



GIS

The Geographic Approach for the Nation



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ModelBuilder: An Introduction

Brett Rose

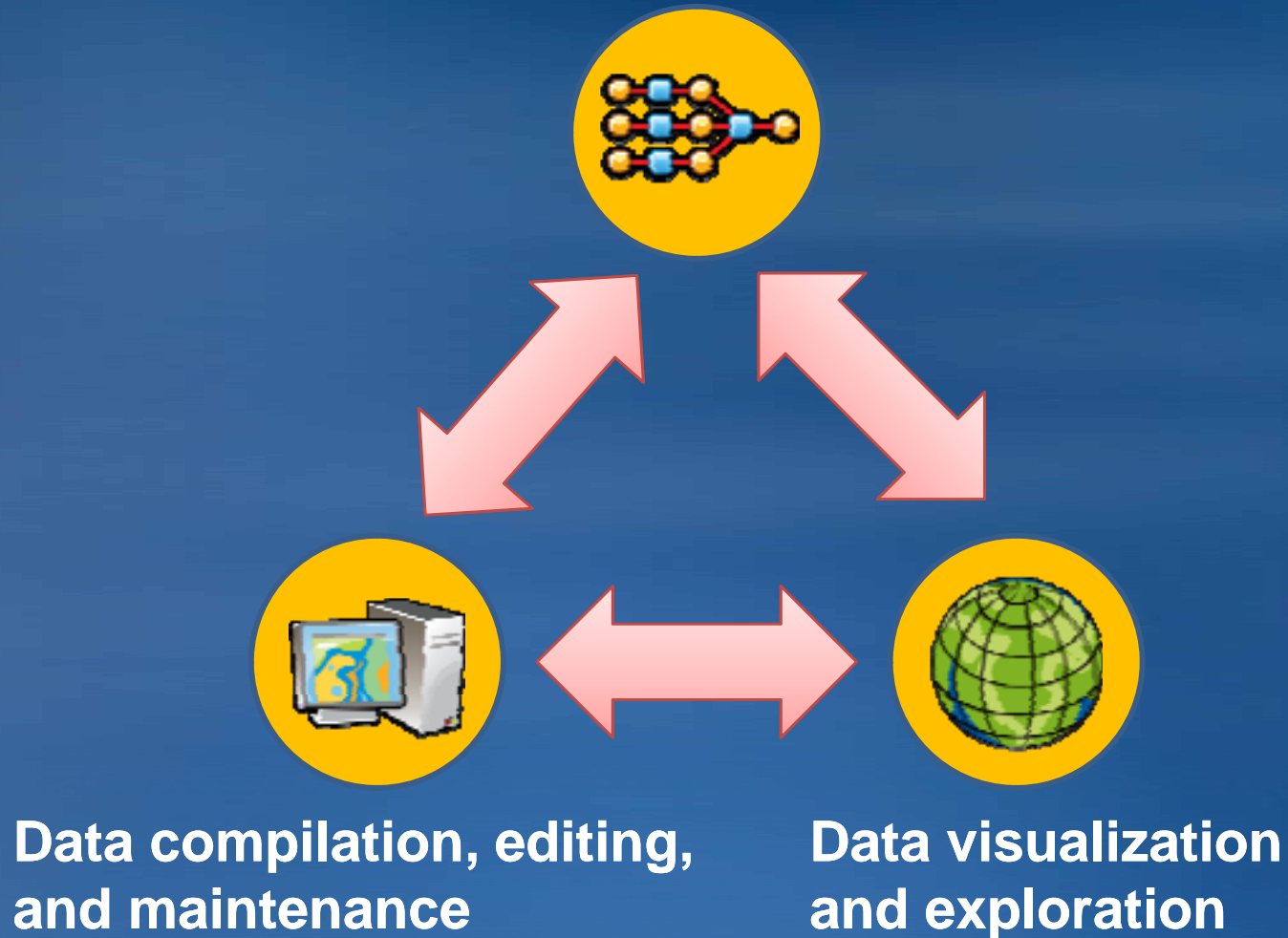


What is ModelBuilder?

- **A user-friendly way to automate a series of tools**
- **Part of the ArcGIS geoprocessing framework**
 - **ModelBuilder can run any tool in the ArcToolbox, including scripts, custom tools, and other models**
 - **Supports GDBs, shapefiles, tables, coverages, rasters, CAD**

What is ModelBuilder?

“Computing with data” -- geoprocessing



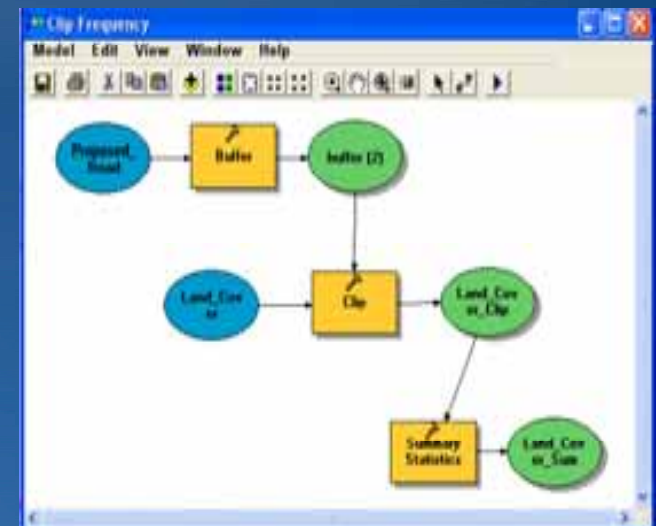
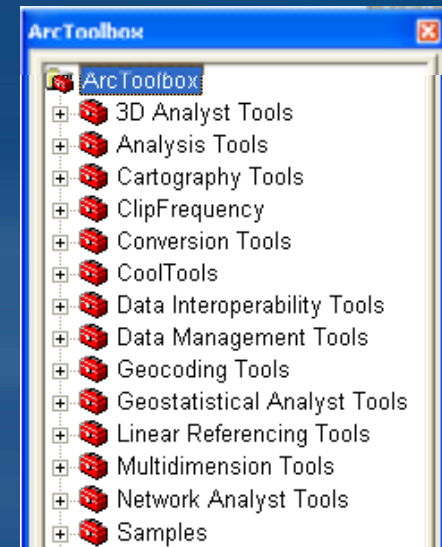
Tools and Framework

- **Tools**

- Perform essential operations on data
- Learning tools enables you to solve real-world problems

