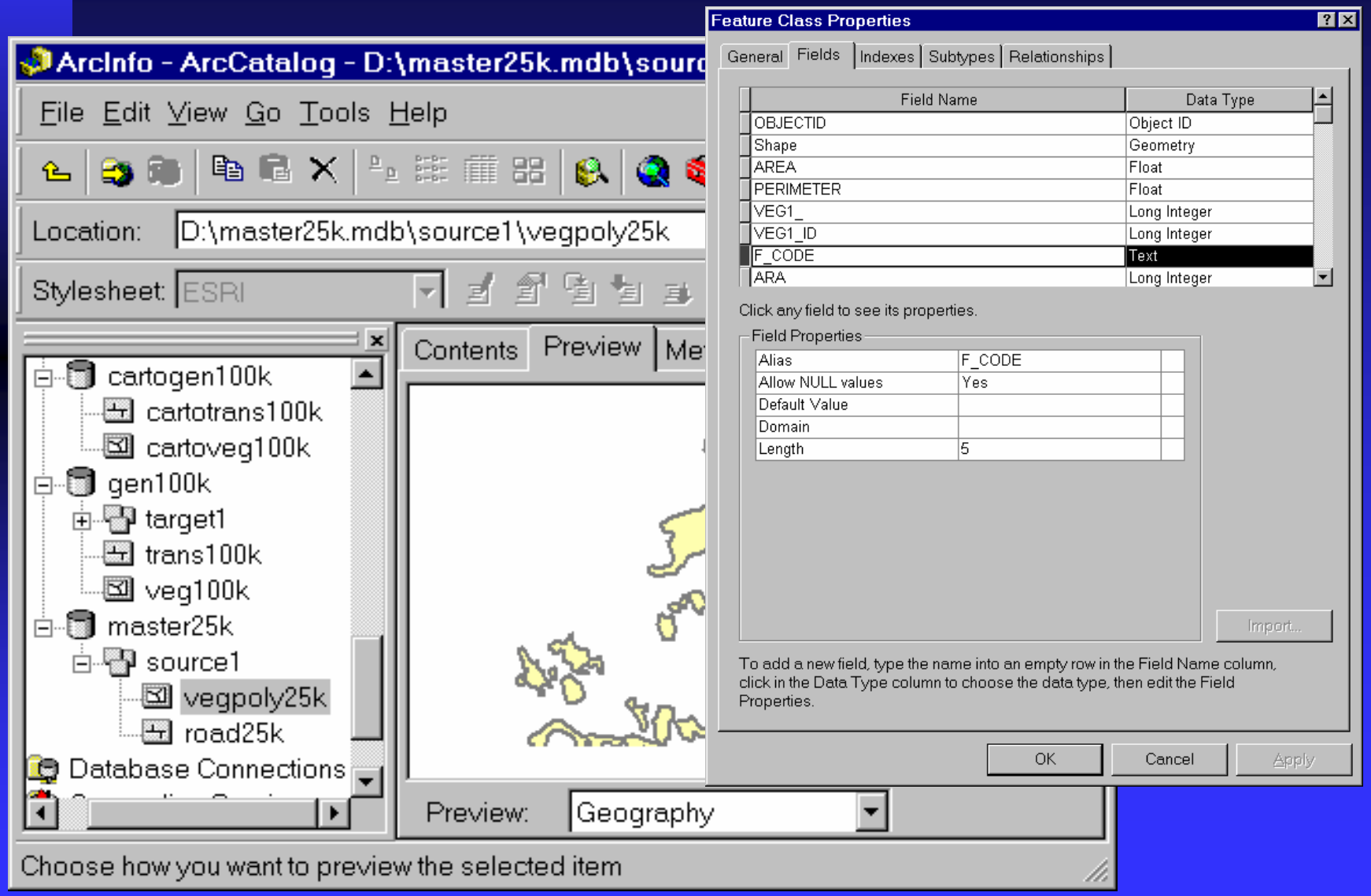
And:

- Advanced Geoprocessing
- Advanced ArcToobox
- Advanced Editing
- Workstation ArcInfo

Geodatabase concept



Creating a geodatabase



Map Generalization

Support multiple-purpose, multiple-scale data transformation and map production

Recent releases in Workstation ArcInfo

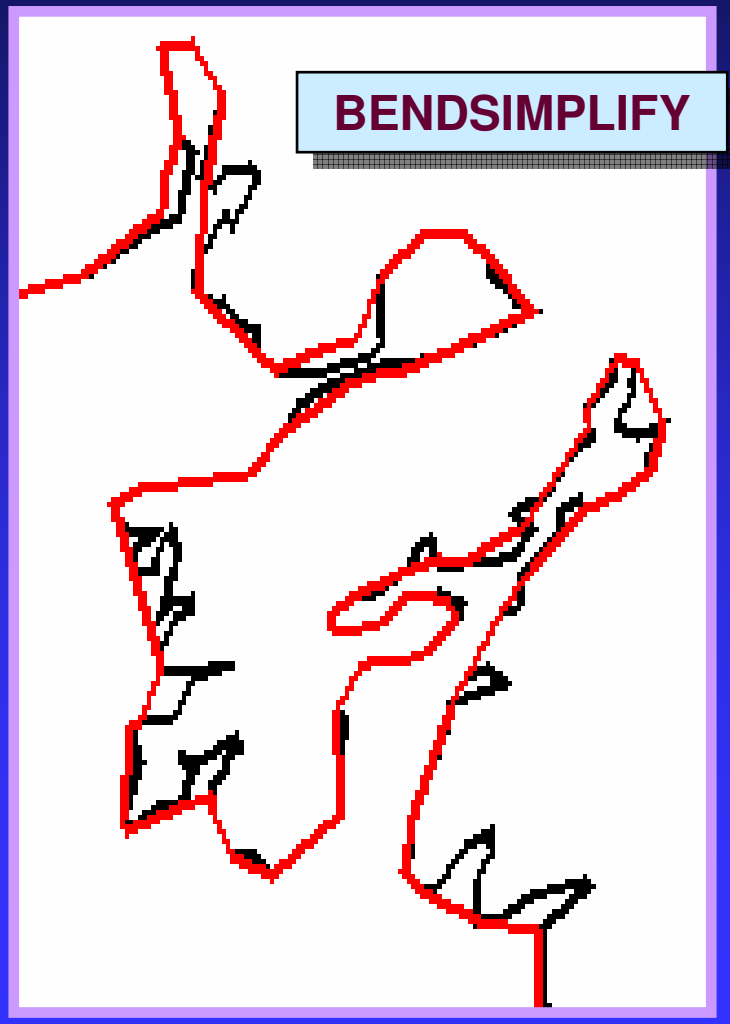
- **Focus on database generalization**
- **Support attribute transfer**
- **Facilitate post-processing and editing**

BENDSIMPLIFY operator–ArcInfo 7.1.2
ORTHOGONAL operator –ArcInfo 7.2.1
BUILDINGSIMPLIFY command –Workstation ArcInfo 8.0.1
FINDCONFLICTS command –Workstation ArcInfo 8.0.1
CENTERLINE command –Workstation ArcInfo 8.0.1
AREAAGGREGATE command –Workstation ArcInfo 8.0.2
Enhancements to the GENERALIZE command

a minor enhancement for Workstation ArcInfo 8.0.1;
a major enhancement to be released in Workstation ArcInfo 8.1

