Esri Developer Summit

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esri.com/events/devsummit

Building tools with ModelBuilder

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Questions for you

- How many Developer Summits have you been to?
- Geoprocessing experience?
  - Little (rarely used)
  - Some (know the basics)
  - Advanced (build your own tools)
  - Guru (anointed or legendary?)
- Platform?
  - 9.3
  - 10.0
  - 10.1

Who are you? Analyst? Developer?

- Analyst:
  - Solves the GIS problem
  - “Need to summarize this stuff by these polygons”
- Developer:
  - Solves the software / system problem
  - “We need to run this model on a whole bunch of different data”
  - “We need a tool to do <blah>”
- You’re probably both an Analyst and a Developer, right?

Why create tools with ModelBuilder?

- Quick and easy
- Great for prototyping
- If you are building script tools, having a deeper understanding of ModelBuilder makes you a much better script tool developer
  - Understand how users will use your script tools in MB
  - Instead of a monolithic script tool, develop ‘utility’ tools for use in ModelBuilder

Macros versus Tools

- A macro is tied to a specific set of data
  - A layer with a particular name (“Streets”), geometry type (lines), fields (“CFCC”, “Meters”)
  - In order to work on another set of data, either the macro code or data must be changed
- A tool parameterizes data
  - It is not hard-coded to a particular set of data
  - It must react accordingly (work with any data)

New at 10.1 – Geoprocessing Packages

- Right-click a result and choose Share As > Geoprocessing Package
- Result contains everything needed to package
- Packages are how you can deliver macros
  - Package includes all data, all tools… everything that's needed

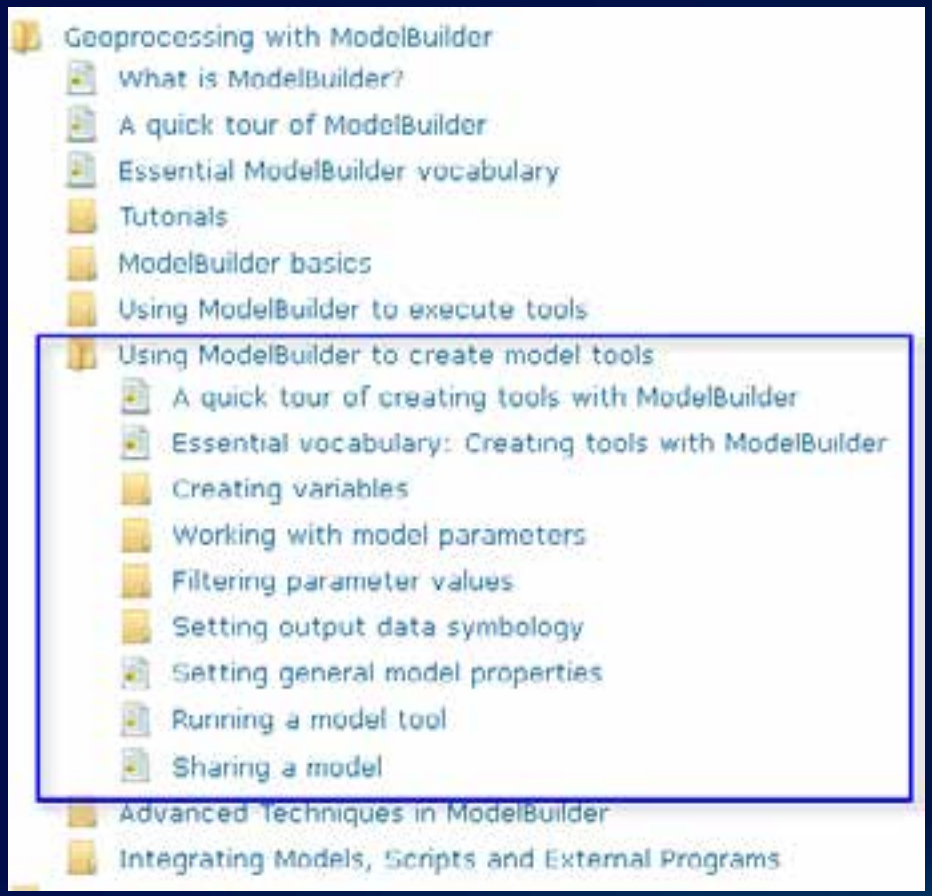
Macros and tools in ArcGIS

- You can create macros with:
  - ModelBuilder
  - Python Window
- You can create tools with:
  - ModelBuilder
  - Python Scripts
  - ArcObjects
- Tools that you create are called *custom tools*
  - …and are found in custom toolboxes that you create

Today’s agenda – the basics of

- Turning a model macro into a model tool
  - All about model parameters
- Feature sets
  - Interactive entry of features
- Variable substitution
- Branching & conditional execution

Help topics



- **(10.0 site)**
  - **http://help.arcgis.com/en/arcgisdesktop/10.0/help**
- **(10.1 site)**
  - **http://resourcesbeta.arcgis.com/en/help/main/10.1**
  - **Coming soon: drop ‘beta’ from address**