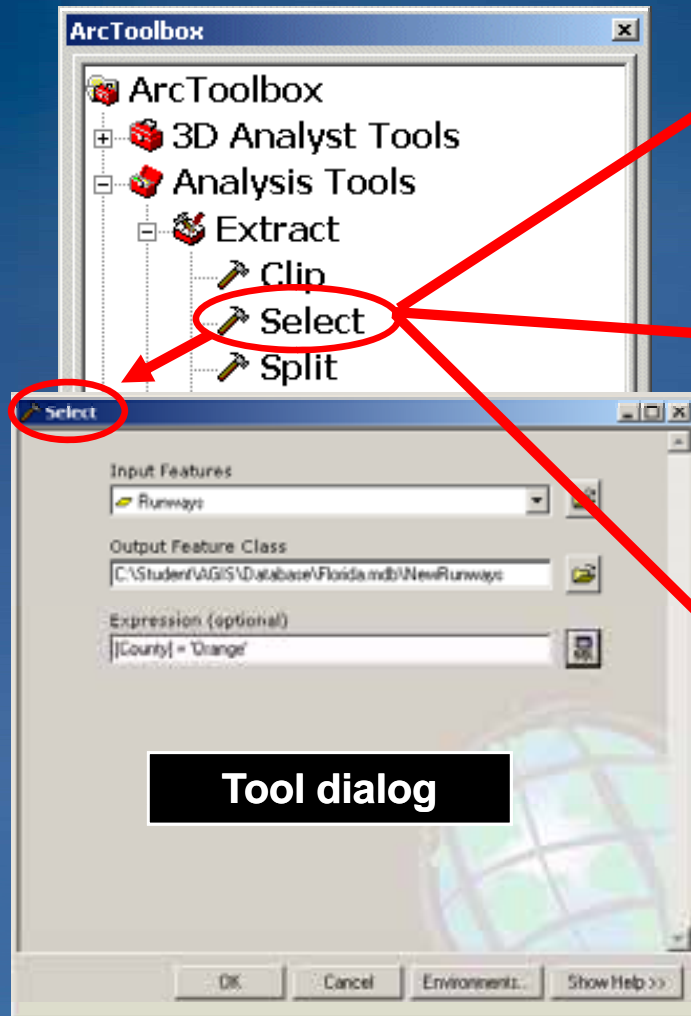
- **Framework**

- Mechanics of using, managing, and publishing tools
- Automating workflows by creating new tools - models and scripts

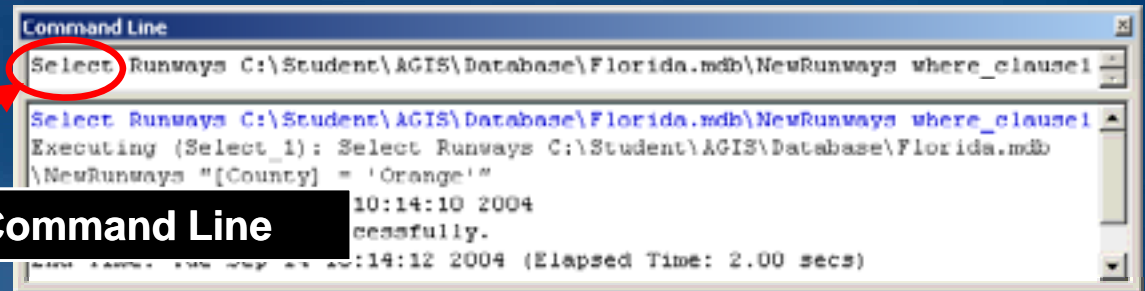


Framework

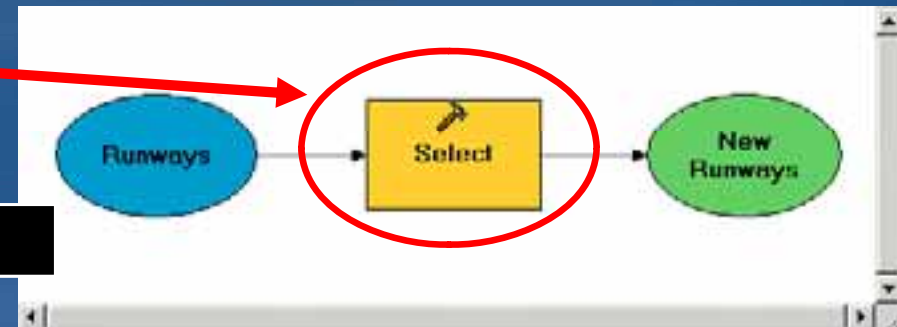
Four ways to use tools



Tool dialog



Command Line



Models

```
# Import system modules  
import win32com.client  
  
# Create the Geoprocessor object  
pGP = win32com.client.Dispatch("esri  
pGP.Select("Runways", "NewRunways")
```

Scripts

Demo 1

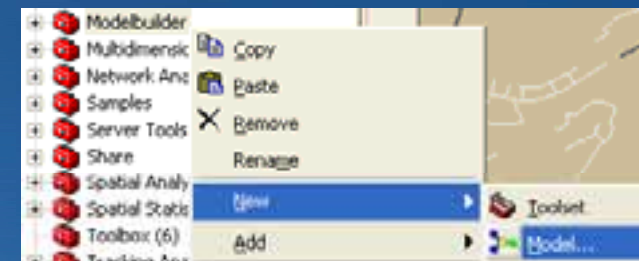
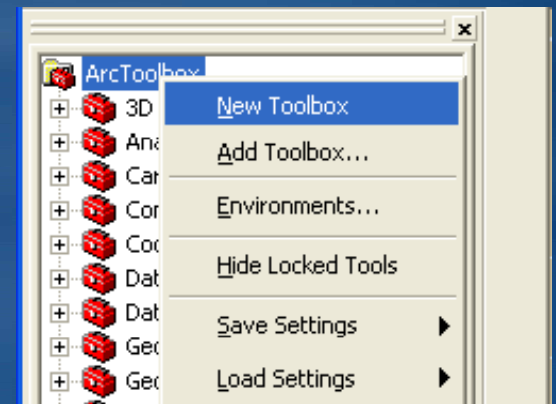
- Create a new toolbox, add new tools/model
- Build a model
- Run the model w/in ModelBuilder
- Add more processes and run them

ArcToolbox Basics

- Dockable window in any ArcGIS application
- System tools organized into toolboxes and toolsets
- Each toolbox contains tools with similar functionality. Toolsets refine further.
- Window has four tabs
- Favorites – tree-view of all tools
- Index and Search - assist in finding tools
- Results – logs what you've done and helps manage tool results

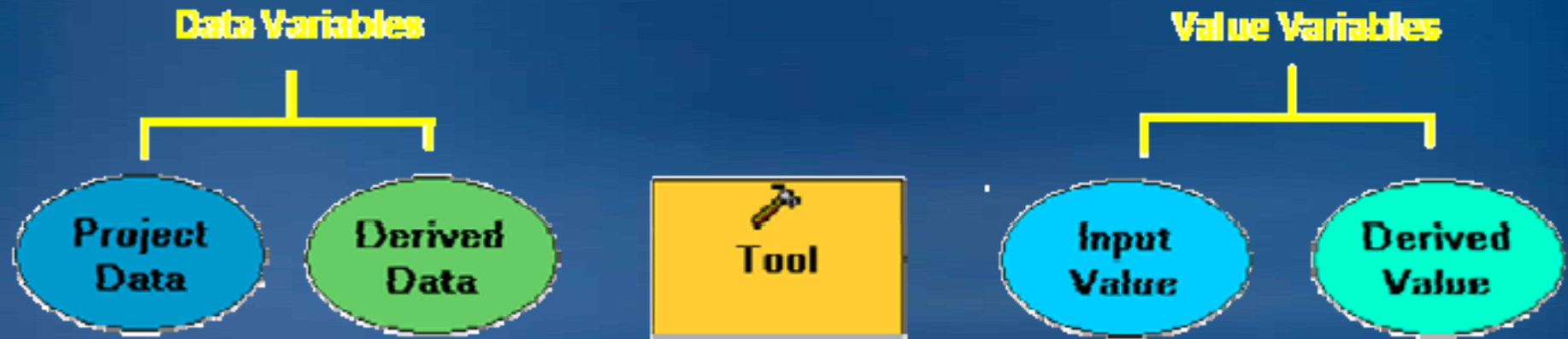


Show/Hide
ArcToolbox Window



Demo Review

Model elements



Tools

- Drag and drop into window
- Use Add button



Data

- Drag and drop into window
- Drag and drop onto tools
- Fill in dialog
- In ArcMap, from the TOC
- Use Add button

