Using Scripts to Support SMCRA Business Processes

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Script

A script is a sequential list of instructions, usually stored in a file, which are interpreted and executed by another software application.

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Characteristics of Scripts

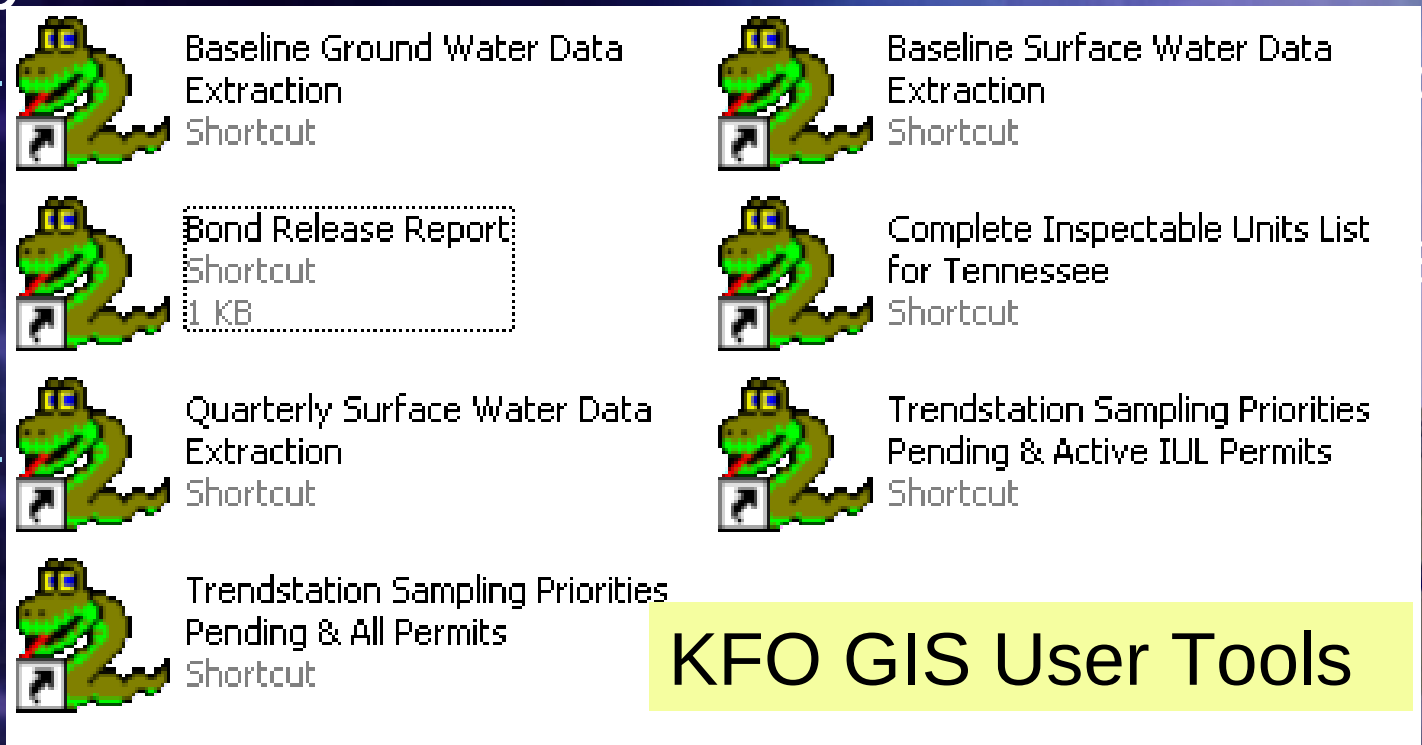
- Written in a software application's proprietary language or a utility language
- High degree of customization
- Interpreted environment allows "write and run" execution, no compiler required
- Requires less code and development time than system-level languages
- Easier for domain knowledge expert to learn than system-level language

Reasons to Use Scripts

- Automate repetitive tasks
- Rapid execution of complex tasks
- Standardize a manual process for consistent results
- Improve quality
- Increase reliability
- Increase productivity
- Save time

Automation Using Scripts

- ArcInfo Arc Macro Language (AML)
  - Geoprocessing using ArcInfo Workstation commands through AML processor
- Python
  -
  -



Scripting Examples

- Text Reports
  - Status Reports
  - Calculation Reports
- Dataset Production
  - Exporting data to various formats
  - Joining attributes from external data sources
  - Creating new datasets based on attributes
  - Deriving datasets for analysis

Status Reports

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Permits in FOCIS not in KFO GIS

The following is a list of Tennessee permits contained in FOCIS but not found in the digitized permits contained in KFO GIS on the date this report was prepared. Some IU numbers in FOCIS have been excluded from this report because they did not result in issuance of a permit. Excluded IU numbers are listed in the focis_permit_exceptions table of the General database in the KFO GIS SQL Server.