Demo: basics making a model tool from a model macro

Demo review

- Creating *model* parameters
- Making variables from tool parameters
  - Which become model parameters
- Specifying output symbology
- Removed default values in variables
  - Doesn’t run in MB, only as tool
- Environments
- Filters
- A small utility script tool to circumvent tool behavior

Demo review: ModelBuilder has a split personality

- ModelBuilder used in two modes:
  - Create a macro
  - Create a tool

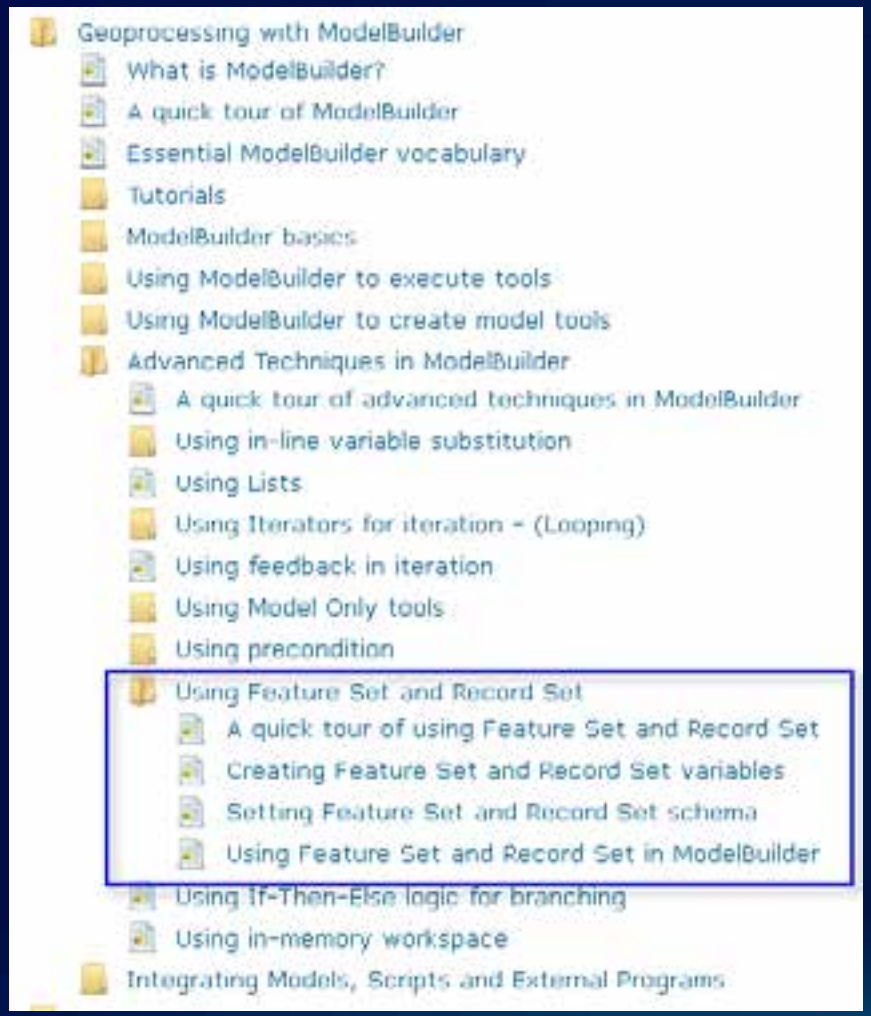
Feature Sets

Interactive entry of features

Feature and record sets

- Interactive input of features and their attributes
- Interactive input of table rows

Feature & Record set documentation



Demo: Feature Sets

Demo review

- Any tool that accepts a feature class or feature layer can be made to use a Feature Set
- To create a Feature Set
  - Right-click existing variable and change data type, or
  - Create new variable
- Feature sets have a schema that defines
  - Fields
  - Symbology
- Use the Copy Features to copy the in-memory feature set to disk

Variable substitution

%percent%percent%

Variable substitution

- Primarily used for:
  - Building expressions
  - Specifying output data location

Variable substitution documentation

- Geoprocessing with ModelBuilder
  - What is ModelBuilder?
  - A quick tour of ModelBuilder
  - Essential ModelBuilder vocabulary
  - Tutorials
  - ModelBuilder basics
  - Using ModelBuilder to execute tools
  - Using ModelBuilder to create model tools
  - Advanced Techniques in ModelBuilder
    - A quick tour of advanced techniques in ModelBuilder
    - Using in-line variable substitution
      - A quick tour of using inline variable substitution
      - Examples of inline model variable substitution
      - Examples of inline model variable substitution with environment settings
      - Examples of in-line variable substitution with ModelBuilder system variables
    - Using Lists
    - Using Iterators for iteration - (Looping)
    - Using feedback in iteration
    - Using Model Only tools
    - Using precondition
    - Using Feature Set and Record Set
    - Using If-Then-Else logic for branching
    - Using in-memory workspace
  - Integrating Models, Scripts and External Programs