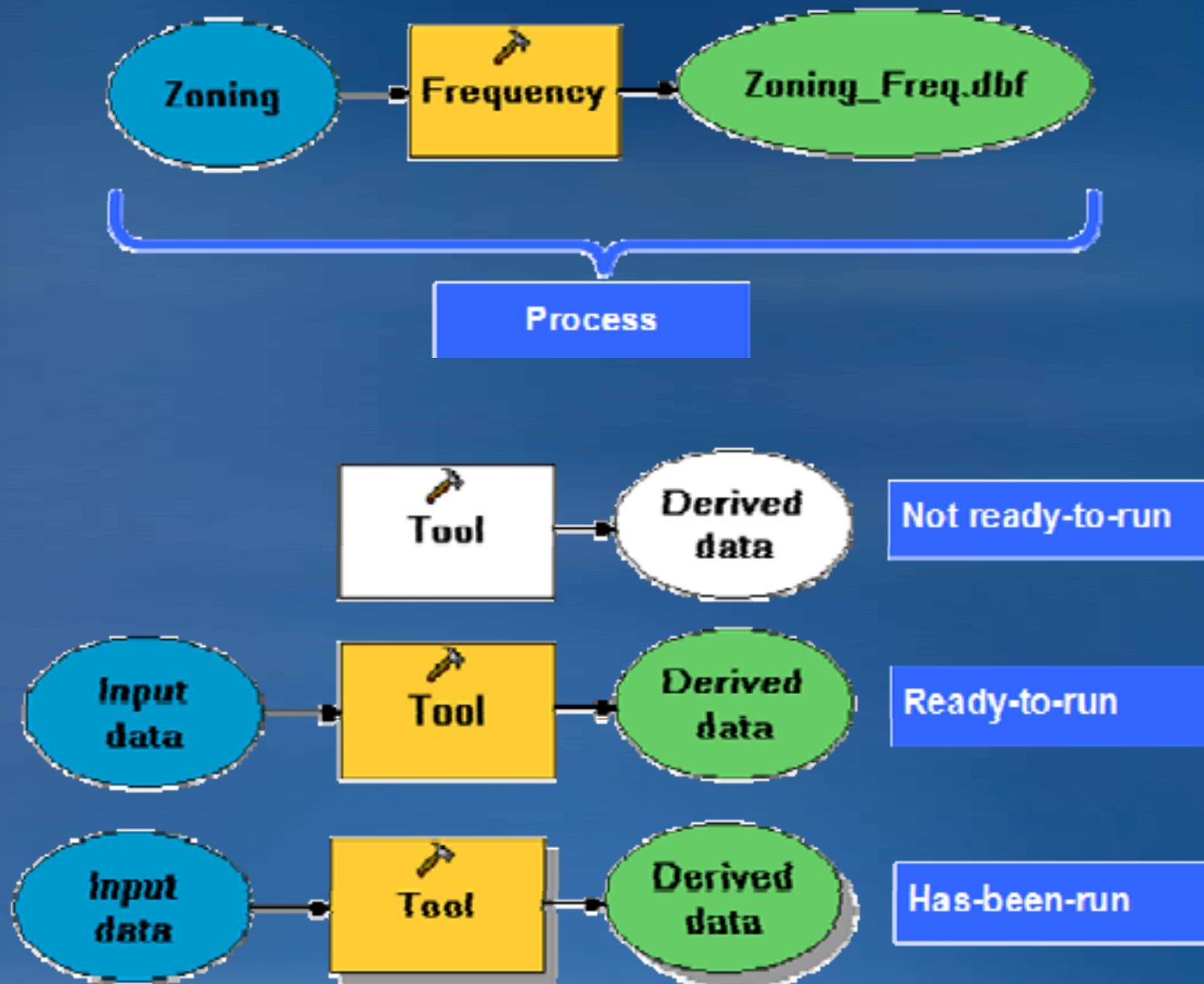


Elements can be:

- Copied/pasted within the same model, and other models
- Deleted - remaining elements become “not ready to run”
- Renamed - only changes the label not the name
- Disconnected from a tool (exception: derived data variables)