PERMIT	NAME OF COMPANY	NAME OF MINE
2183113	NATIONWIDE INC	AREA 3A
2183143	SIERRA ENERGY CORP	AREA 3
2184020	UNIVERSAL COAL CO	AREA 11
2184022	LAYTON P HOOD COAL CO	AREAS 3 & 4
2184024	BLACK MOUNTAIN MINING CORP	MINE #1
2184032	HELENWOOD ENERGY INC	AREA 15
2283119	F + M MINING CO	MINE #1
2283120	INDIAN FORK FUEL INC	MINE 1
2284016	MORGAN SPRINGS MINING CO INC	MINE #1

Calculation Reports

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Trendstation Sampling Priorities Using
Pending Permit Applications And Permits On Active Inspectable Units List

Selected stream locations in the coalfield of Tennessee are monitored for surface water quality by the Knoxville Field Office. This report lists these locations by the amount of coal mining activity within their respective watersheds.

Table 1. Trendstations with pending permit applications within their watershed boundaries.

Station	HUC-14 Stream Name	Longitude	Latitude	Score*
10-4	Hickory Creek	-84.075445	36.500485	8344.9
10-2	Tackett Creek	-84.005742	36.540161	6284.9
8-1C	New River	-84.321402	36.207972	3650.3
9-5	Big Creek	-84.128089	36.395311	1652.7
8-1B	New River	-84.322803	36.208938	1418.7
10-1A	Clear Fork Creek	-83.944564	36.553145	935.3
10-5A	Hickory Creek	-84.106522	36.493414	827.2
11-1B	Clinch River	-84.166263	36.214527	604.0
10-6A	Elk Fork Creek	-84.136173	36.589989	582.9
9-3	Cove Creek	-84.226461	36.306932	374.5
10-3	Stinking Creek	-84.14178	36.506209	340.7
10-1B	Clear Fork Creek	-83.946749	36.549486	191.6
9-5A	Big Creek	-84.127547	36.396878	91.9
8-1A	New River	-84.362942	36.283703	23.6
10-5	Hickory Creek	-84.044674	36.550417	22.8
11-32	Poplar Creek	-84.313879	36.048463	8.0