Demo: Variable substitution

Demo review

- Used substitution in a select expression
  - So that your user doesn't have to build an expression
- Used a Value List filter to present a choice list
- Showed the Make Feature Layer with the Select Layer By <Attribute / Location> pattern
  - This pattern used a *lot* in model tools
- Unless the variable is a number, you'll want quotes outside the percents
  - "%Fire Station Name%"

New at 10.1 – scratchGDB and scratchFolder

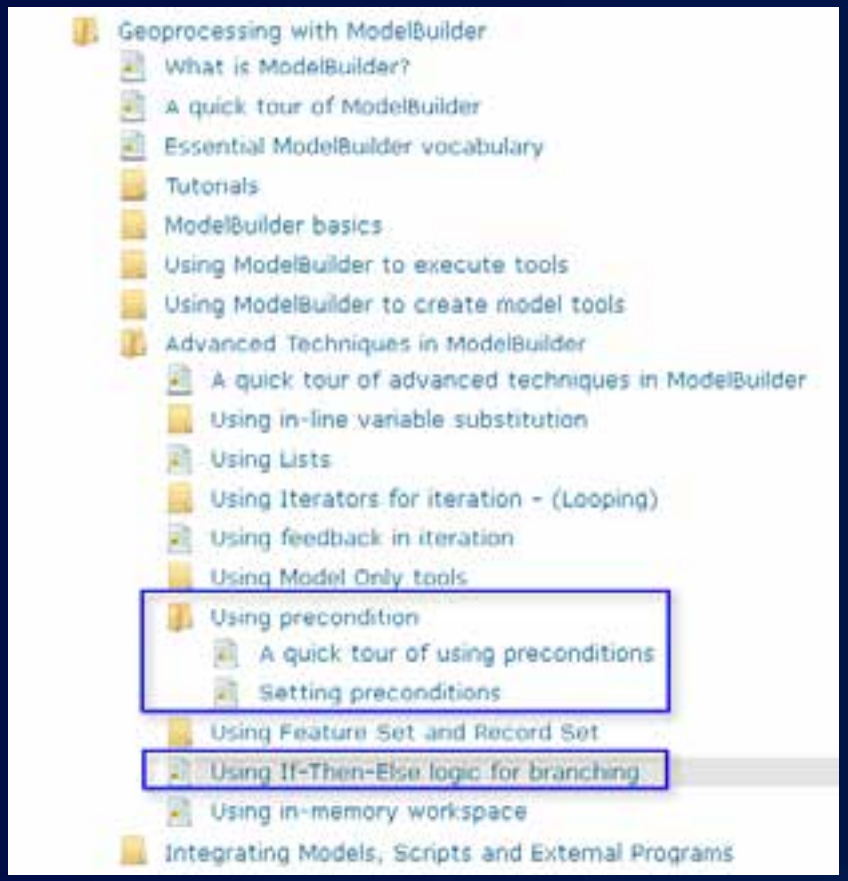
- **scratchGDB:**
  - **A file geodatabase that is guaranteed to exist and be writeable when your tool runs**
- **scratchFolder:**
  - **A system folder that is guaranteed to exist and be writeable when your tool runs**
- **You cannot change the location (read-only environment)**

Branching

Branching uses Preconditions

- Precondition is a connection between a variable and a tool
  - Tool will execute only if the variable evaluates to TRUE
- Three general classes of variables:
  - Boolean
  - Numbers (0 = false, anything else = true)
  - Everything else – variable must have a valid (non-empty value)

Branching documentation



- **Five part blog series on if-then-else (branching):**
  - **http://blogs.esri.com/esri/arcgis/2011/09/29/modelbuilderifthenelsepart5/**
  - **(this is part 5; has all the links to part 1 thru 4)**

Demo: Branching

Demo Review

- Used Calculate Value to output a Boolean variable
  - This Boolean used as precondition
- Showed Managed parameters
  - Managed parameters don’t show up on dialog
- Used Merge Branch to determine what to output
- Created a choicelist and branched on the choice
  - See *Conversion toolbox > Metadata toolset > Import Metadata* for another example

Other model-only tools

- **Parse Path**
  - Given a pathname, return its components
- **Get Field Value**
  - Returns the value of a field in a table – first record only
  - Sample use: Summary Statistics, find MAX of a field, use Get Field Value to retrieve the value
- **Select Data**
  - Returns a child element
- **Collect Values**
  - Creates a multivalue, mainly used with iteration

Demo: Using Get Field Value

Documenting tools

- Right-click your tool and click Item Description
- Content is used:
  - To generate side panel help
  - Full help documentation
- New at 10.1 – side-panel help image

Questions?

esri.symbol.
new dojo.Color([0,0,
polySymbol
feature.setSy
}
else if(f == 1) {
var polySymbolGreen.setoutlin
polySymbolGreen.setOutlineSymbol(esri.symbo
symbol.SimpleLineSymbol(esri.symbo
.Color([0,0,0,0.5]), 1));
polySymbolGreen.setcolor(new dojo
ature.setSymbol(polySymbolGreen);
2) {
blue = new esri.symbol.simp
setoutline(new
esri.symbol).SimpleLineSymbol
new dojo.Color([0,0,255,0
blue);

esri