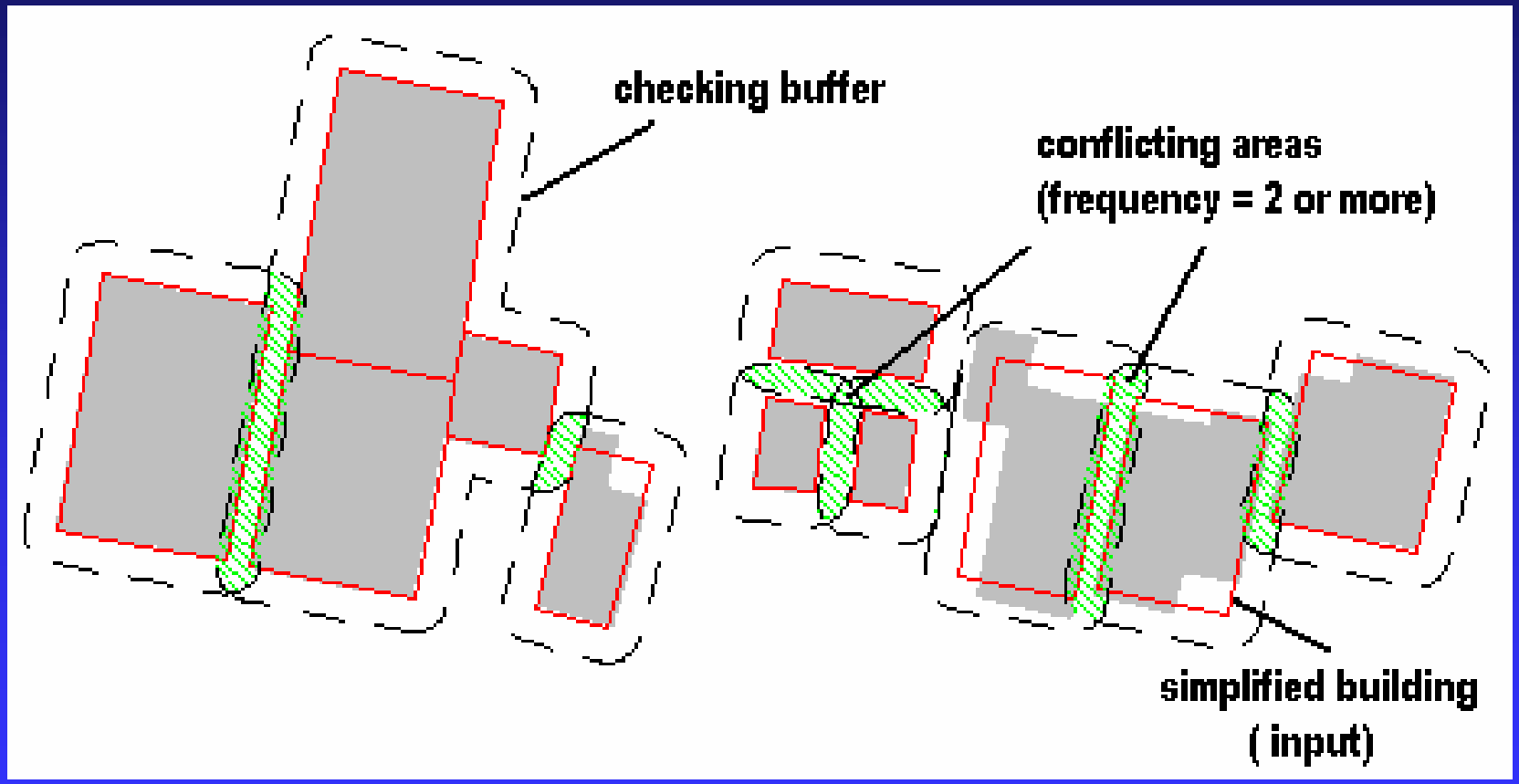
GENERALIZE

(pointremove vs. bendsimplify)

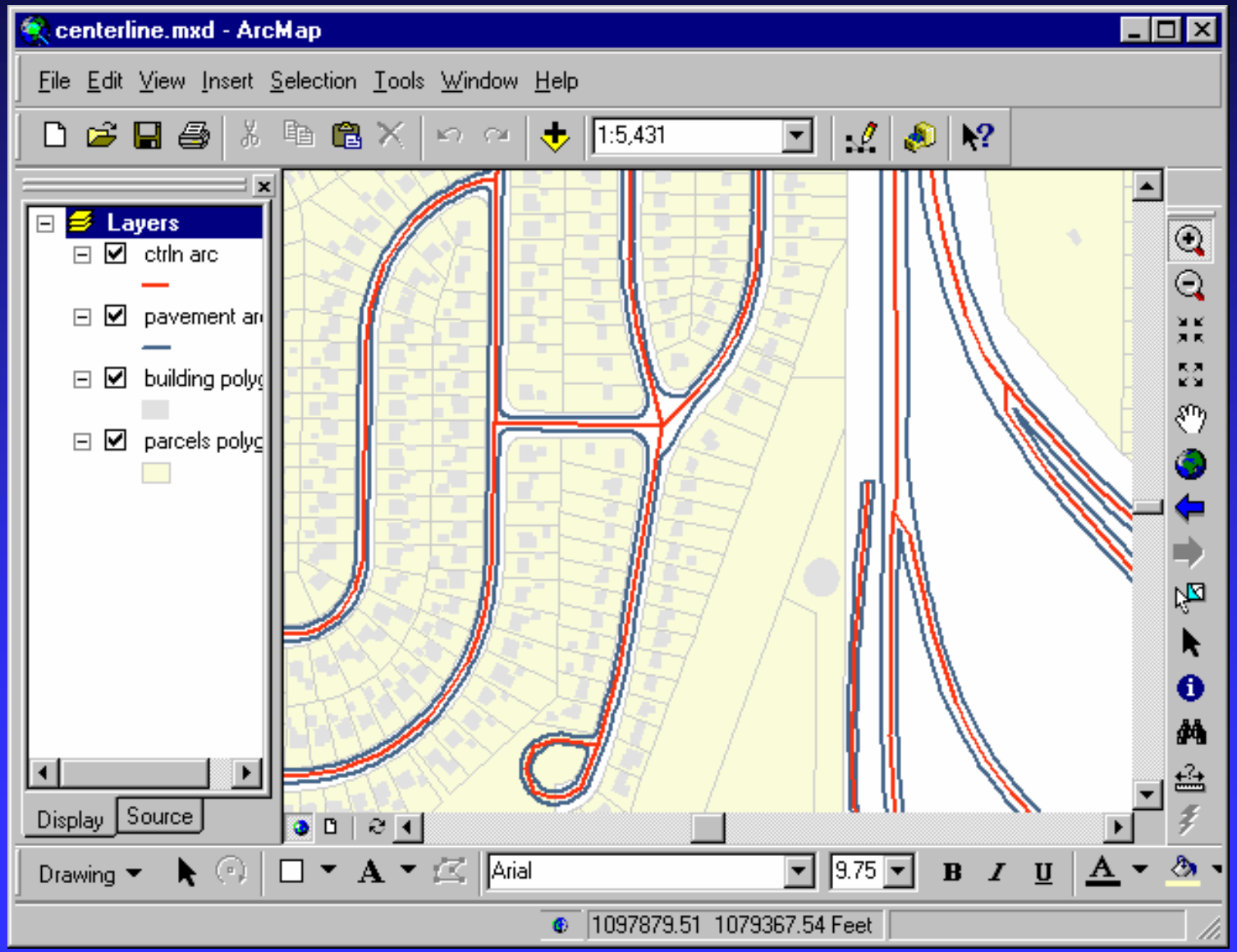


BUILDINGSIMPLIFY

FINDCONFLICTS

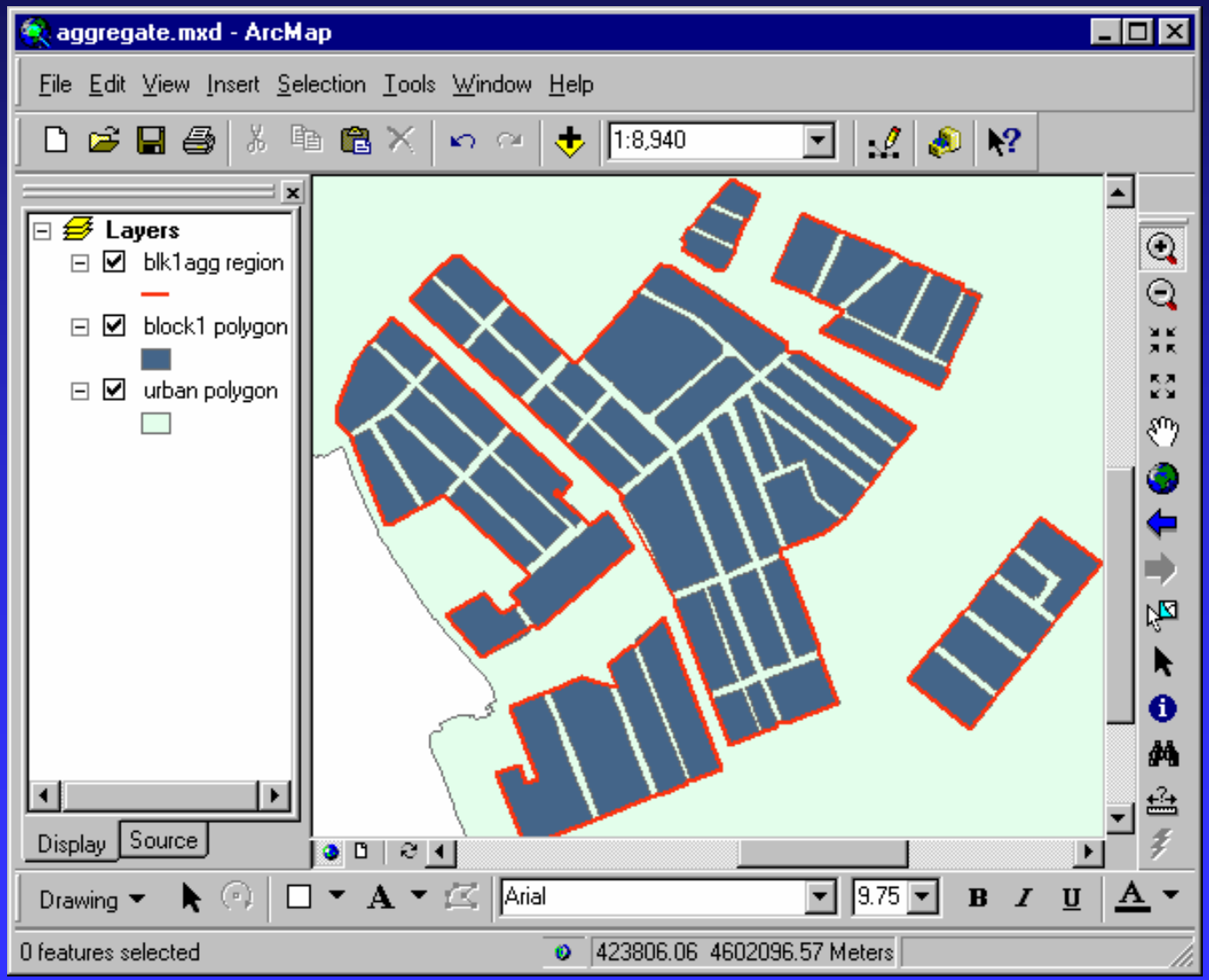


CENTERLINE


centerline.mxd - ArcMap
File Edit View Insert Selection Tools Window Help
1:5,431
Layers
ctrln arc
pavement arc
building polyg
parcels polyg
Display Source
Drawing
Arial
9.75
1097879.51 1079367.54 Feet