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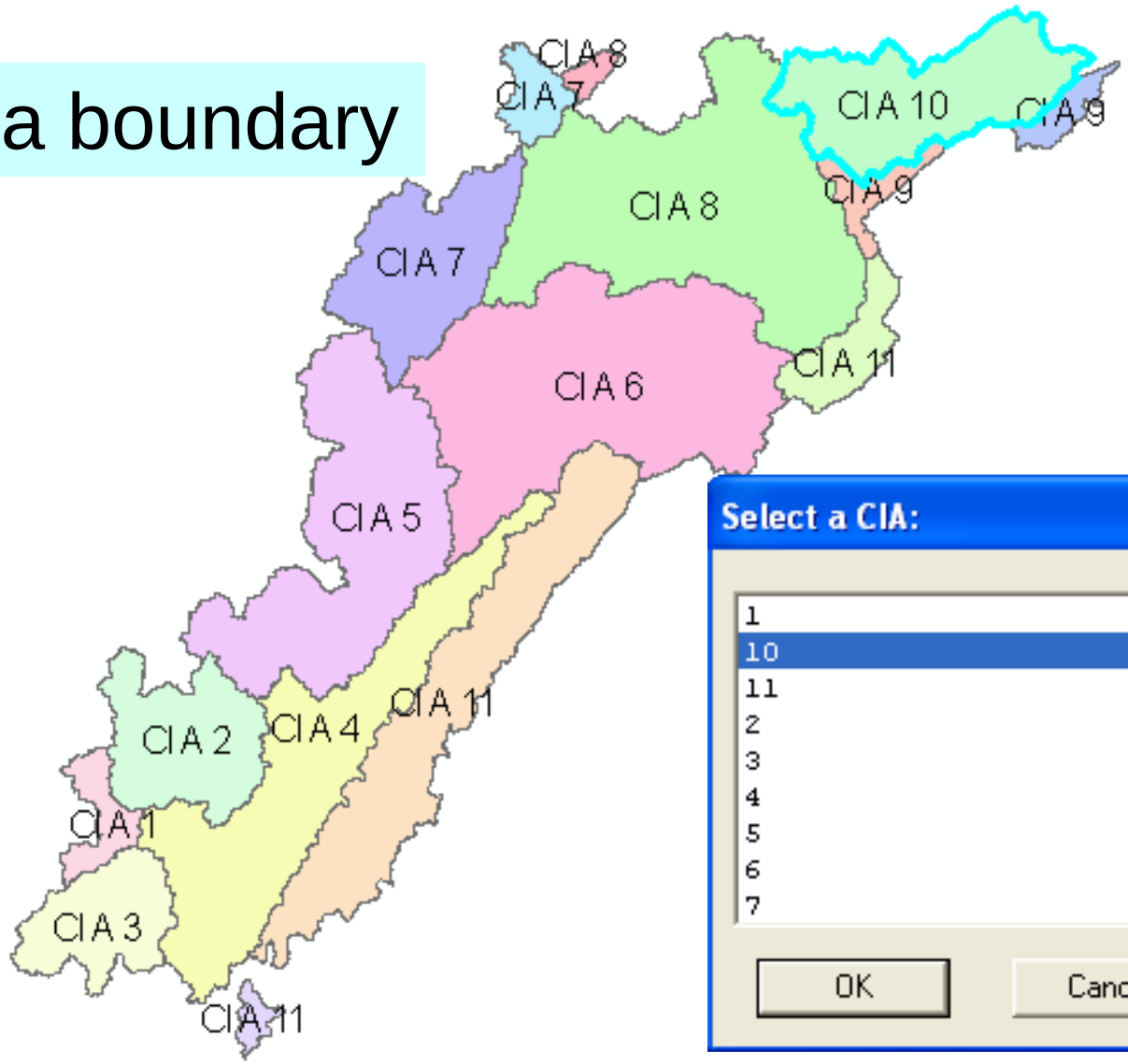
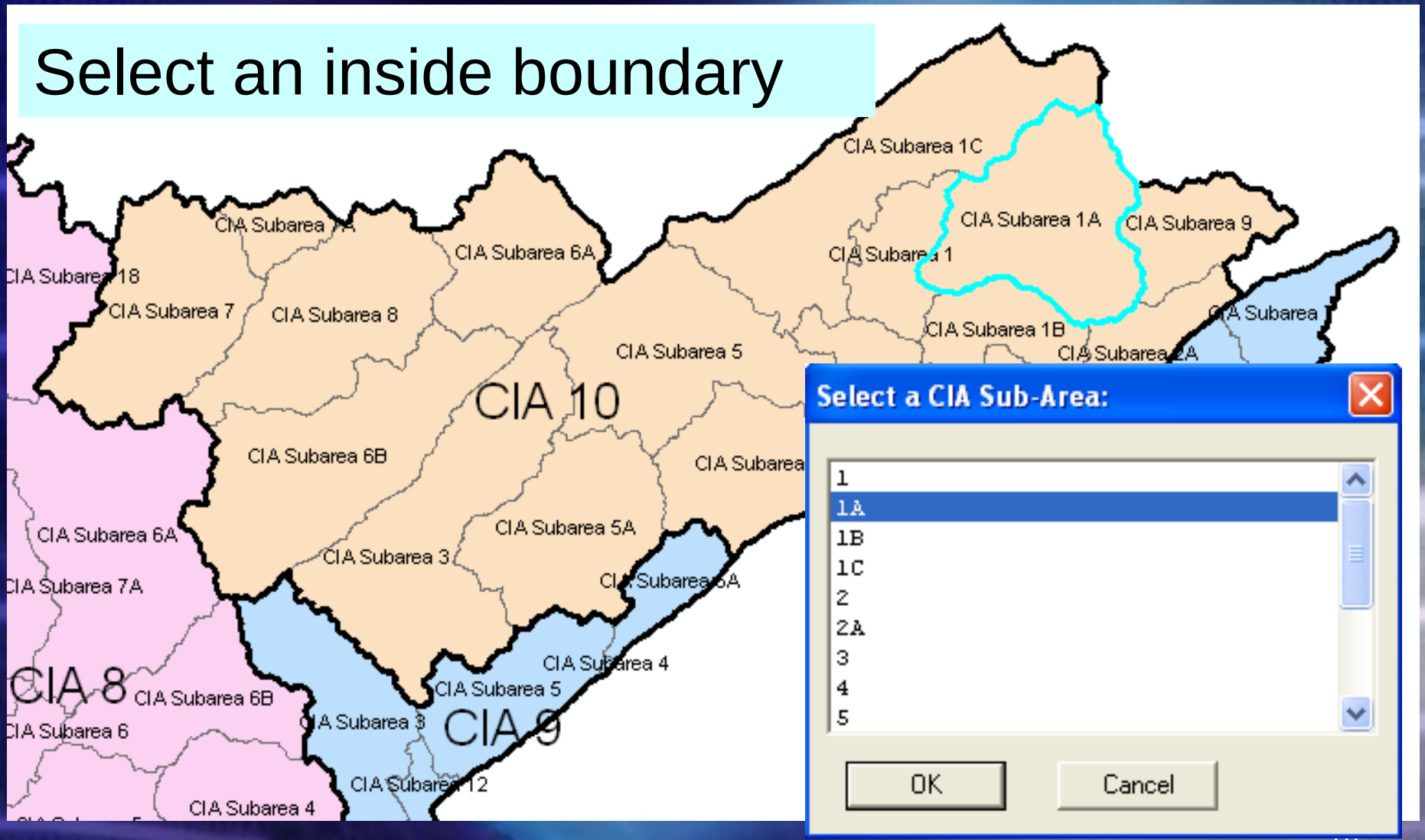
Dataset Production
Spatial Selection in a Script - 1

