



Esri International User Conference | San Diego, CA
Technical Workshops |

Building tools with ModelBuilder

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Session evaluation – on-line

- www.esri.com/sessionevals

Questions for you

- **How many User Conferences 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

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?

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)

http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#35;/A_quick_tour_of_creating_custom_tools/0015000000100000/

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

http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#/A_quick_tour_of_creating_tools_with_ModelBuilder/00150000001t000000/

http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#/Tutorial_Creating_tools_with_ModelBuilder/00150000001v000000/

Why create tools?

- **Reuse**
 - Use like a system tool – in models and scripts
 - No need to alter data or code (model) to make it work
- **Sharing**
 - Works with your user's data without modification
- **Geoprocessing services**
 - For web clients
- **Productivity**
 - Build your own libraries

Today's agenda – the basics of

- Turning a model **macro** into a model **tool**
 - All about model parameters
- Other techniques you need to know
 - Feature sets (Interactive entry of features)
 - Variable substitution
 - Branching & conditional execution
- Many of these techniques apply to macros as well
 - Start on the road to ninja-hood...

Demo: basics making a model tool from a model macro



Demo review

- **Creating model parameters**
- **Making variables from tool parameters, making variables model parameters**
- **Specifying output symbology**
- **Removing default values in variables**
 - Doesn't run in ModelBuilder, only as tool
- **Intermediate data**
- **Environments**
- **Filters**
- **A small utility script tool to really polish the tool**

Help topics of interest

- http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#/A_quick_tour_of_creating_tools_with_ModelBuilder/002w0000007m000000/
- http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#/Creating_model_parameters/002w0000003z000000/
- http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#/A_quick_tour_of_filtering_parameter_values/002w0000005t000000/
- http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#/A_quick_tour_of_setting_output_data_symbology/002w0000005v000000/
- http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#/A_quick_tour_of_managing_model_environments/002w0000005n000000/

Demo review: ModelBuilder has a split personality

- ModelBuilder used in two modes:
 - To create a **macro**
 - To 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

http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#/A_quick_tour_of_using_Feature_Set_and_Record_Set/002w00000023000000/

Demo: Feature Sets

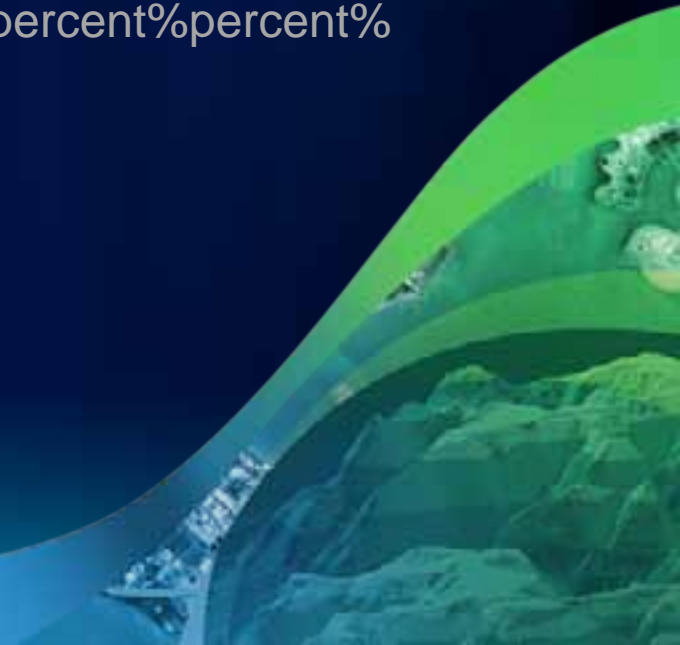


Demo review

- 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 tool** to copy the in-memory feature set to disk

Variable substitution

%percent%percent%



Variable substitution

- **Primarily used for:**
 - **Building expressions**
 - **Specifying output data location – using workspace and scratchworkspace environments**

http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#/A_quick_tour_of_using_inline_variable_substitution/002w0000001t000000/

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%"**

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)

• http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#/A_quick_tour_of_using_preconditions/002w0000007r000000/

• http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#/Using_If_Then_Else_logic_for_branching/002w00000022000000/

Demo: Branching



Demo Review

- Used **Calculate Value** to output a Boolean variable
 - This Boolean used as precondition
- Used 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

http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#/A_quick_tour_of_using_Model_Only_tools/002w00000020000000/

Demo: Using **Get Field Value**



Demo: Model calling Model



Documenting tools

- Right-click your tool and click Item Description
- Content is used:
 - To generate side panel help
 - Full help documentation