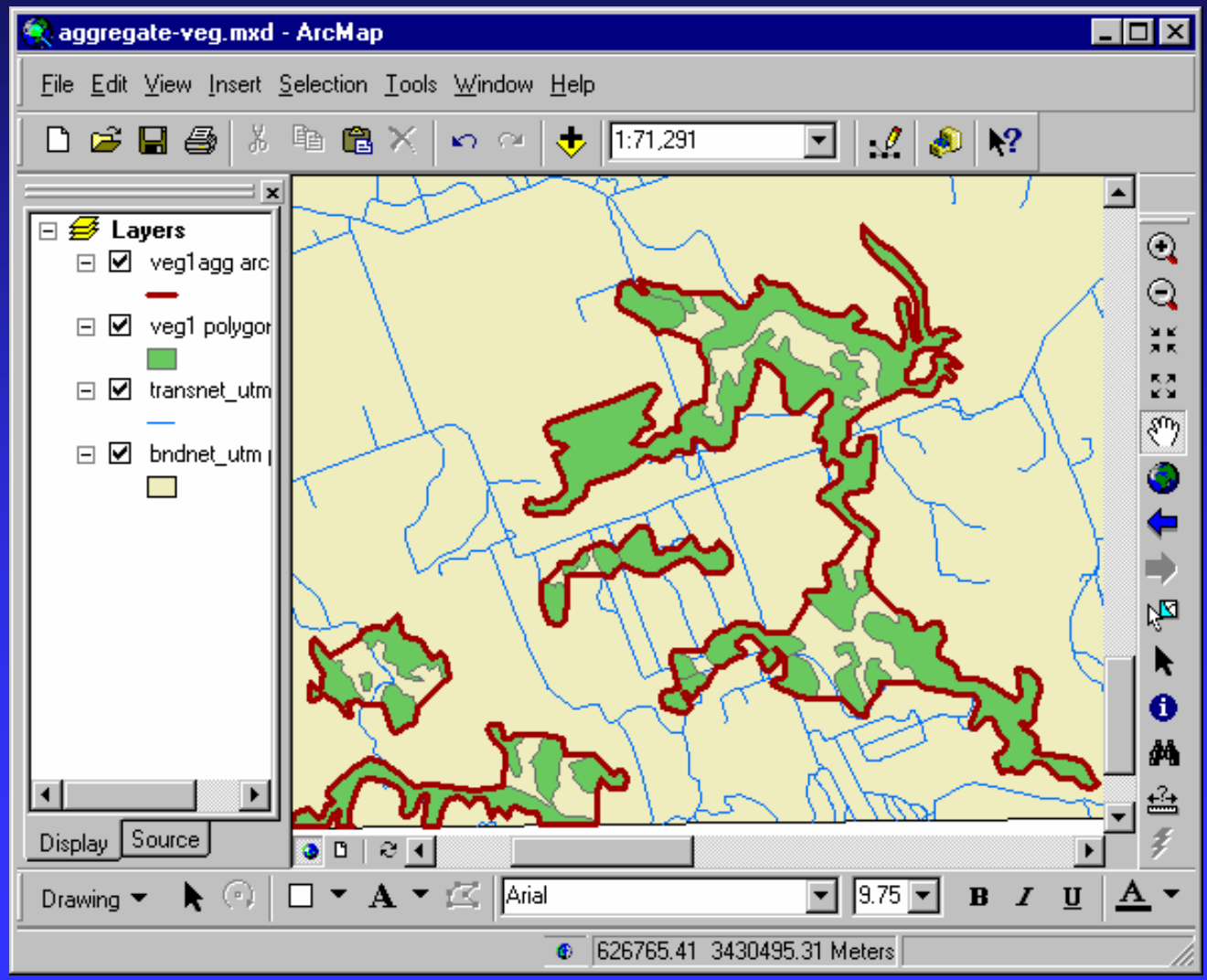
AREAAGGREGATE

(orthogonal)

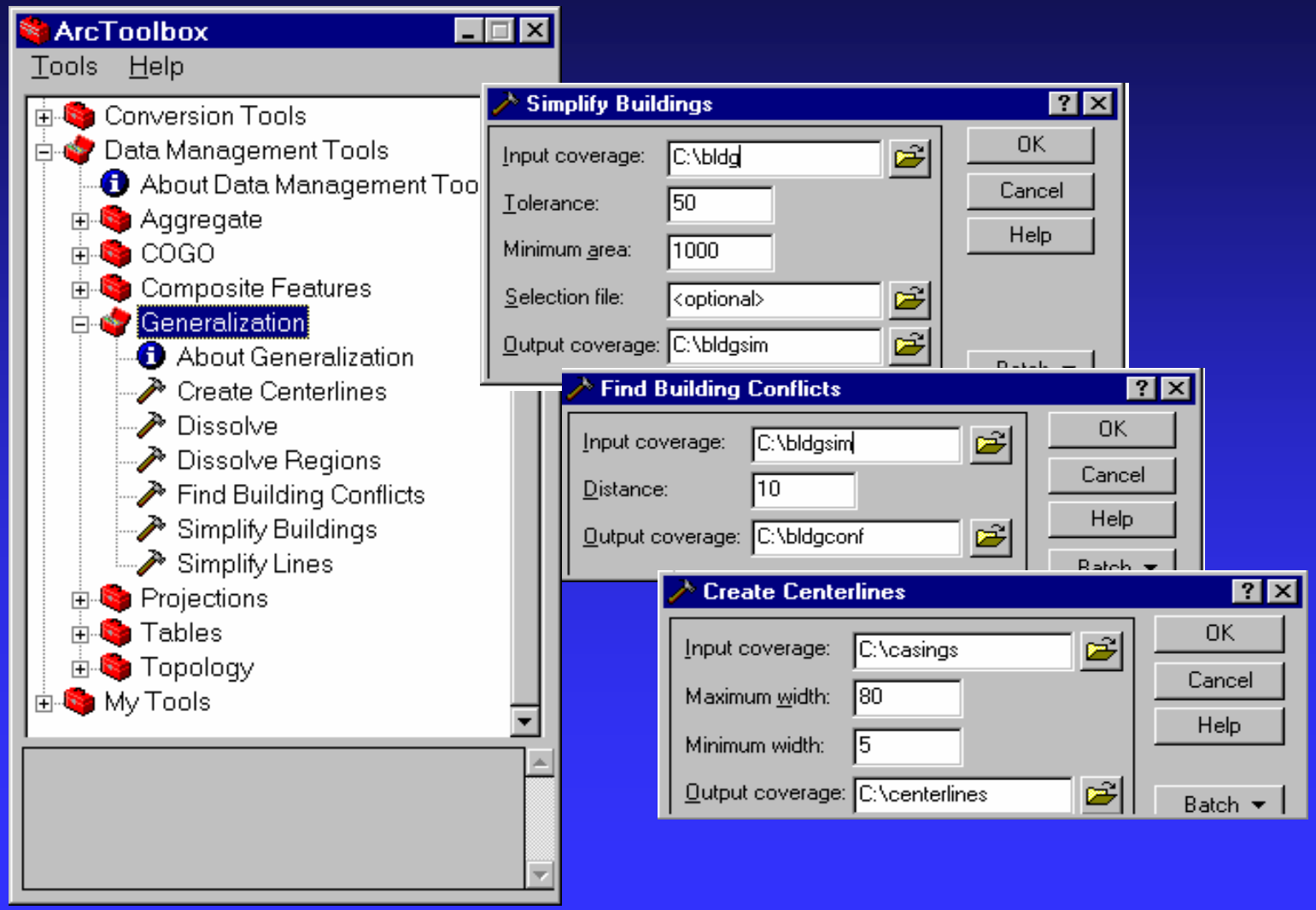


AREAAGGREGATE

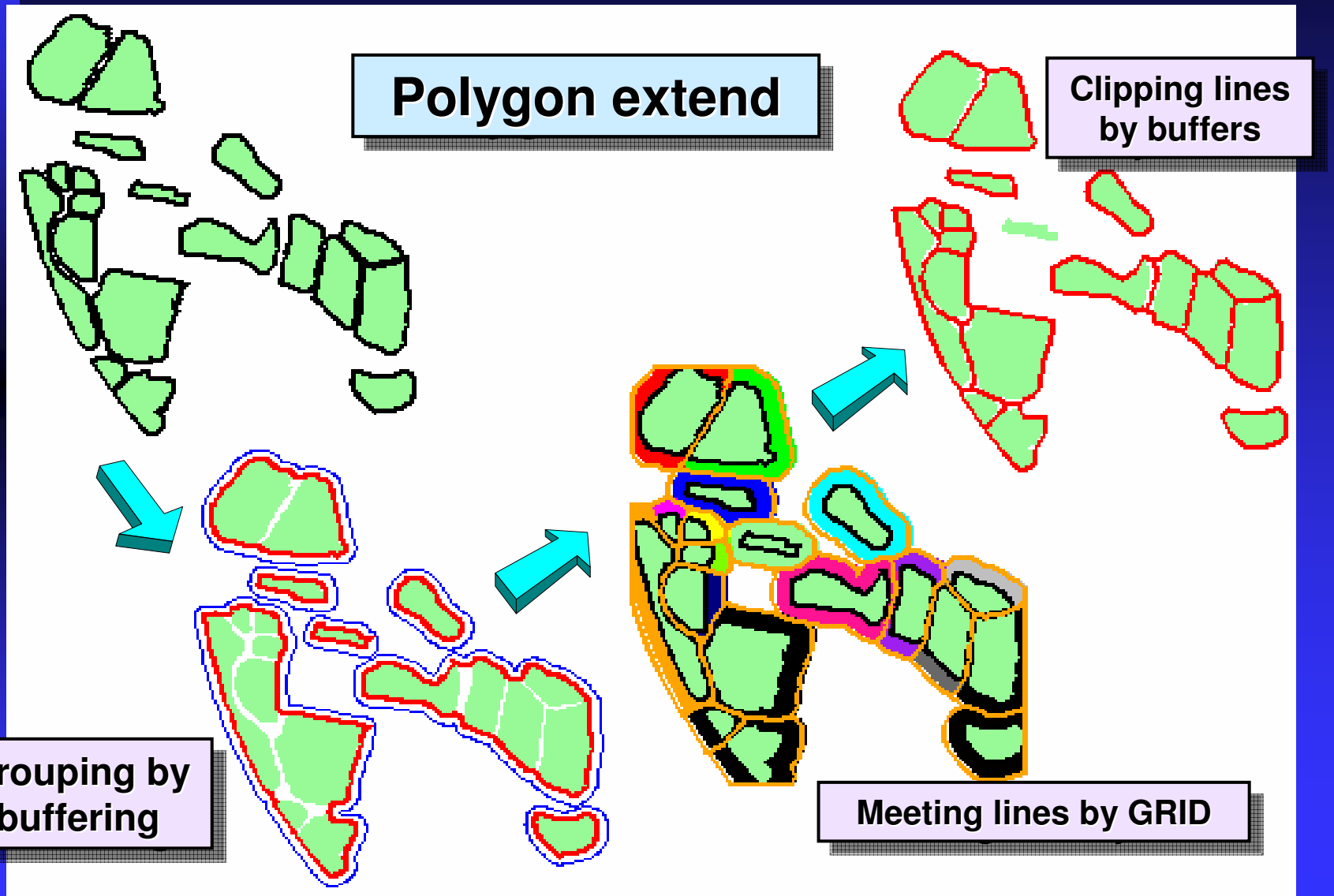
(non_orthogonal)