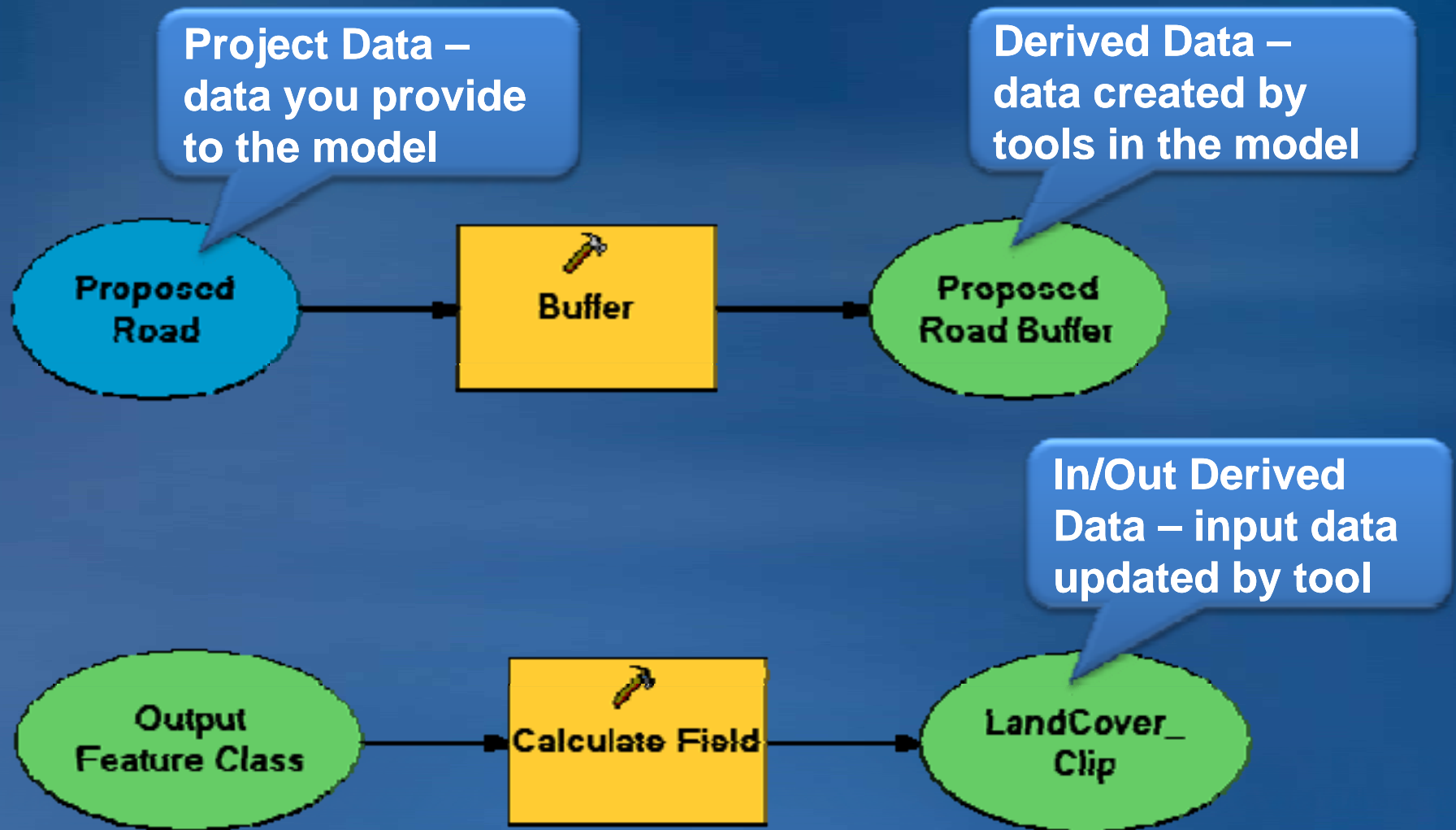
Demo Review

Model process and process states



Demo Review

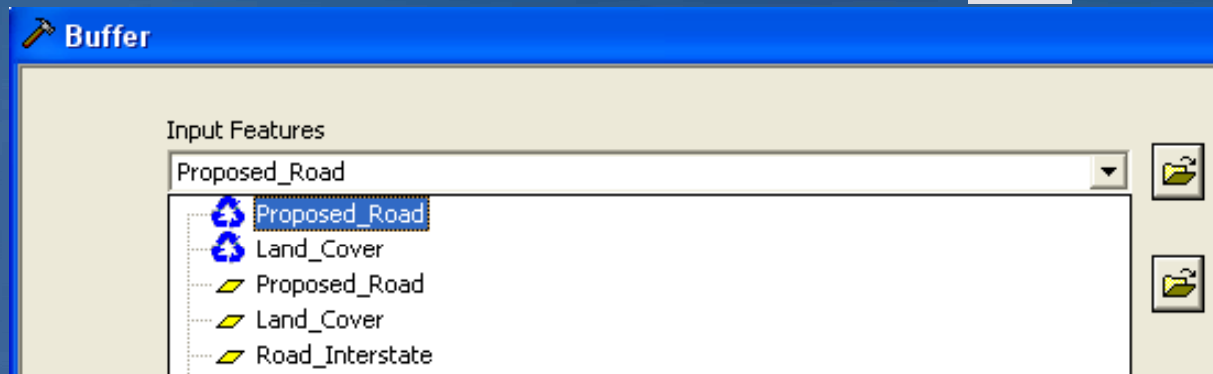
Derived data



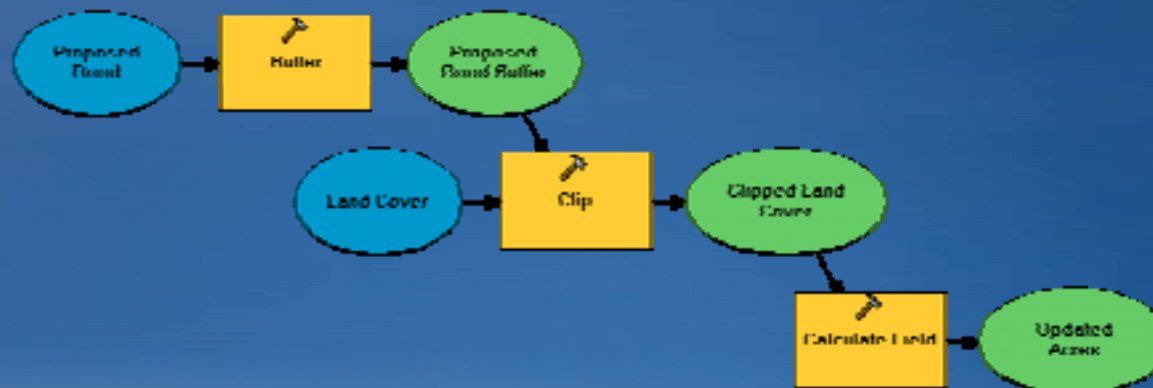
Demo Review

Connecting data and processes

- There are two ways you can connect data elements to tool elements, either by using the Connect tool  or the tool's dialog



- To connect processes, connect the output of one process to the input of another



Demo Review

Execution messages

Status messages can be viewed in:

- Progress dialog and Command Line window (if opened)
- Right-click on process and View Messages
- Reports

For each model, it shows:

- The parameter values specified
- The time the tool was run
- The status of the execution
- The time the tool finished executing
- Execution errors messages

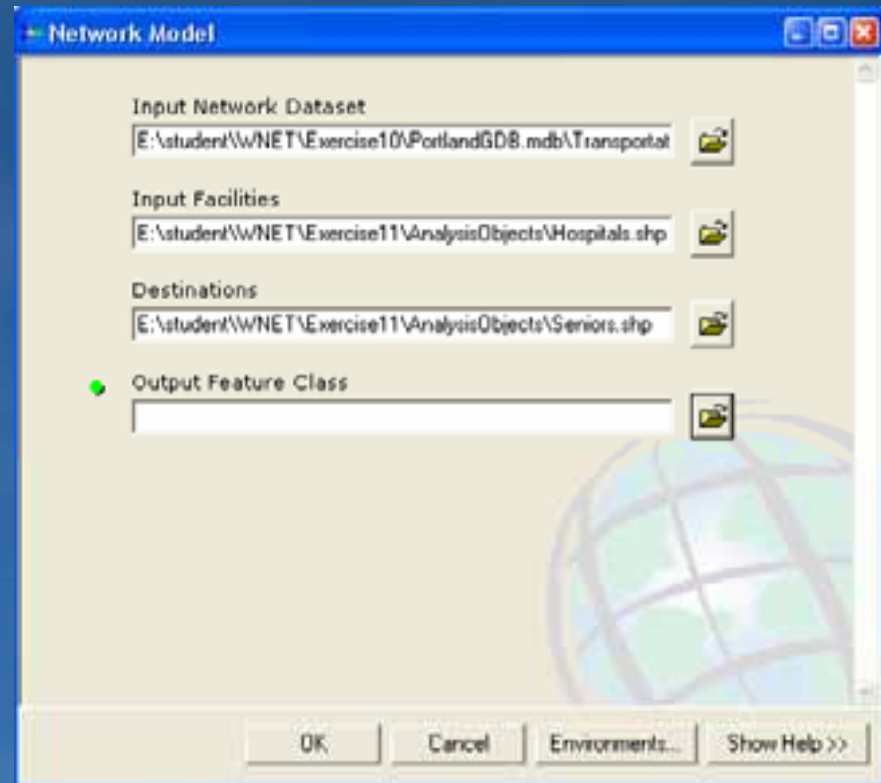
Demo 2

- Run the model from ArcToolbox
- Create and use parameters
- Changing model properties