Select a boundary

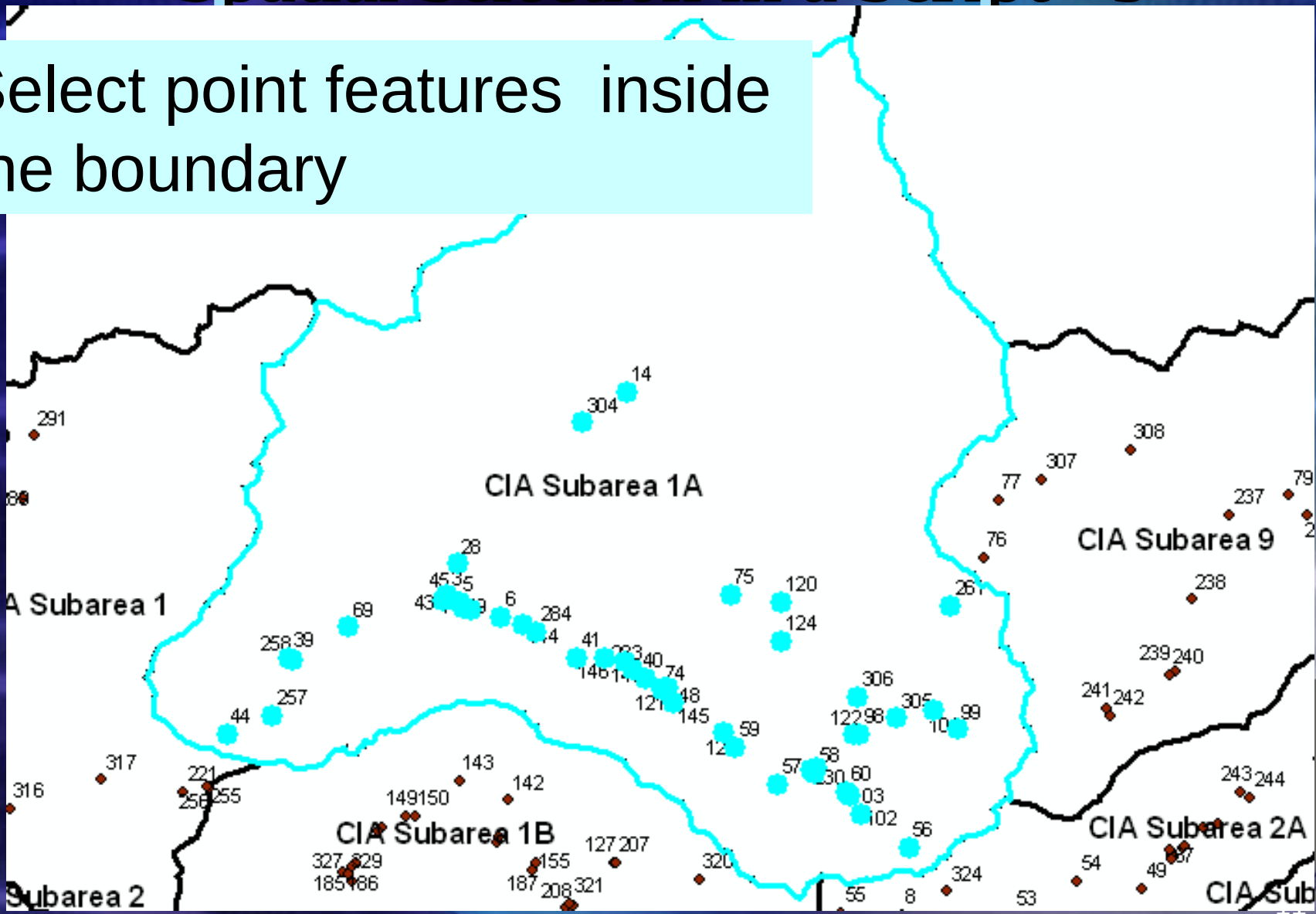


Dataset Production
Spatial Selection in a Script - 2



Dataset Production
Spatial Selection in a Script - 3

Select point features inside the boundary



Dataset Production
Exporting Spatially Selected Data

Excel spreadsheet containing surface water data

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	SITEID	PERMIT	LOCNAME	LOCDESC	STRMTYPE	PH	TDS	TSS	SC	FETOT	FEDIS	MNTOT	MNDIS
2	3	2519	SWIM-7	Stream	P	6.65	0.000	2.000	740.000	0.30	0.00	0.20	0.00
3	3	3011	CF-1	Stream	P	0.00	487.000	0.000	0.000	0.00	0.00	0.00	0.00
4	3	3011	CF-1	Stream	P	0.00	490.000	0.000	0.000	0.00	0.00	0.00	0.00
5	3	3011	CF-1	Stream	P	0.00	719.000	0.000	0.000	0.00	0.00	0.00	0.00
6	3	3011	VC16000	Stream	P	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00
7	3	3112	SWIM-3/R (CF-1)	Stream	P	8.20	0.000	6.000	625.000	0.34	0.00	0.12	0.00
8	3	3112	SWIM-3/R (CF-1)	Stream	P	8.20	0.000	8.000	470.000	0.17	0.00	0.12	0.00
9	3	3112	SWIM-3/R (CF-1)	Stream	P	8.08	0.000	20.000	550.000	0.06	0.00	0.24	0.00
10	3	3112	SWIM-3/R (CF-1)	Stream	P	8.10	0.000	10.000	470.000	0.05	0.00	0.56	0.00
11	3	3112	SWIM-3/R (CF-1)	Stream	P	8.10	0.000	12.000	268.000	0.19	0.00	0.12	0.00
12	3	3112	SWIM-3/R (CF-1)	Stream	P	8.00	0.000	6.000	515.000	0.05	0.00	0.18	0.00
13	3	3112	SWIM-3/R (CF-1)	Stream	P	8.00	0.000	12.000	540.000	0.07	0.00	0.12	0.00
14	3	3112	SWIM-3/R (CF-1)	Stream	P	8.70	672.000	3.000	1121.000	0.00	0.00	0.00	0.00
15	3	3112	SWIM-3/R (CF-1)	Stream	P	8.40	566.000	4.000	871.000	0.02	0.00	0.00	0.00
16	3	3112	SWIM-3/R (CF-1)	Stream	P	7.80	300.000	4.000	480.000	0.73	0.00	0.23	0.00
17	14	2183084	S6	Stream	P	6.33	160.870	1412.240	0.000	43.62	0.93	18.43	0.75
18	14	2183084	S6	Stream	P	6.16	66.670	471.700	0.000	18.43	0.82	1.05	0.34
19	14	2183084	S6	Stream	P	6.55	79.310	517.860	0.000	22.30	1.09	0.91	0.23
20	14	2183084	S6	Stream	P	6.15	68.970	514.520	0.000	21.52	1.44	0.88	0.14