Gen-tools in ArcToolbox



Example of Macro- procedures



Development of generalization tools for ArcGIS

More functions, flexibility, and productivity

Extending the following areas:

- **Geodatabase tools**
  - Derive target schema, feature classification and extraction;
  - Maintain feature links between source and target data
- **Geometry processing**
  - Add generalization operators
- **Editor tools**
  - Allow interactive generalization and queued edit
- **User interface**
  - Add a gen-toolbar, menus, forms, and controls

Database generalization

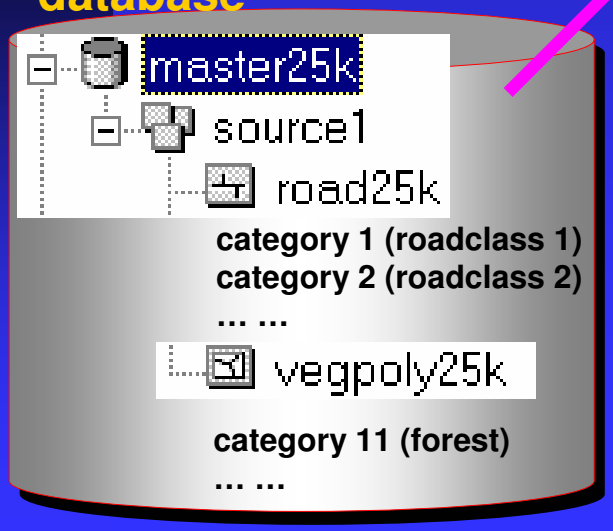
Define/create target feature classes
(attribute fields and domains)

Define and link source feature categories to target features

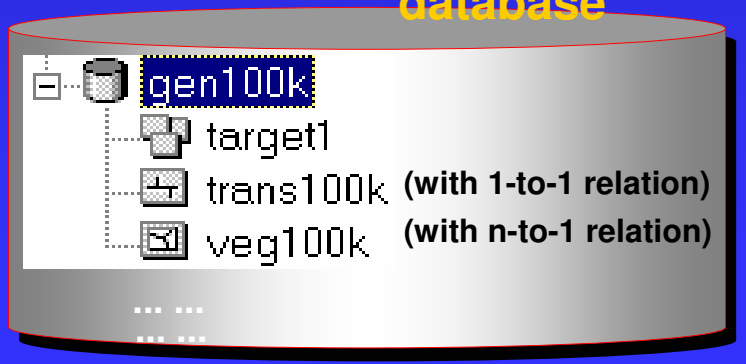
Transforming source features to generalized features (in batch)

Source feature	Output feature	Steps
category 1	trans100k-fr001	simplification, elimination
category 2	trans100k-fr002	typification, simplification
... ...	... ...	
category 11	veg100k-fv011	aggregation, smoothing