Running a model

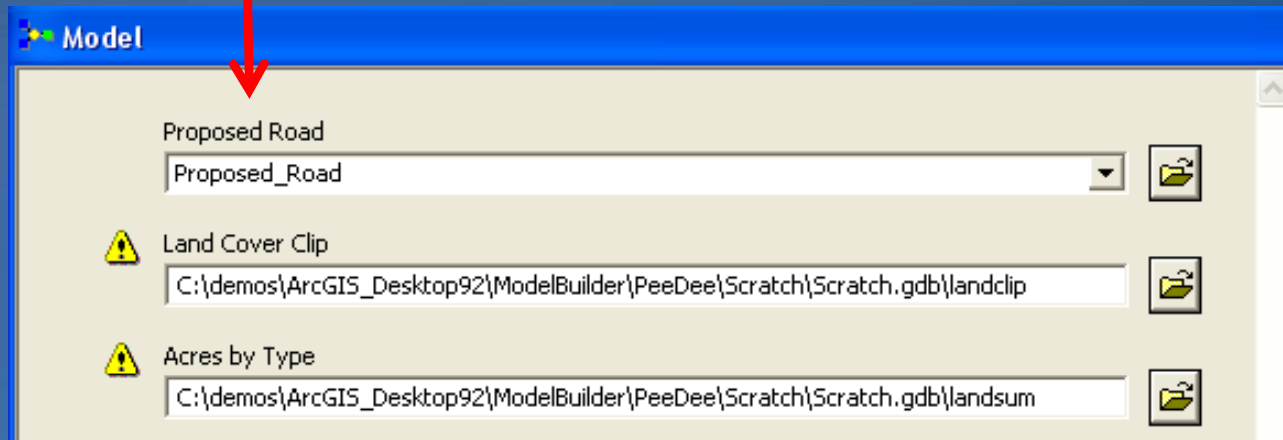
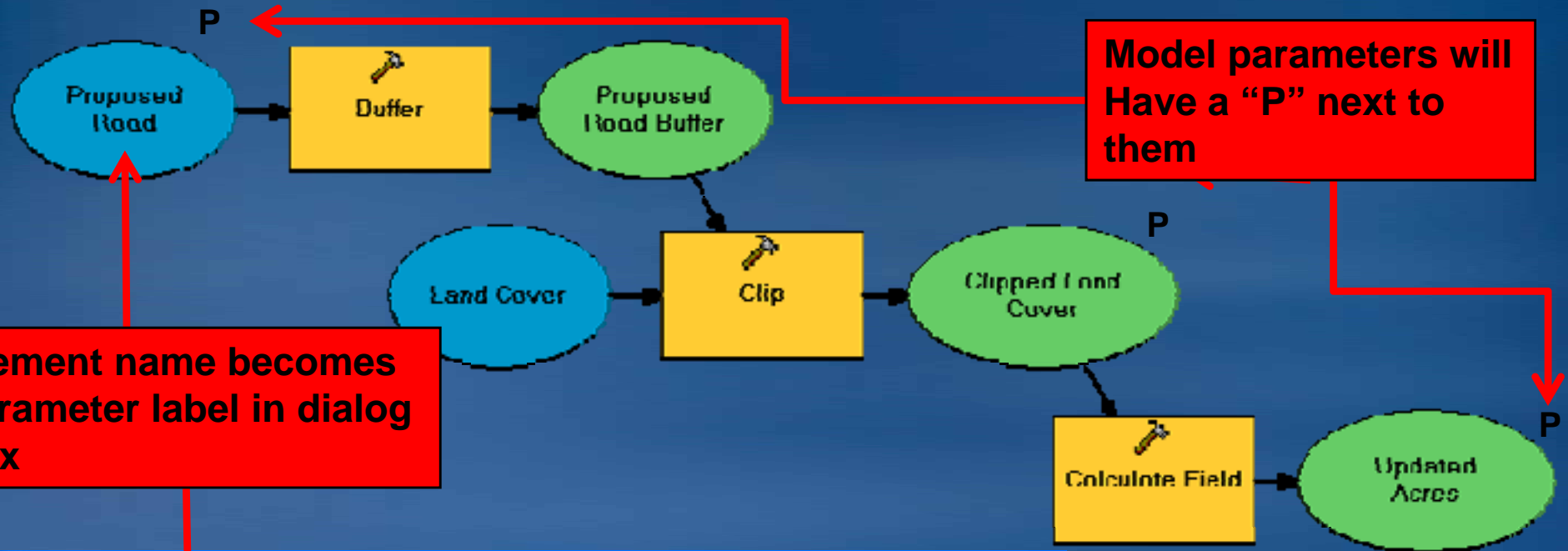
From a dialog box

- Double-click on the model from ArcToolbox
- If there are no model parameters, just click OK in the dialog
- If there are model parameters, populate what is required, then click OK to run the model



Demo Review

Model parameters

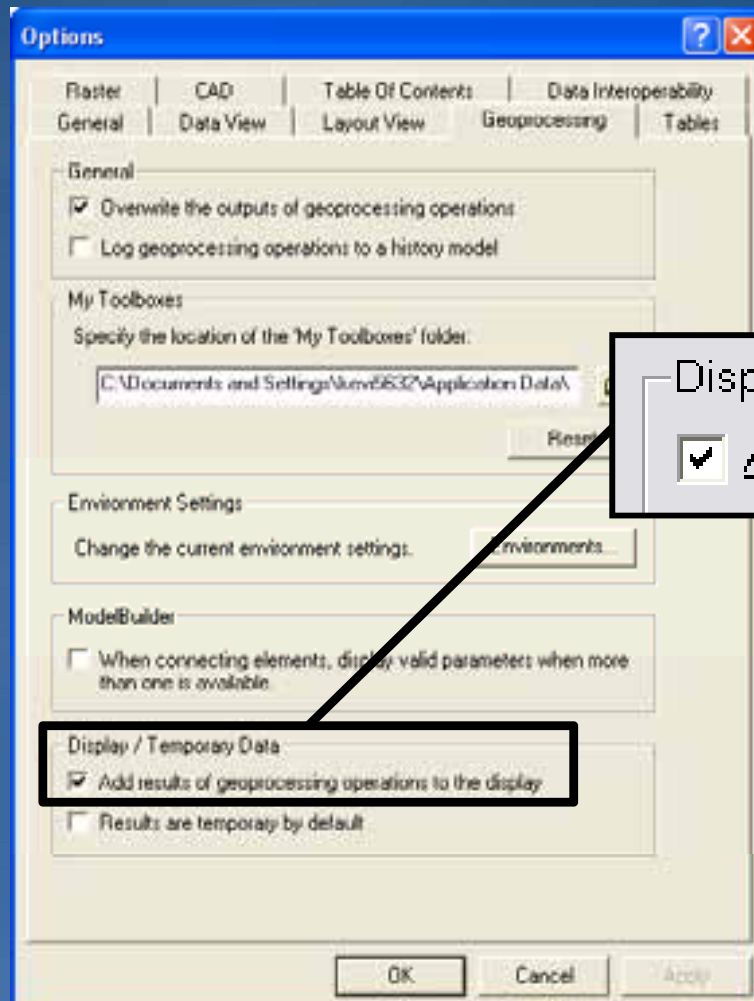


Demo Review

Adding Results

Tools > Options > Geoprocessing tab > Add results...