Dataset Production – Joining Attributes

Geometry

Attributes of kfogis.SDE.permits

OBJECTID*	FEATURE	PERMIT	ACRES	Shape*	SHAPE.area	SHAPE.len
709	permitbnd	1183040	77.070615	Polygon	3357196.009186	18977.763316
710	permitbnd	2181257	59.221190	Polygon	2579675.038858	24302.271764
760	permitbnd	2182210	159.372008	Polygon	6942244.669647	68398.925073
761	permitbnd	2182306	58.610910	Polygon	2553091.255270	9027.270190
762	permitbnd	2183035	49.395429	Polygon	2151664.883755	13329.343233
711	permitbnd	2183051	7.440634	Polygon	324114.021600	12699.210029
712	permitbnd	2183052	77.975315	Polygon	3396604.701003	25474.893795

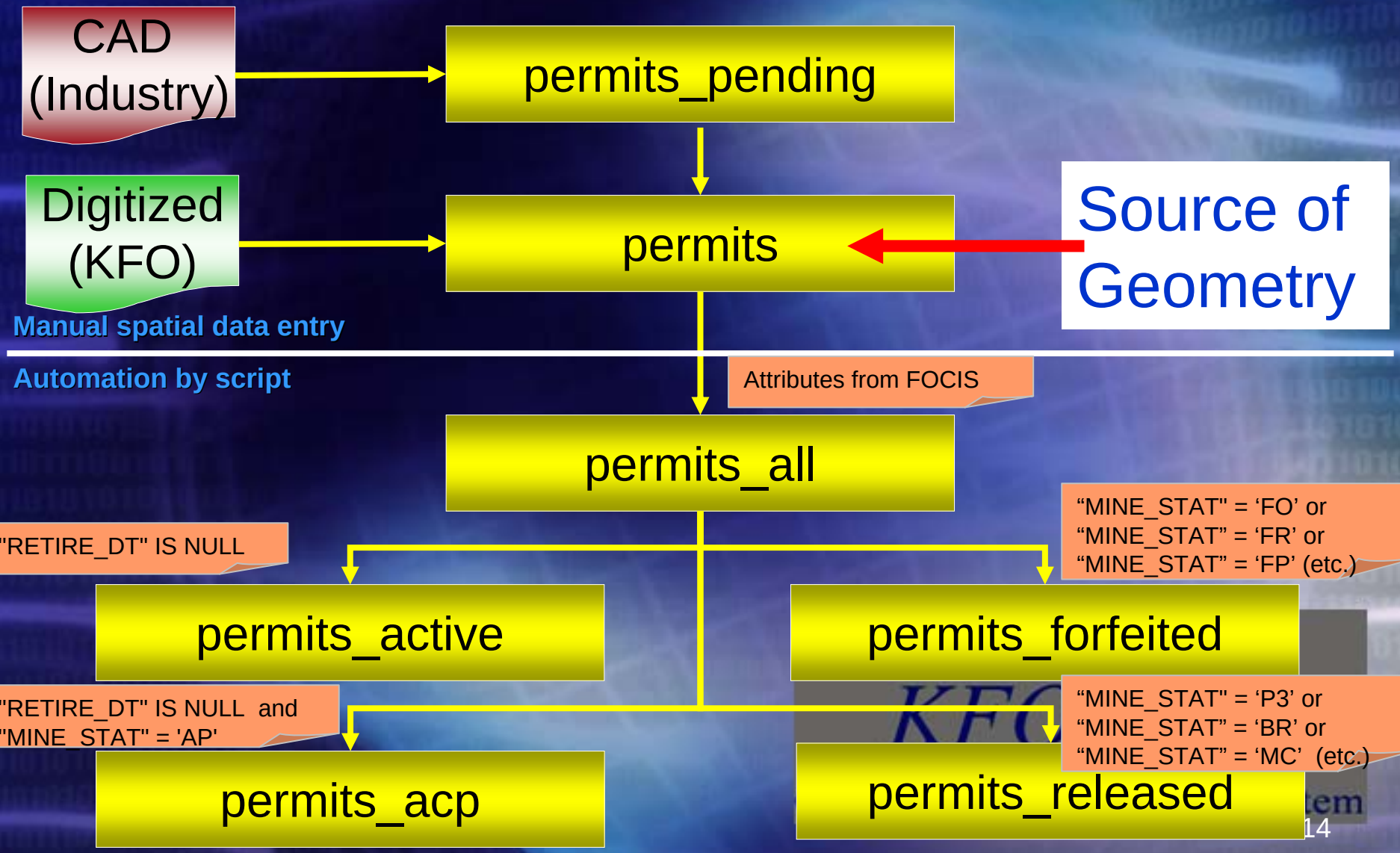
New dataset with geometry plus external attributes