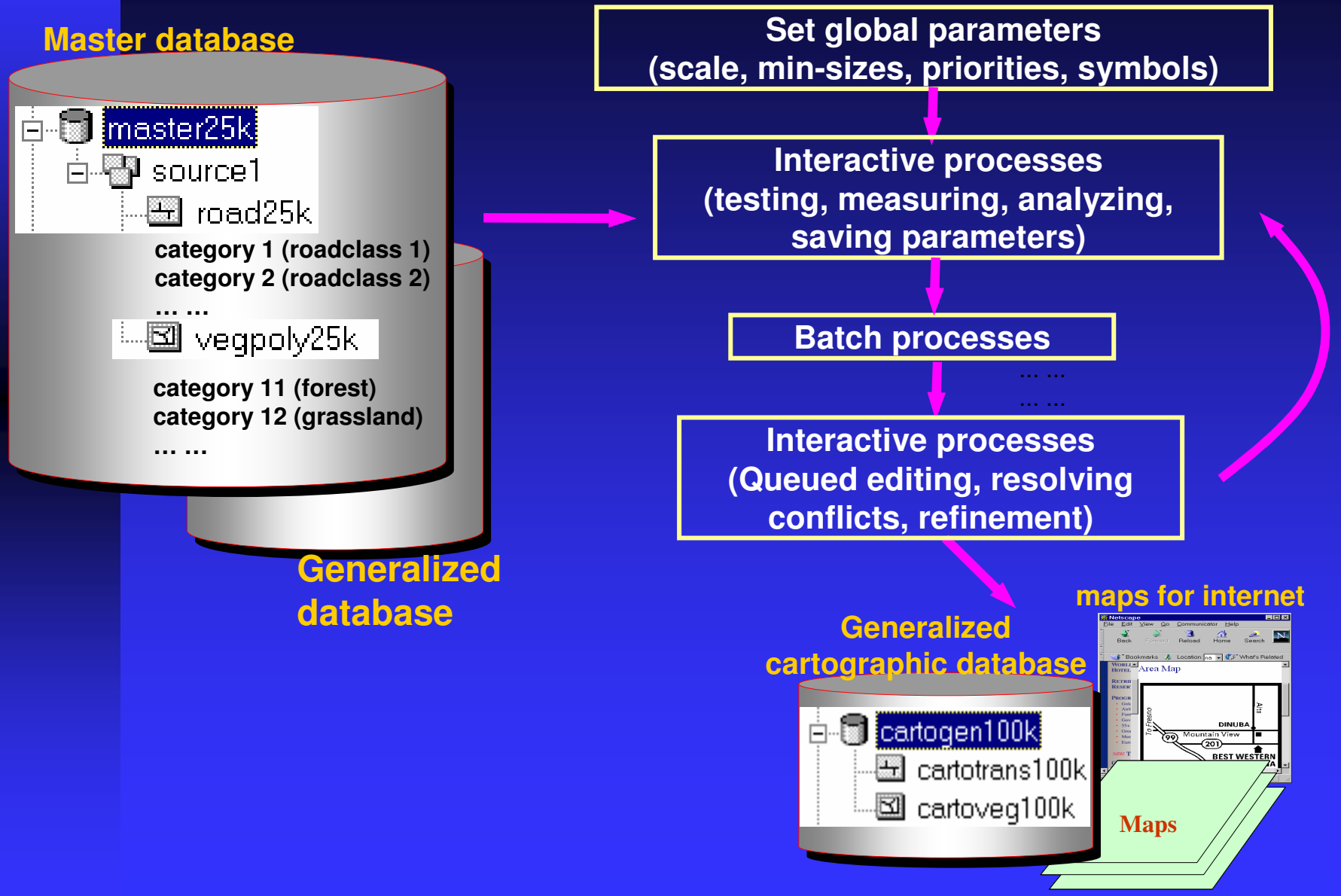
Master database



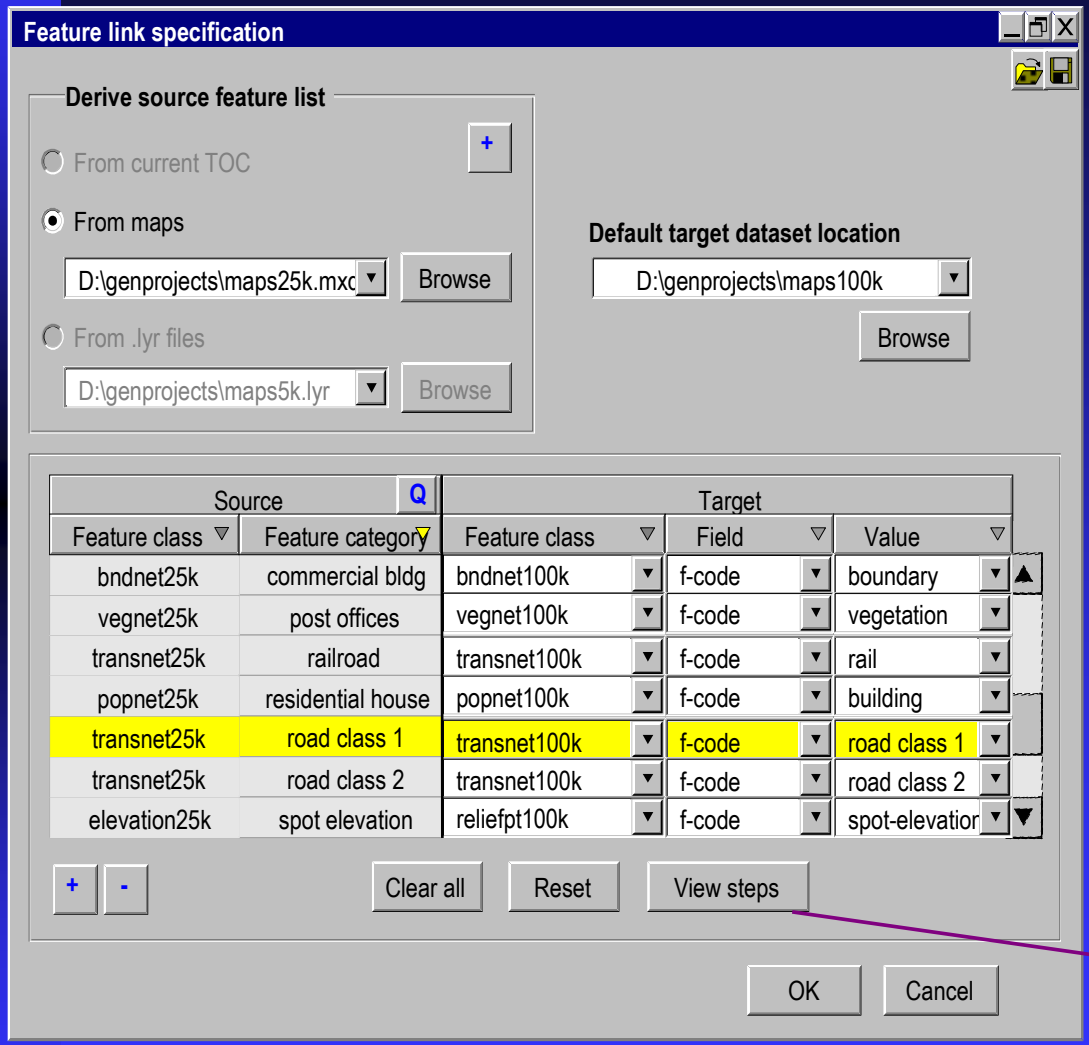
Generalized database

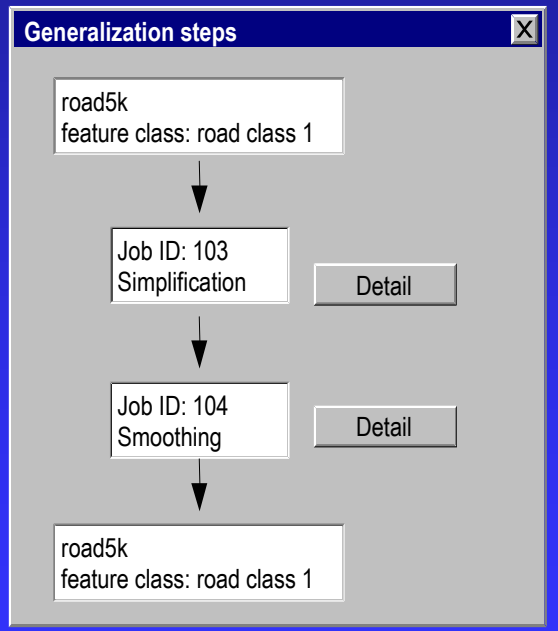


Cartographic generalization

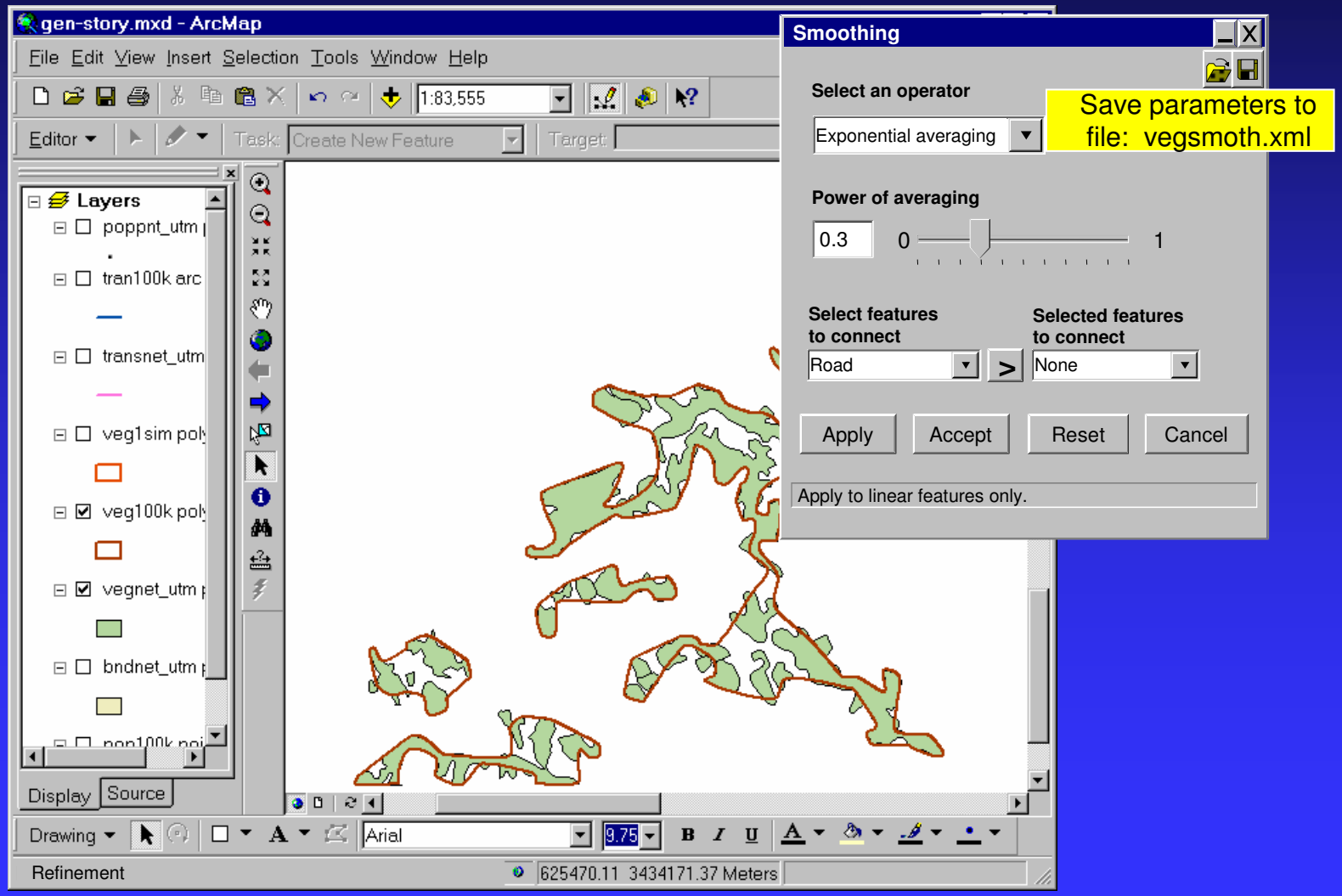


Linking source and target features

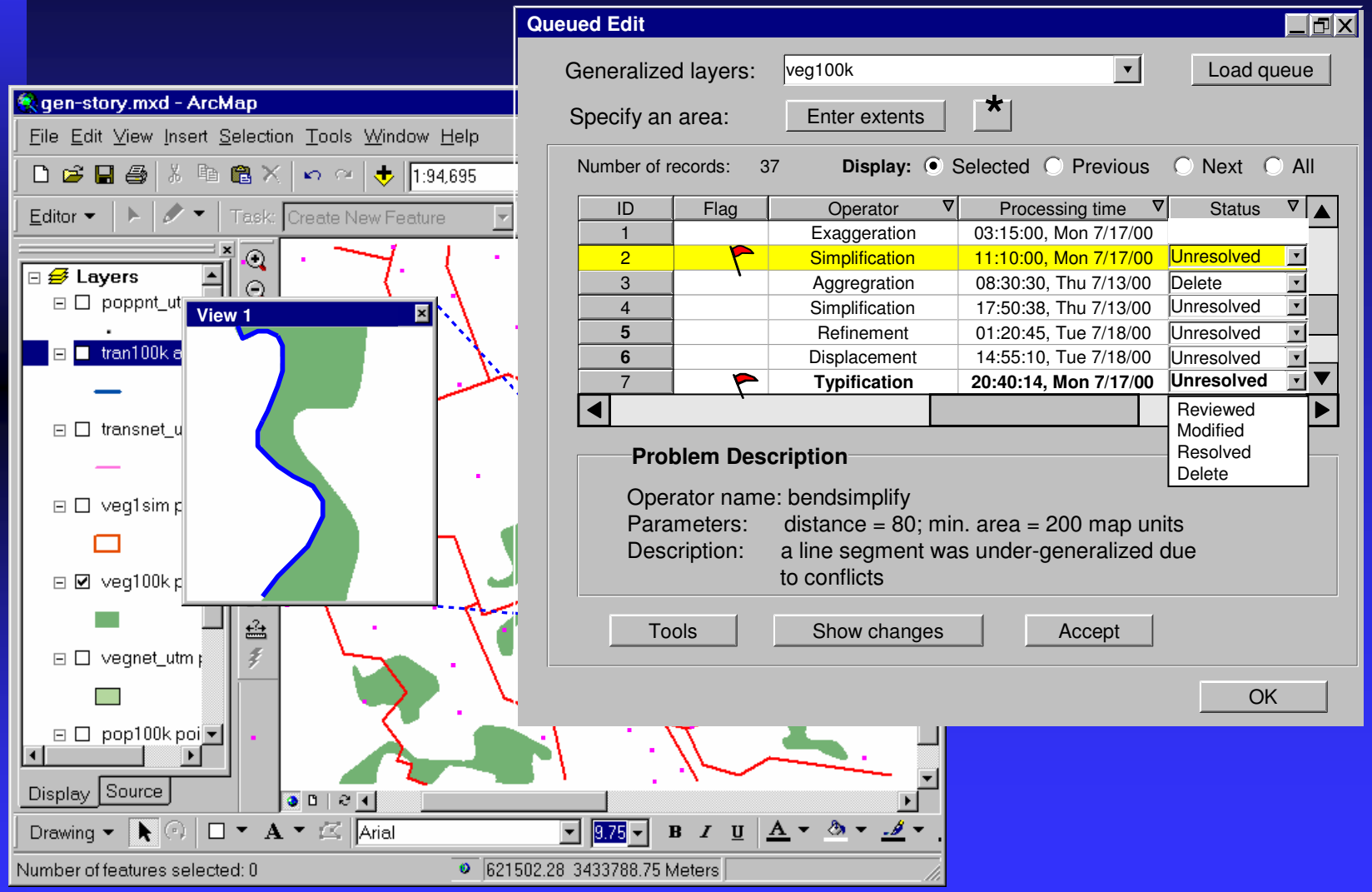




Interactive tools

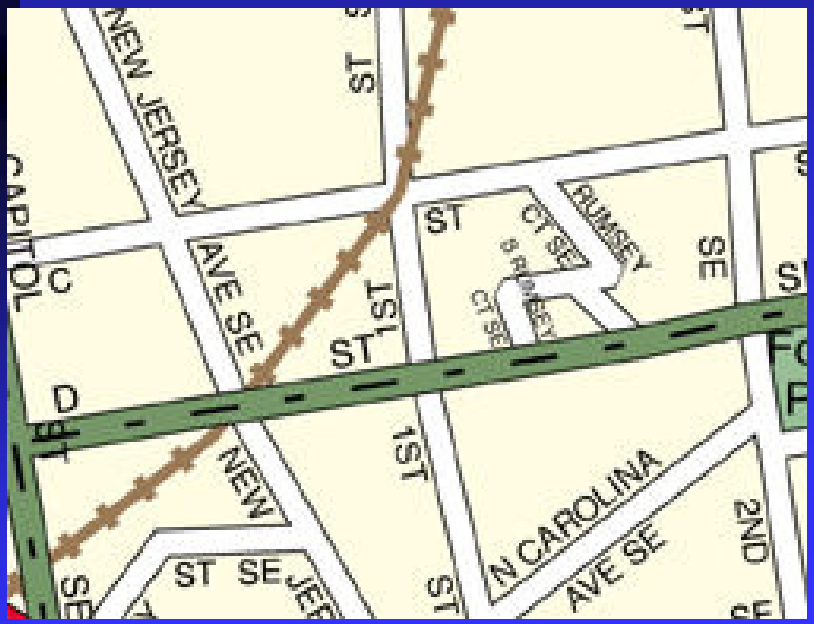