- All OUTPUT parameters will be added to map

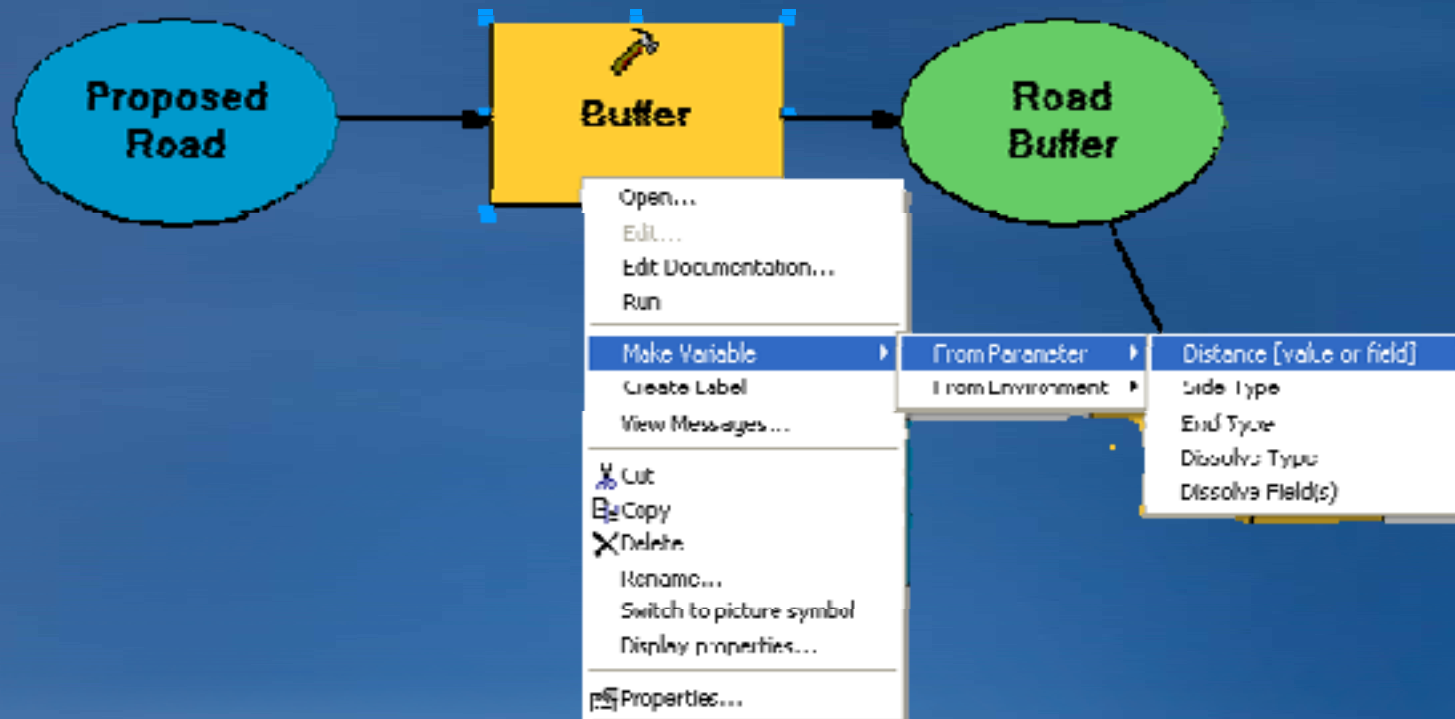


Display / Temporary Data

- ☒ Add results of geoprocessing operations to the display

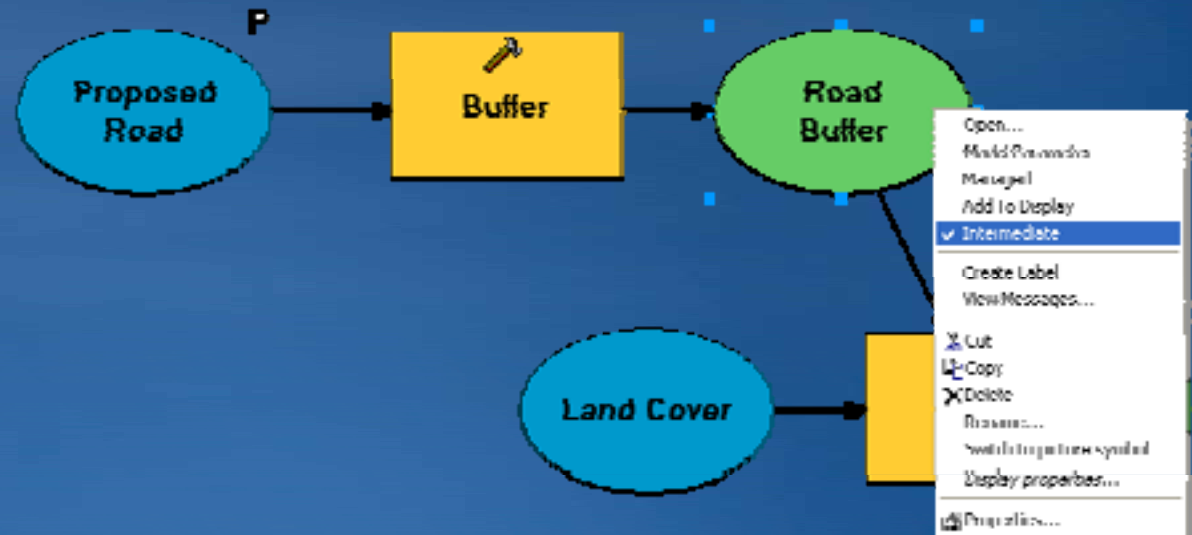
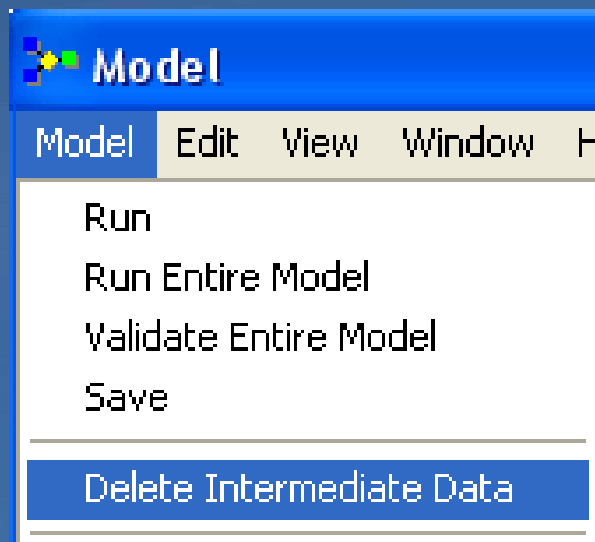
Making variables

- **ModelBuilder will create a variable for all input datasets**
 - You decide which tool arguments to expose as variables
 - Any variable can be made a model parameter
- **Right-click tool: Make Variable > From Parameter**
 - Then set variable as a model parameter