Attributes of kfogis.SDE.p_all

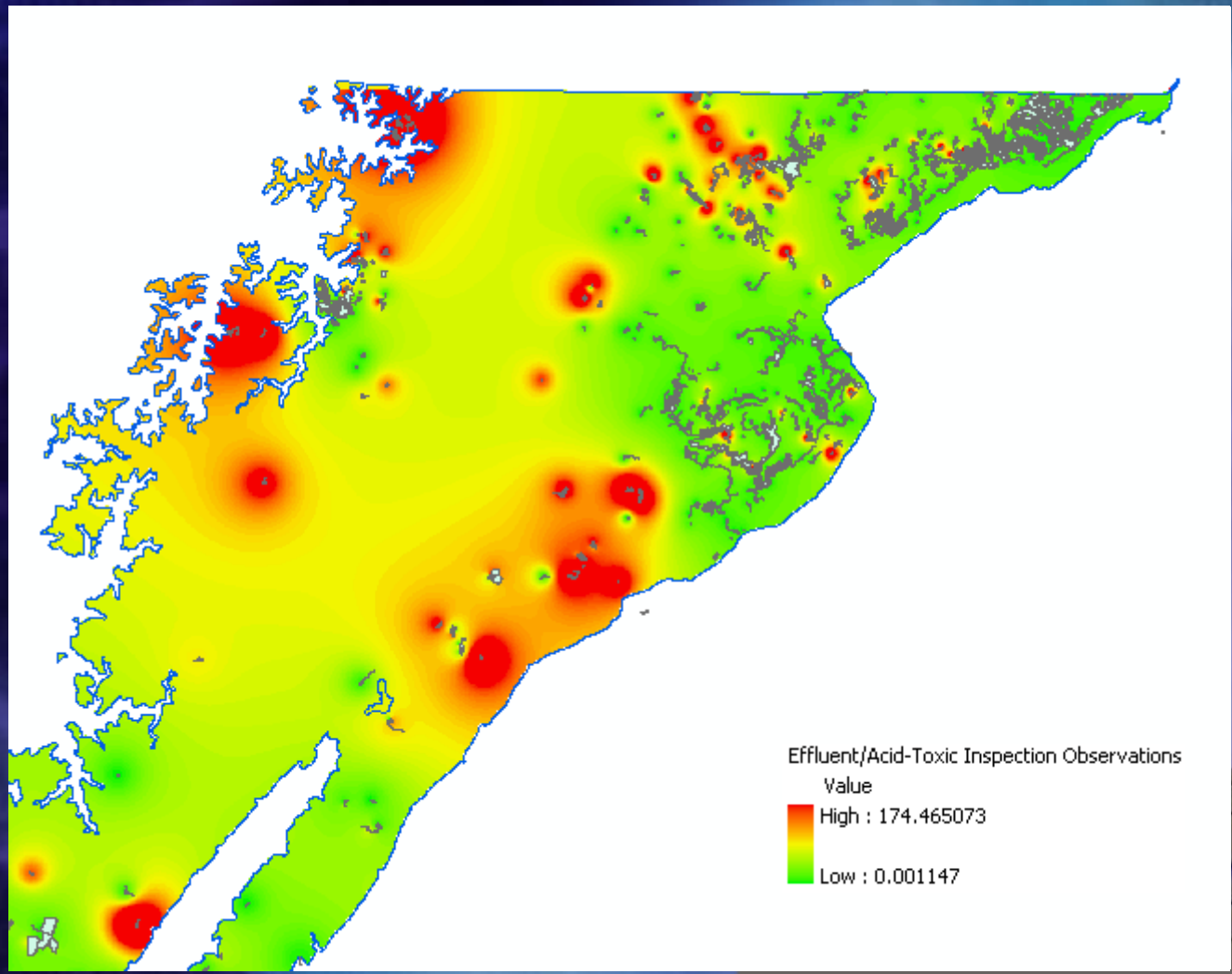
OBJECTID*	FEATURE	PERMIT	ACRES	IU_NO	COMP_NO	SITE_NO	MOD_NO	COMP_NAME
708	permitbnd	1183040	77.070615	1183040	0003	0555	02	A + W AUGER CORP
709	permitbnd	2181257	59.221190	2181257	0537	0507	01	PREMIUM COAL CO. INC
759	permitbnd	2182210	159.372008	2182210	0615	0475	01	SHEMCO INC
760	permitbnd	2182306	58.610910	2182306	0649	0158	00	TENNESSEE RESOURCE DEV
761	permitbnd	2183035	49.395429	2183035	0419	0353	00	LOG MOUNTAIN MINING CO
710	permitbnd	2183051	7.440634	2183051	0171	0544	00	CROSS MTN COAL INC
711	permitbnd	2183052	77.975315	2183052	0430	0545	00	LUEKING COAL CO