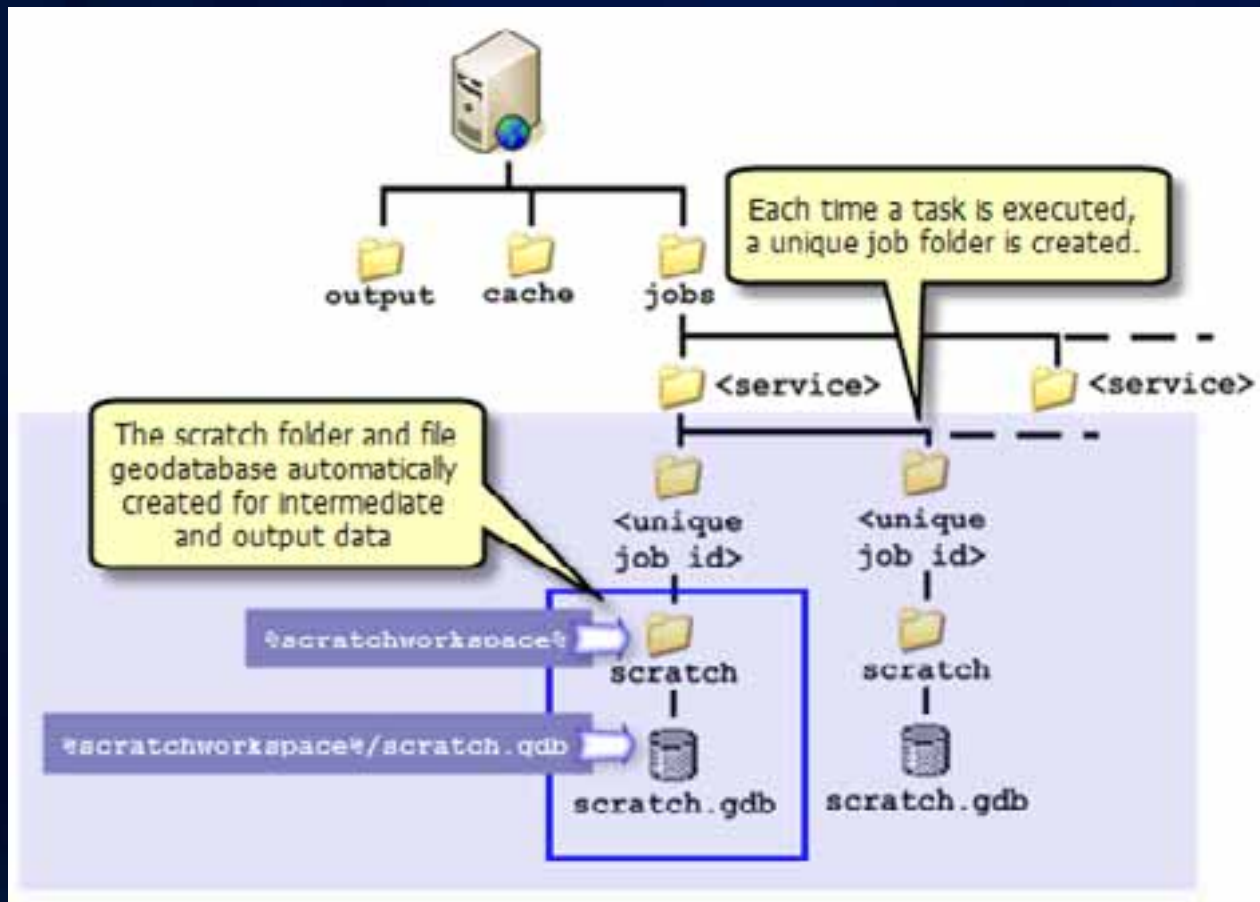
http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#/A_quick_tour_of_documenting_tools_and_toolboxes/001500000014000000/

Geoprocessing services

- **Geoprocessing services are model or script tools**
- **Use ModelBuilder to configure the service**
 - **Decide what parameters to expose with the service**
 - **Convert Feature Classes and Feature Layers into Feature Sets**

Geoprocessing service – the sandbox

Use `%scratchworkspace%` or `%scratchworkspace%/scratch.gdb` for all outputs



Web Clients only have a few simple data types

Service Parameter Type	Corresponding JavaScript object	Corresponding Model variable type
GPBoolean	boolean	Boolean
GPDataFile	<u>DataFile</u>	File
GPDate	<u>Date</u>	Date
GPDouble	Number	Double
GPFeatureRecordSetLayer	<u>FeatureSet</u>	Feature Set
GPRecordSet	<u>FeatureSet</u>	Record Set
GPLinearUnit	<u>LinearUnit</u>	Linear Unit
GPRasterData	<u>RasterData</u>	Raster Dataset
GPRasterLayer		Raster Layer
GPString	string	String

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Questions?





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