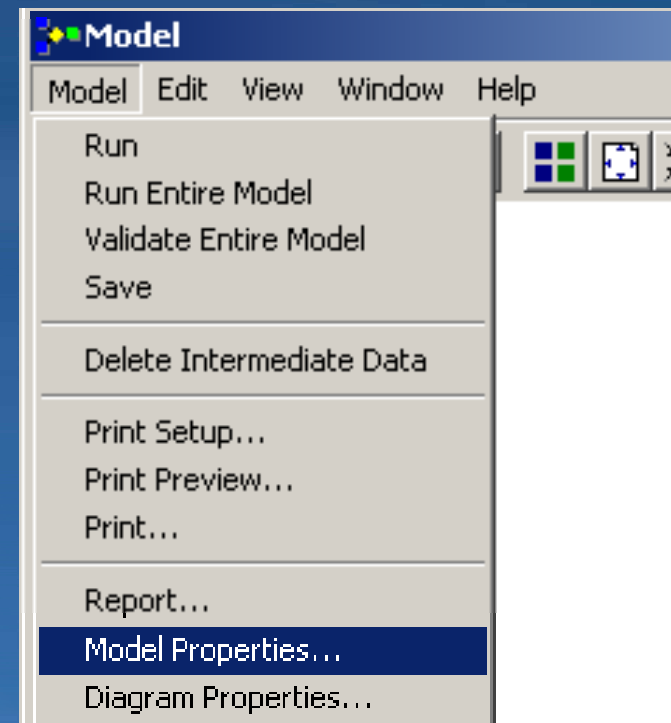
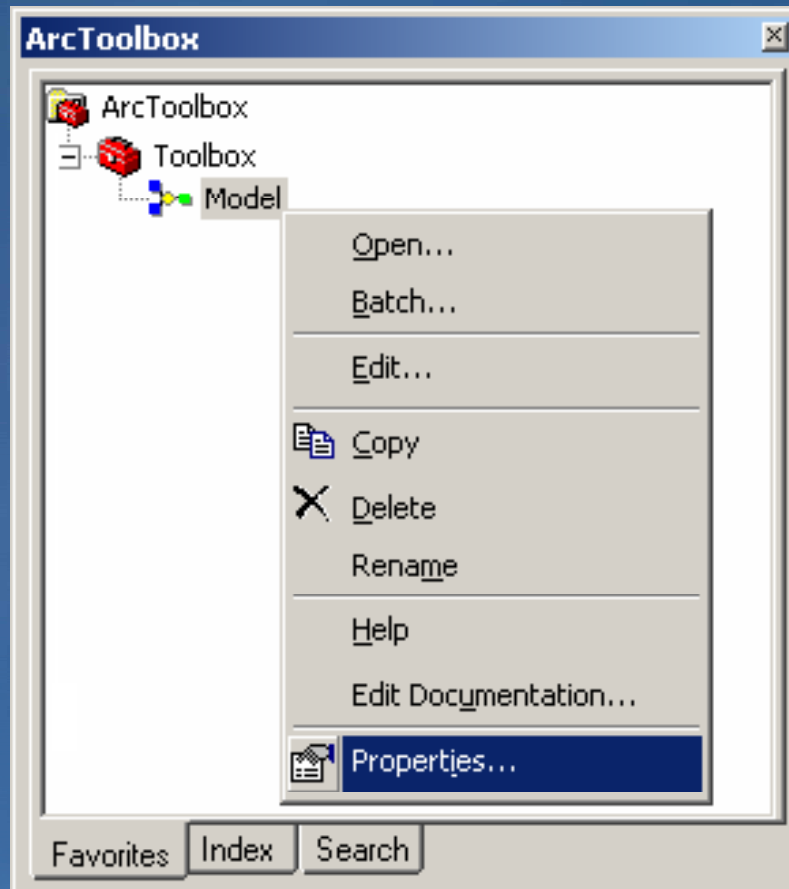
Intermediate data

- You decide to how to handle intermediate data
- Data marked as intermediate:
 - Is deleted after model run as a dialog from ArcToolbox
 - Is flagged but NOT deleted automatically if model is run from ModelBuilder window



Model properties dialog

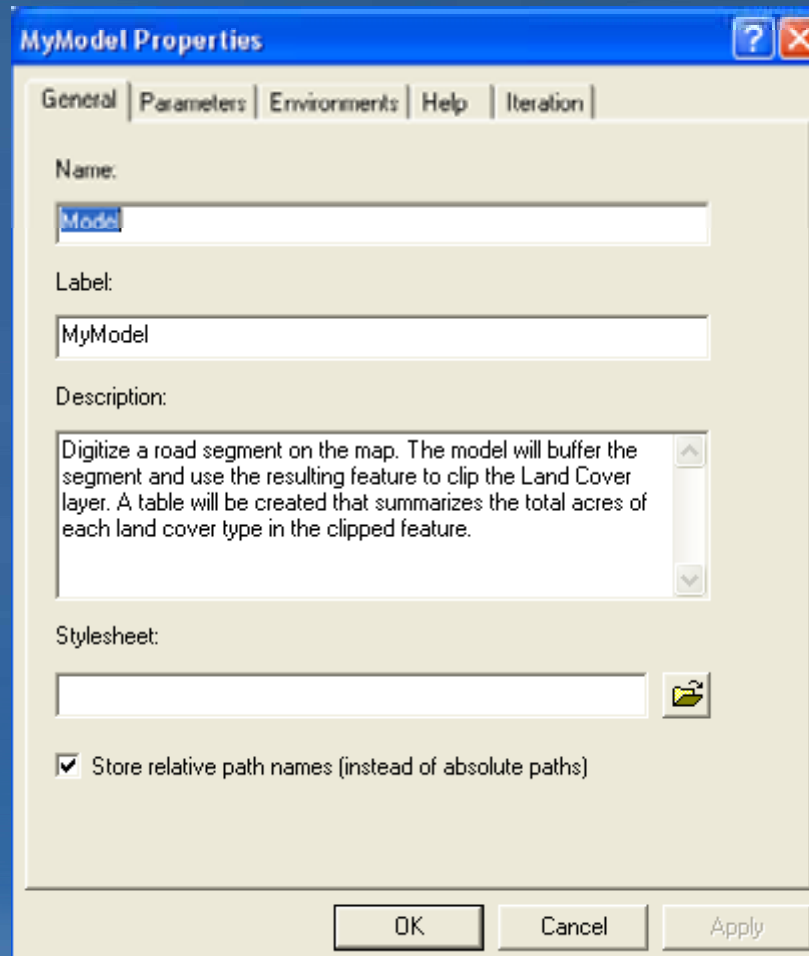
- Choose Model Properties on the tools context menu, or
- In the MB window: Model menu > Model Properties



Model properties

General

- Modify the name, label, description, and style sheet
- Specify relative vs. absolute paths



The screenshot shows the 'MyModel Properties' dialog box with the 'General' tab selected. The dialog has a title bar with a question mark and a close button. Below the title bar are tabs for 'General', 'Parameters', 'Environments', 'Help', and 'Iteration'. The 'General' tab contains the following fields:

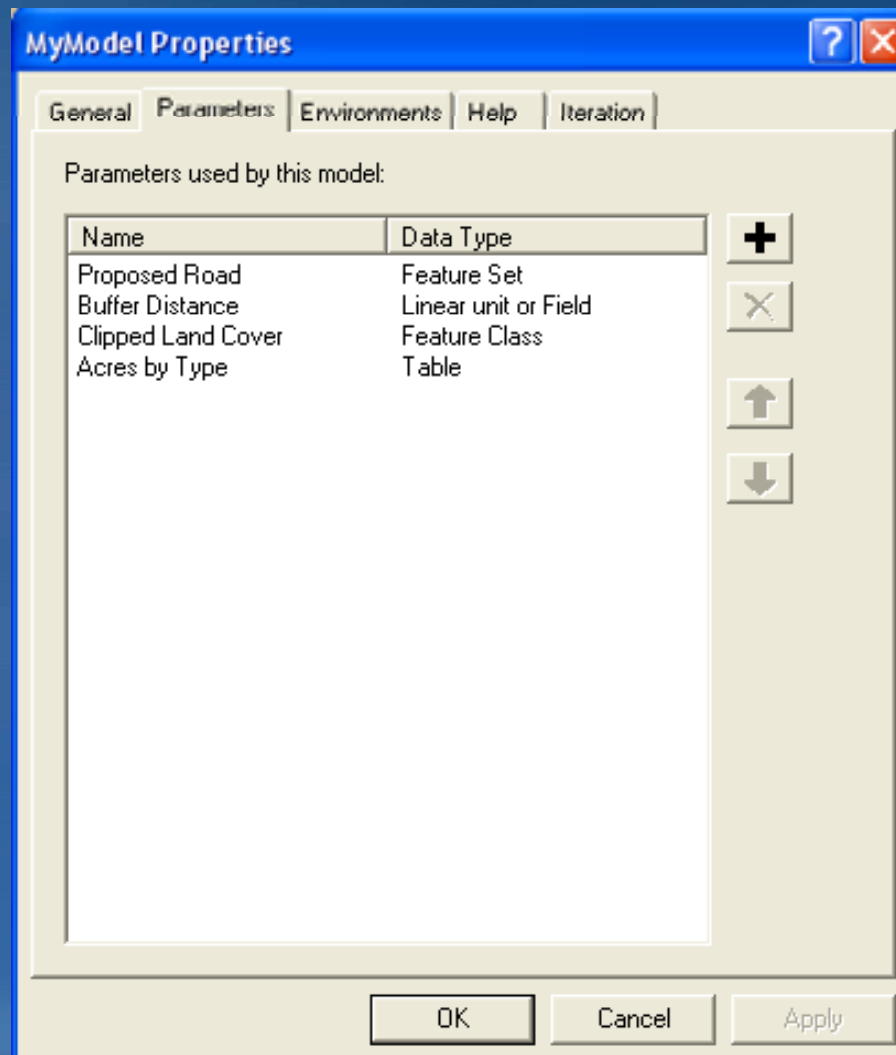
- Name:** A text box containing 'Model'.
- Label:** A text box containing 'MyModel'.
- Description:** A text area containing the text: 'Digitize a road segment on the map. The model will buffer the segment and use the resulting feature to clip the Land Cover layer. A table will be created that summarizes the total acres of each land cover type in the clipped feature.'
- Stylesheet:** A text box with a folder icon button to its right.
- ☒ Store relative path names (instead of absolute paths)