Queued editing



Text Placement

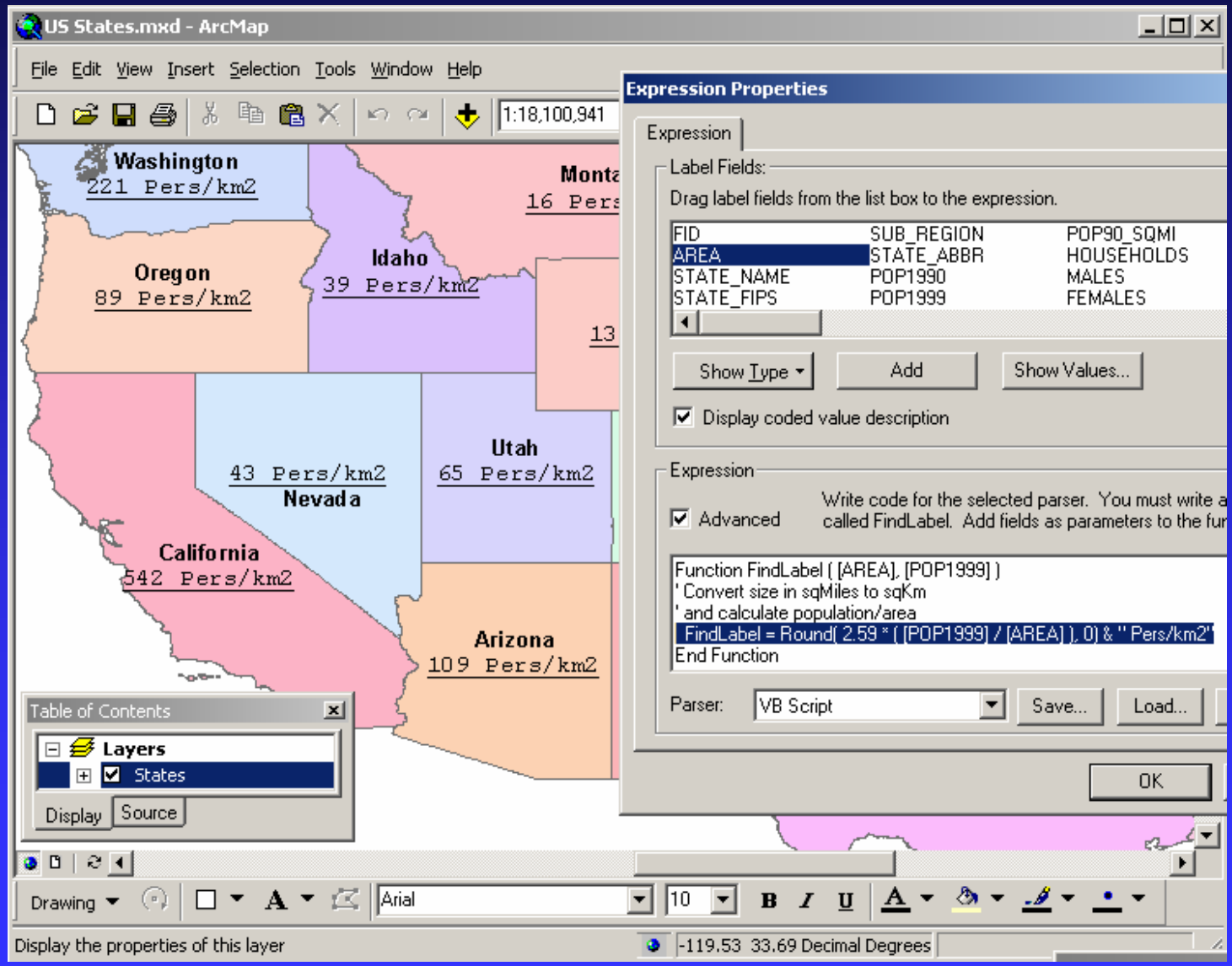
A major component of cartography



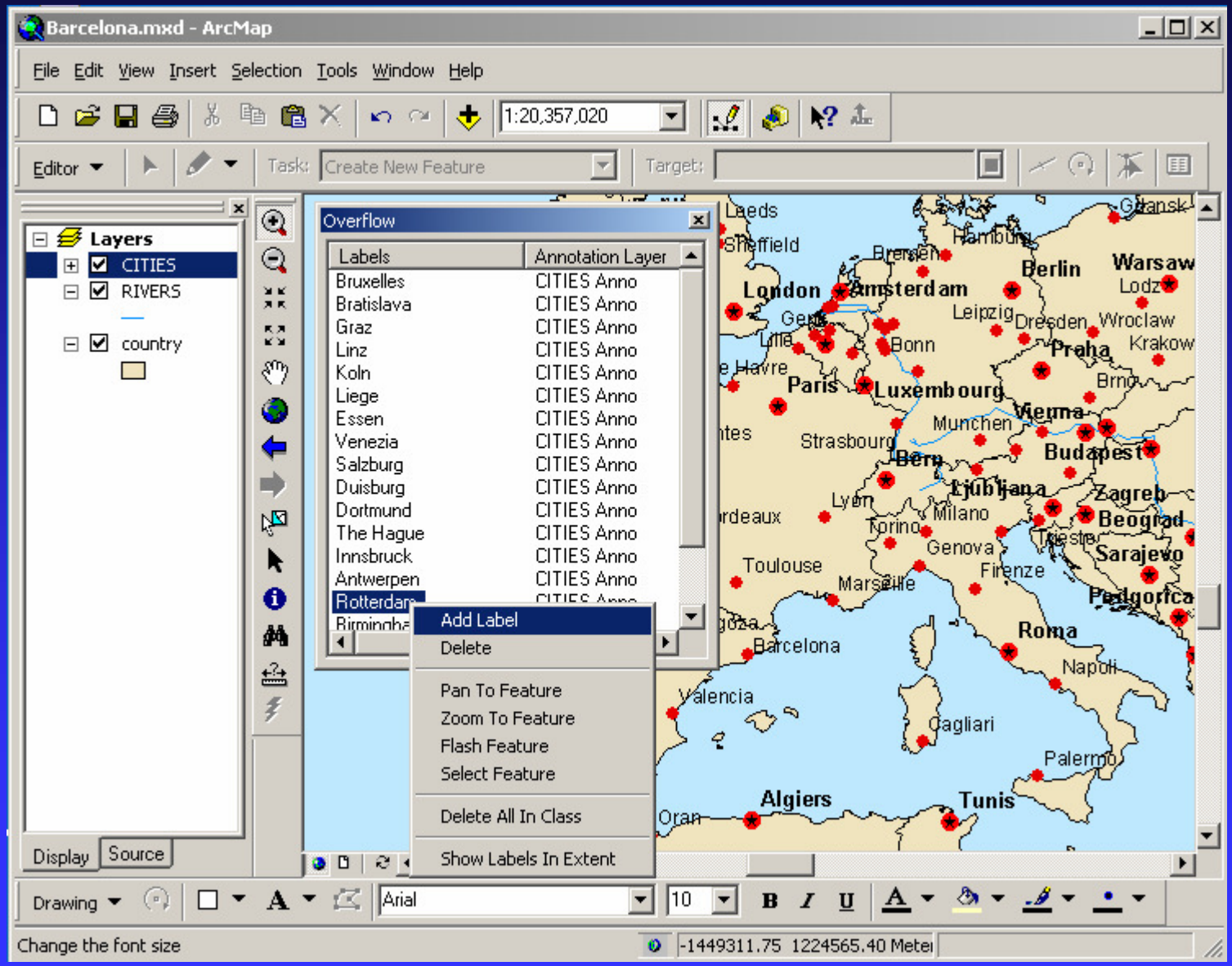
Dynamic labeling in ArcMap

- Places labels at "ideal" location on the fly
- For on-line display or as batch process for creating persistent annotation
- Can place multiple labels / feature