External database

Dataset Production – Creating New Datasets Based on Attributes



Dataset Production – Deriving Datasets for Analysis



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Automation with AML Scripting

- Starting AML from ArcInfo Workstation:

  ```
  &run myamlprogram.aml
  ```

- Starting AML from a Windows batch file:

  ```
  @echo off
  arc "&run myamlprogram.aml"
  ```

- Starting AML from Python:

  ```
  import os
  os.system('arc "&run myamlprogram.aml"')
  ```

AML – Connect to SDE

dataset connect <dataset> <server> <instance> <username> <password> {database} where "dataset" is a logical database and "server" is the node name.

dataset connect session1 <server> esri_sde <username> <password>

Define the layer in SDE Geodatabase to be exported.

layer define layer1 SDE session1 KFOGIS.SDE.PERMITS SHAPE POLYGON

Export the layer to a shapefile on the workstation, for example

layerexport layer1 SHAPEFILE <shapefilename.shp>

Remove the layer from the SDE connect session.

layer remove layer1

Disconnect from the SDE Geodatabase and end the SDE connect session.

dataset disconnect session1

AML – Connect to SQL Server

An ODBC data source connection (“ SQL connection”) using Windows NT authentication of the user to the Microsoft SQL Server must reside on the workstation. This connection specifies the SQL Server database to be accessed. “sqlsrvr” is a system file found at : C:\arcgis\arcexe9x\database\sqlsrvr.dbs

connect sqlsrvr <SQL connection>

Export a table from the SQL Server database to an INFO file on the workstation, for example.

dbmsinfo sqlsrvr <SQL Server table> <INFO table>

Disconnect from the SQL Server database.

disconnect sqlsrvr

Automation with Python Scripting

- Use ModelBuilder, export to Python
  - Advantages: easy, correct syntax
  - Disadvantages: writes sloppy code (variable substitution),may be difficult to debug if ESRI revises syntax in future releases, may not write all required code)
- Use Object Model Diagram to write Python code (difficult, weak documentation, errors)
- Use Python references (beware of deprecated code)