At the bottom of the dialog are three buttons: 'OK', 'Cancel', and 'Apply'.

Model properties

Parameters

- Add, remove, or change the order of exposed parameters



Demo 3

- **Add Feature Set input**
- **Symbology**
- **Sharing Tools**

Feature sets and record sets

- **Interactive input of features**
 - **Example: Allow the user to click a point on the map to buffer rather than using a point feature class as an input**
- **Stored “in memory”**
- **Schema taken from existing data or layer**
 - **Feature type**
 - **Fields**
 - **Must have a schema**

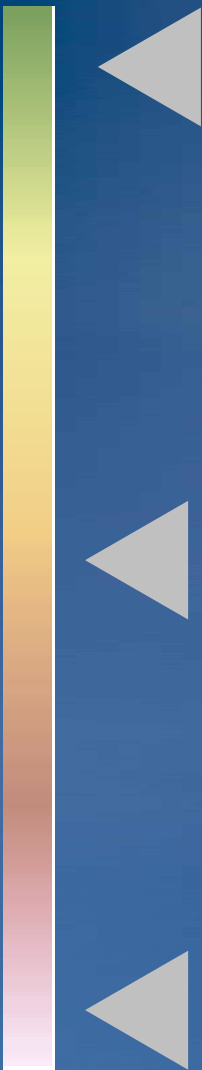
Symbology

- Derived from layer file (.lyr)
- Used for result



Sharing tools

How data is used in the tool

- 
- All variables have values. Can be run w/in ModelBuilder (all processes ready-to-run). All data accessible.
 - Data conversion tool that expects a certain file format and always writes to same location.
 - Some data variables have values. The data is accessible. Cannot be run within ModelBuilder (some processes not-ready-to-run)
 - User enters an address, a five-mile buffer around address created and used to clip known data.
 - Completely generic – no data variables have values. Cannot be run within ModelBuilder
 - Like a system tool that takes any dataset.

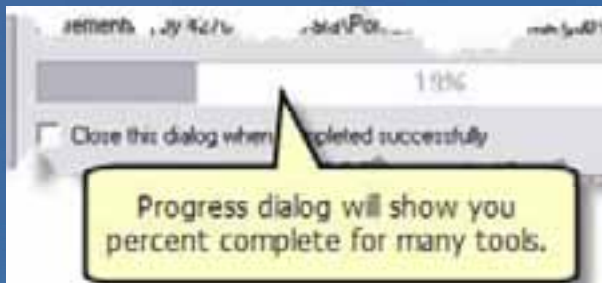
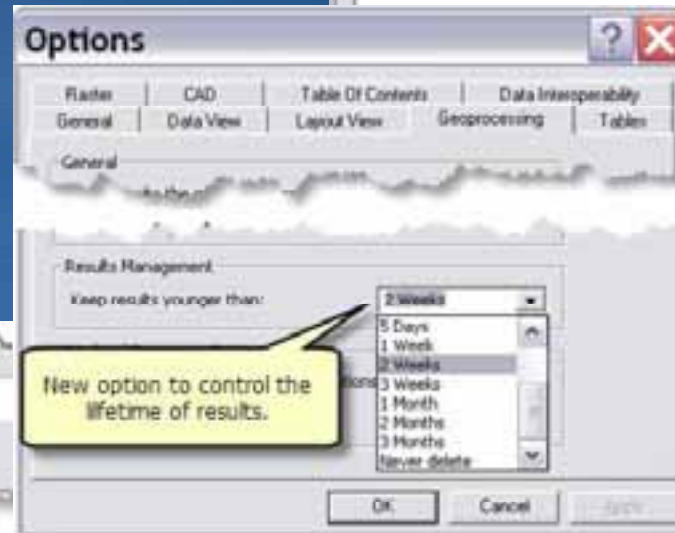
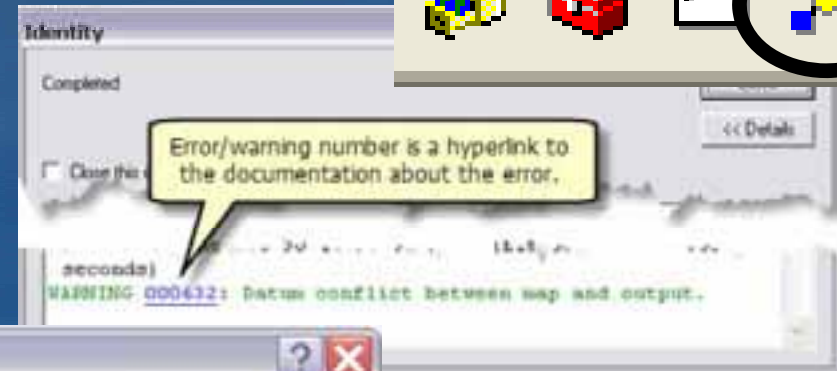
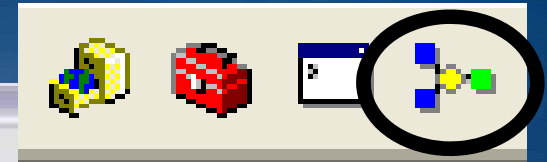
Performance Tips

Helping your models

- Use “in-memory” workspace
 - in_memory\feature
- Avoid coordinate transformations
- Add attribute/spatial indexes
- Reduce data size
- Use ESRI GRID raster format

New at 9.3

- Start ModelBuilder button on Standard Toolbar in Desktop
- Improved Error Messages
- Results Management
- Progress Bar



ModelBuilder Support

- Online

<http://resources.esri.com/geoprocessing>

<http://arcscripts.esri.com>

ArcGIS Desktop online help

- Virtual Campus

Geoprocessing using ModelBuilder*

Geoprocessing CAD data with ArcGIS*

Author & Publishing Geoprocessing Services*

Geoprocessing with ArcGIS Desktop

Getting Started with Scripting in ArcGIS 9*

- Instructor-Led

Introduction to ArcGIS II

Advanced Analysis with ArcGIS

Introduction to GP Scripts with Python

Writing Advanced GP Scripts with Python

* free course