- **Uses expression based on VB- or Java-script to derive text**



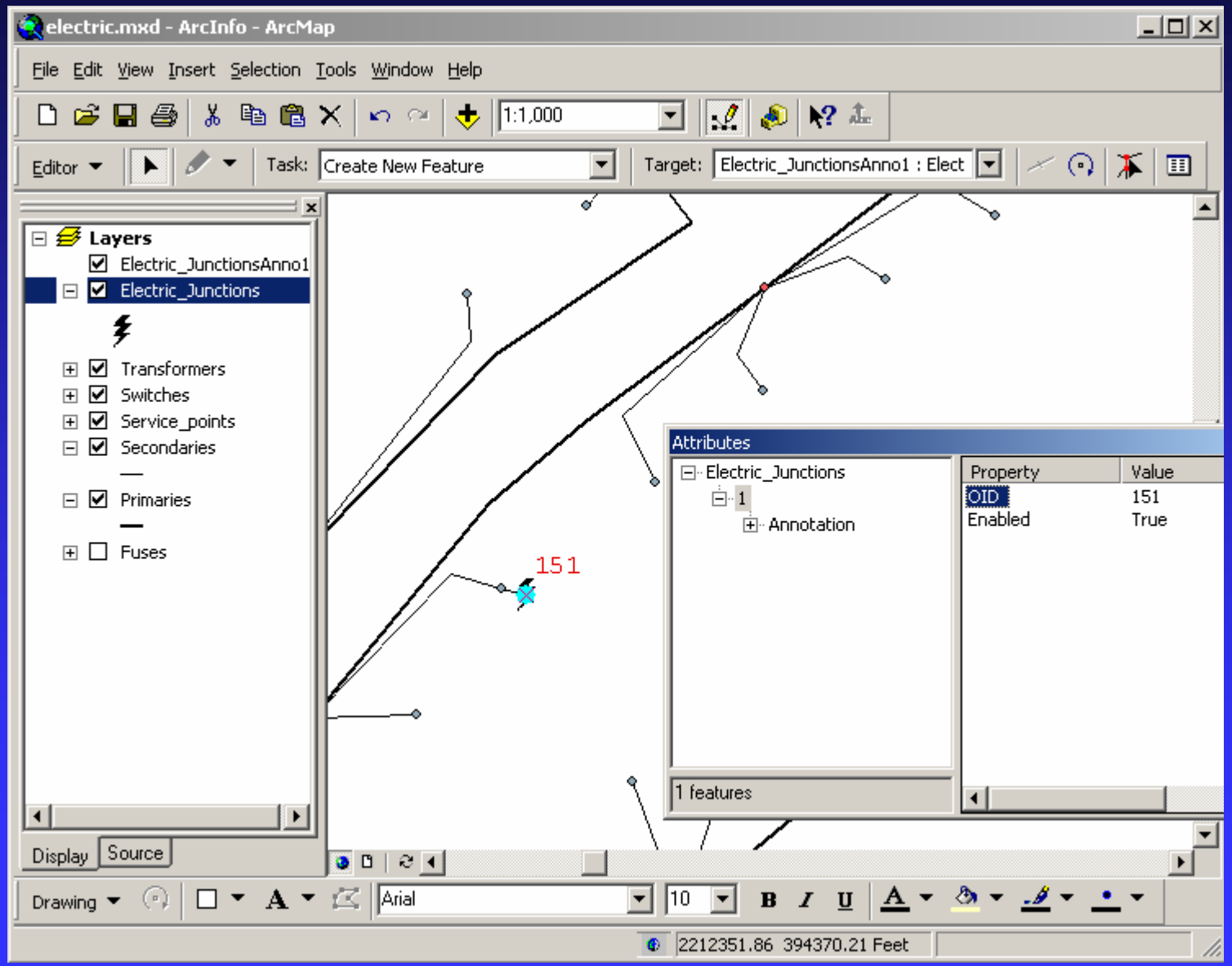
Handles overflow (unplaced) labels



Feature-linked annotation in ArcGIS

- A geodatabase feature class with custom behavior
- One or more annotations linked to a feature (point, line, polygon, …)
- Annotation text derived from feature attribute
- Position maintained in relation to feature
- Updating the feature automatically updates the linked annotation

Feature-linked annotation



Maplex

Currently a separate product
Will be integrated with ArcMap in future

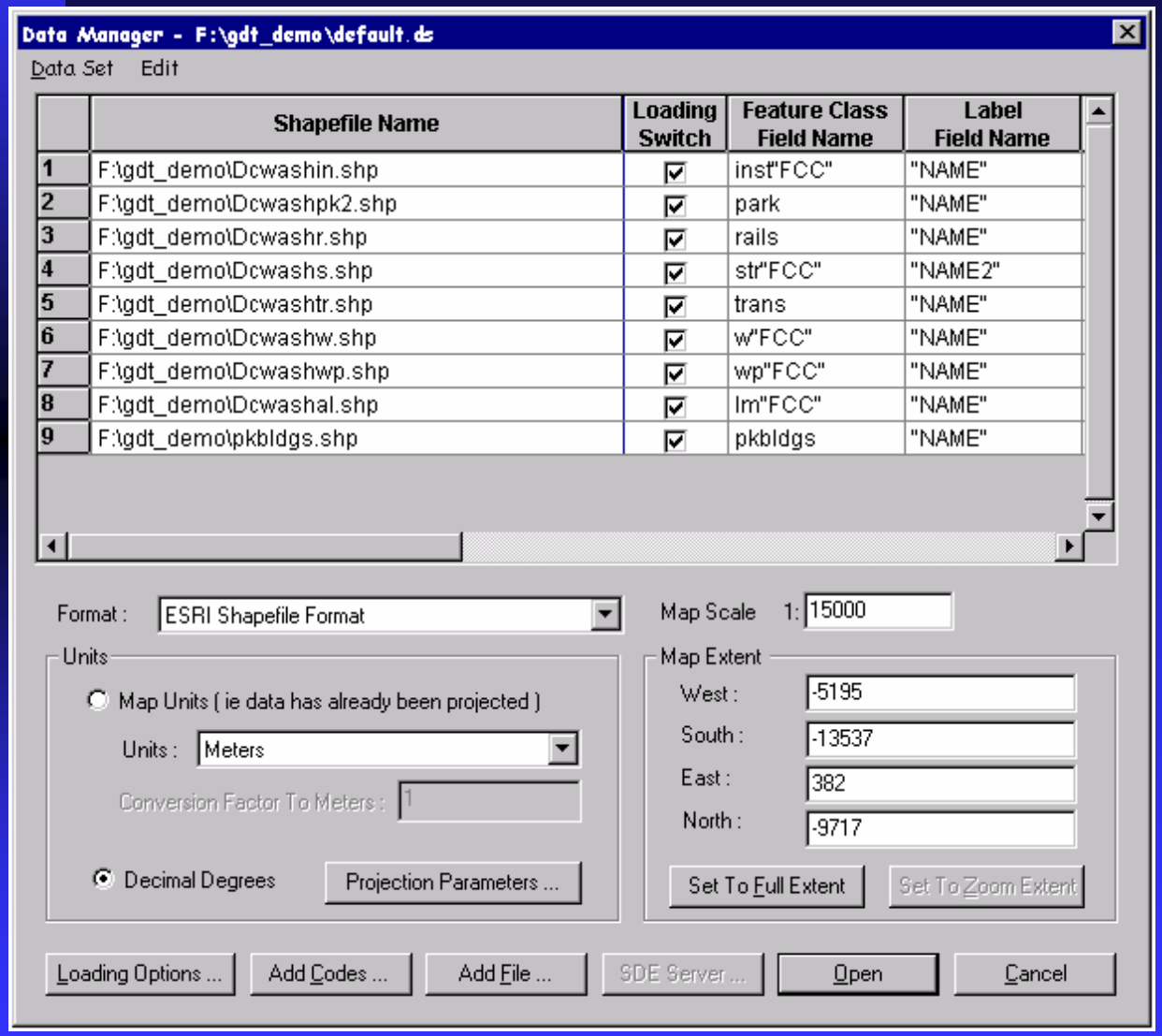
Cartographic Design

- Many input and output formats
- Standard carto symbology built-in
- Custom symbology easily added
- Rule-based projects allow repeatable design styles

Automated Text Placement

- Unambiguously label all features
- Conflict Resolution Between Placements
- User-specified Rules
- Prioritization of features, labels
- Label Points, Lines, Area, Streets, Parcels

The data manager



Feature Class Codes and Label Field are specified here.

Projections, Units, Scale and Map Extents are also set at load time

The rule-base paramaters

Symbology (style, color, size...)

Labels (font, color, size, box...)