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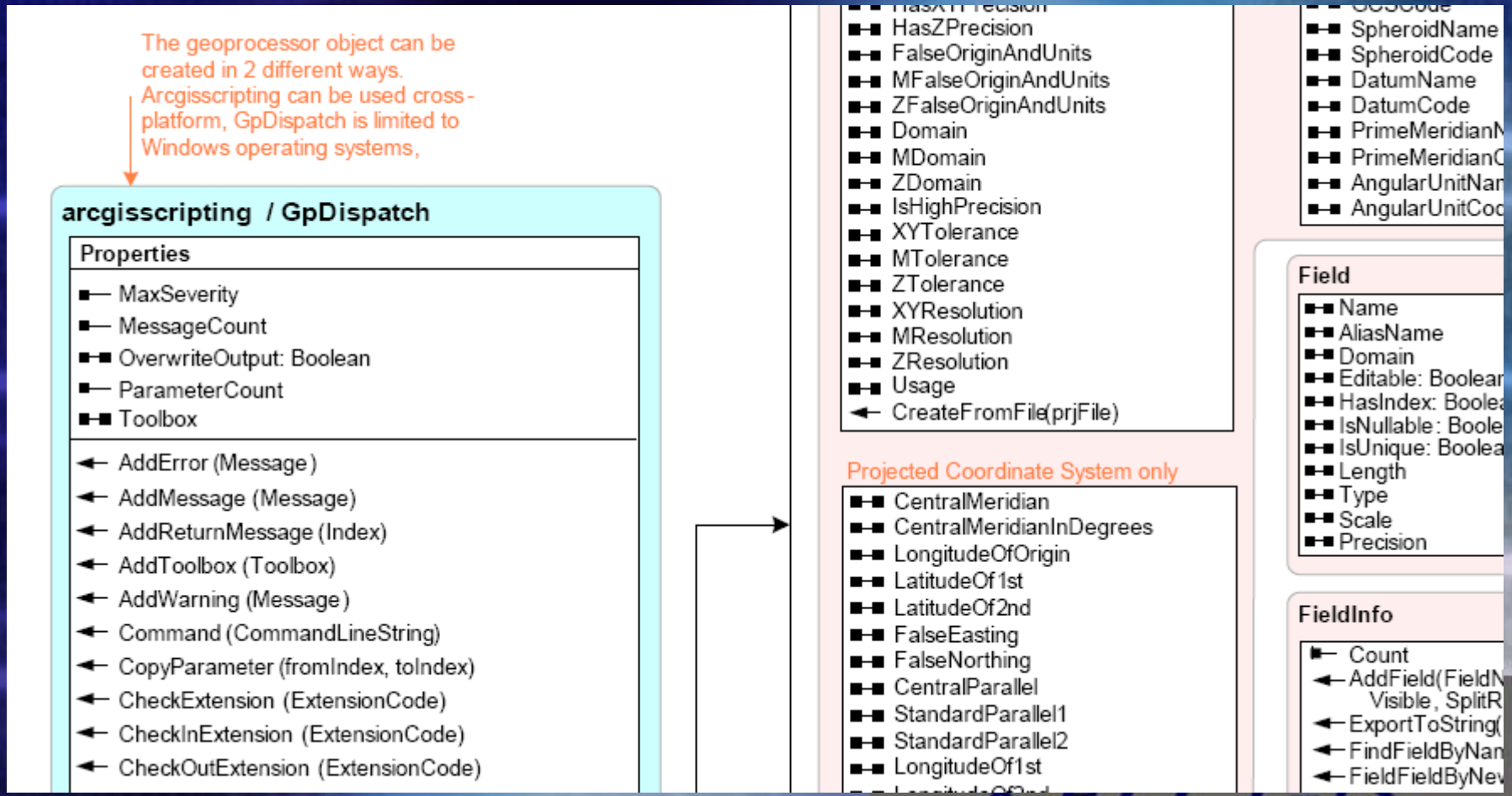
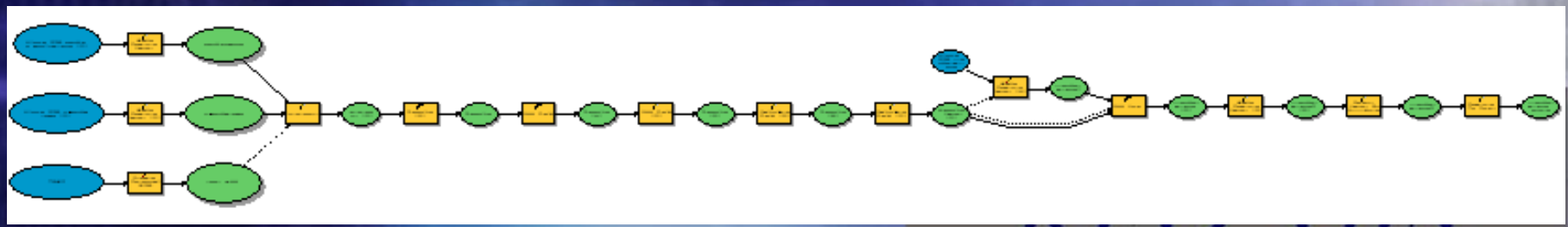
Geoprocessor Object Model



http://webhelp.esri.com/arcgisdesktop/9.2/pdf/Geoprocessor.pdf

ArcGIS ModelBuilder

- Drag tools from ArcToolbox onto ModelBuilder canvas
- Manipulate tools to perform geoprocessing
- When complete, export to Python script



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Python – Connect to ArcSDE

```
# Import the necessary system modules for Python
import sys, string, os, win32com.client

# Create the ESRI Geoprocessor object.
gp = win32com.client.Dispatch("esriGeoprocessing.GpDispatch.1")

# Load connection information to access ArcSDE...
gp.Workspace = "Database Connections\\<sde connection file name>.sde“

# Load required toolboxes...
gp.AddToolbox("C:/Program Files/ArcGIS/ArcToolbox/Toolboxes/Conversion Tools.tbx")

# Set a switch to overwrite previous output, if desired...
gp.overwriteoutput = 1

# Assign variables…
mypermits = "C:\\WorkSpace\\mypermits"

# Run the process: Feature Class To Feature Class...
gp.FeatureclassToCoverage_conversion("kfogis.SDE.permits "", mypermits, "", "double“)
```

Python – Connect to SQL Server (through ESRI Geoprocessor)

```
# Import the necessary system modules for Python
import sys, string, os, win32com.client

# Create the ESRI Geoprocessor object.
gp = win32com.client.Dispatch("esriGeoprocessing.GpDispatch.1")

# Load connection information to access Microsoft SQL Server...
gp.Workspace = "Database Connections\\<odbc connection file name>.odc“

# Load required toolboxes...
gp.AddToolbox("C:/Program Files/ArcGIS/ArcToolbox/Toolboxes/Conversion Tools.tbx")

# Assign variables…
dbo_SurfaceWater = "dbo.SurfaceWater“
WorkSpace = "C:\\WorkSpace“

# Run the process: Table to Table...
gp.TableToTable_conversion(dbo_SurfaceWater, WorkSpace, "surfacewater", "", "", "")
```

New Scripting Object

Old ArcGIS 9.1 Method:

```
# Import the ArcGIS Scripting Object for Python
import win32com.client

# Create the ESRI Geoprocessor object.
gp = win32com.client.Dispatch("esriGeoprocessing.GpDispatch.1")
```

New ArcGIS 9.2 Method:

```
# Import the ArcGIS Scripting Object for Python
import arcgisscripting

# Create the ESRI Geoprocessor object.
gp = arcgisscripting.create()
```

Questions?

- For more information:

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