Placement (the label in relation to its feature)

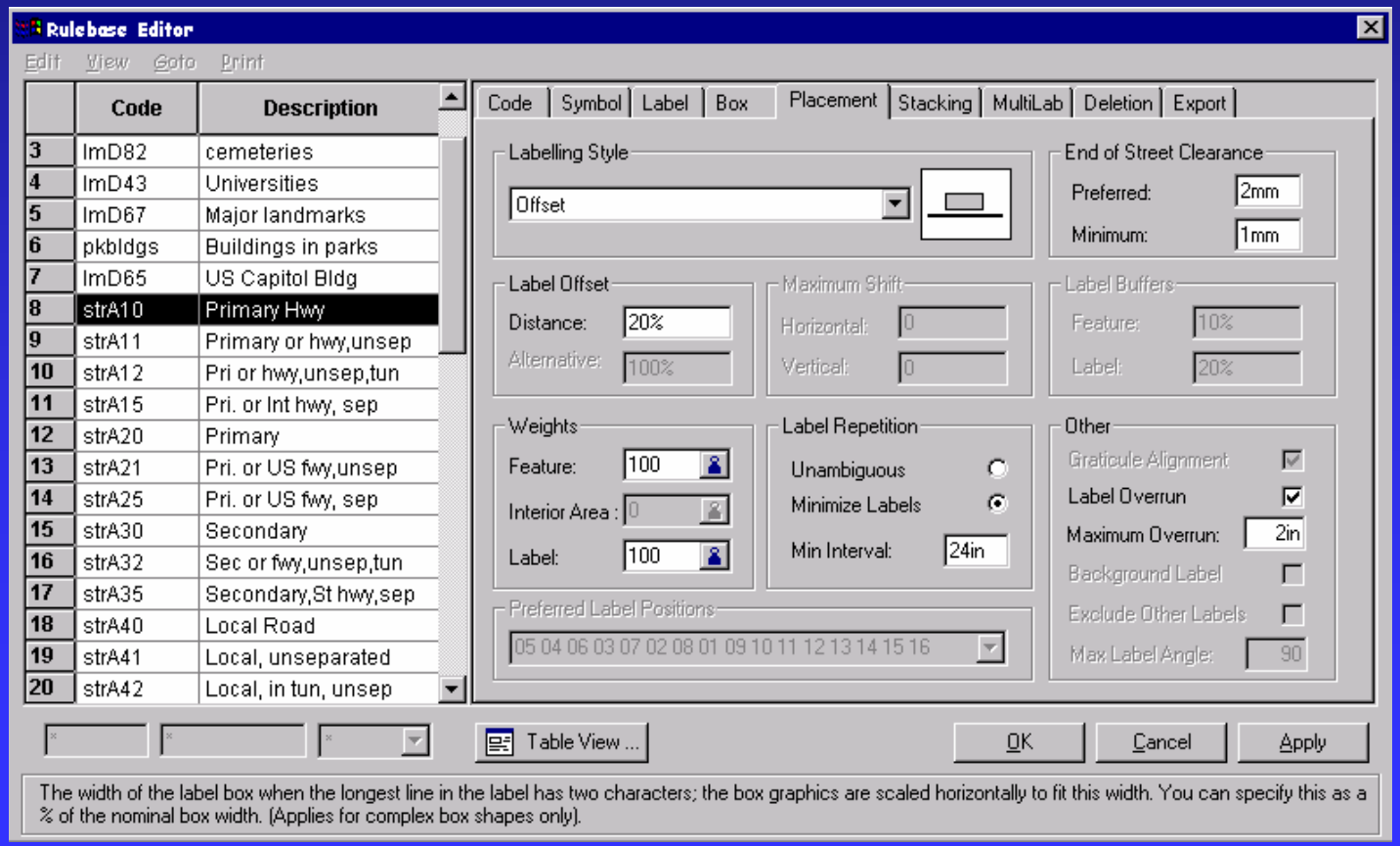
Priorities (features/labels importance ordering)

Stacking (breaking up multi word labels)

Multi-labels (> one label per feature)

Deletion (what to do if no label is placed)

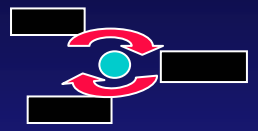
Export (create layered export files)

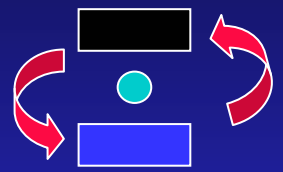


Placement styles and strategies

Point Features

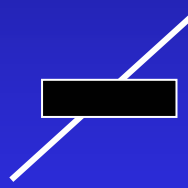
Centered

Offset (freedom to move) 

Offset (with preferred zones such as east or north side) 

Line Features

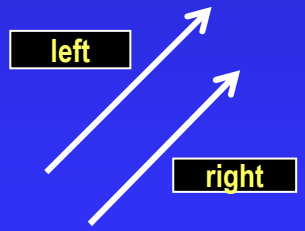
Centered

Horizontal 

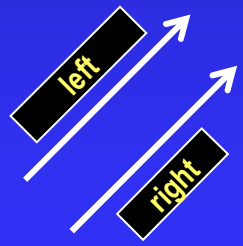
Curved

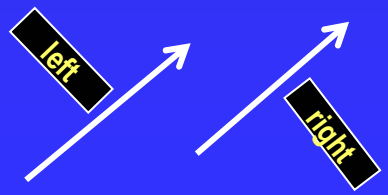
Straight

Offset

Horizontal 

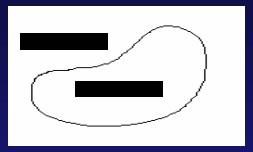
Curved

Straight 

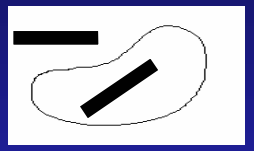
Perpendicular 

Area features

Center horizontal or Offset

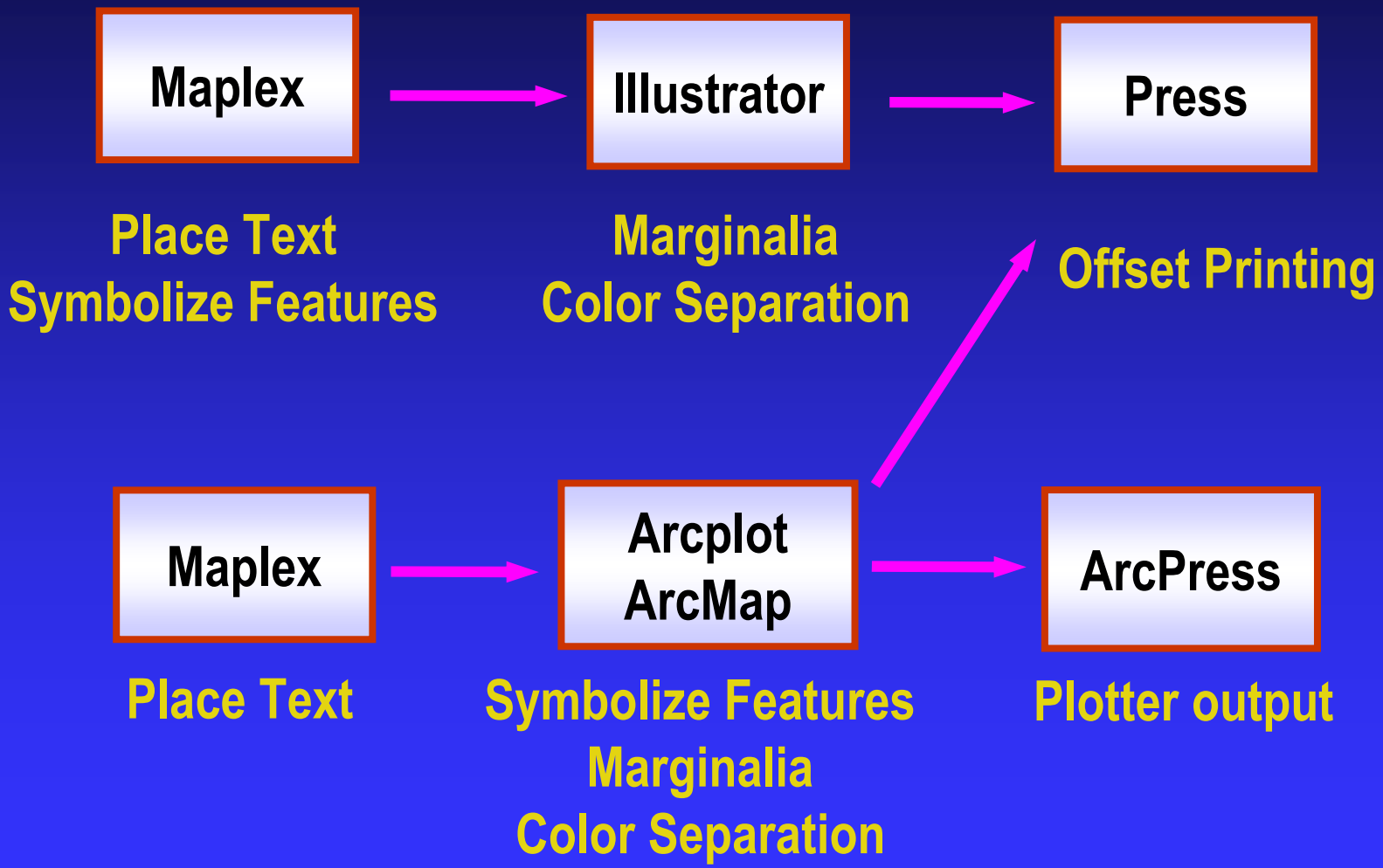


Center straight or offset



Center curved or offset

Placement strategies

- US-Style Streets
- European-Style Streets
- Parcels
- Petroleum
- Atlases
- Standard point, line, polygon

Production workflow