Automating and Extending: Defense Workflows

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What is DevOps and why should we care

- “**DevOps** is a set of practices that combines software development (*Dev*) and information-technology operations (*Ops*) which aims to shorten the systems development life cycle and provide continuous delivery with high software quality”**

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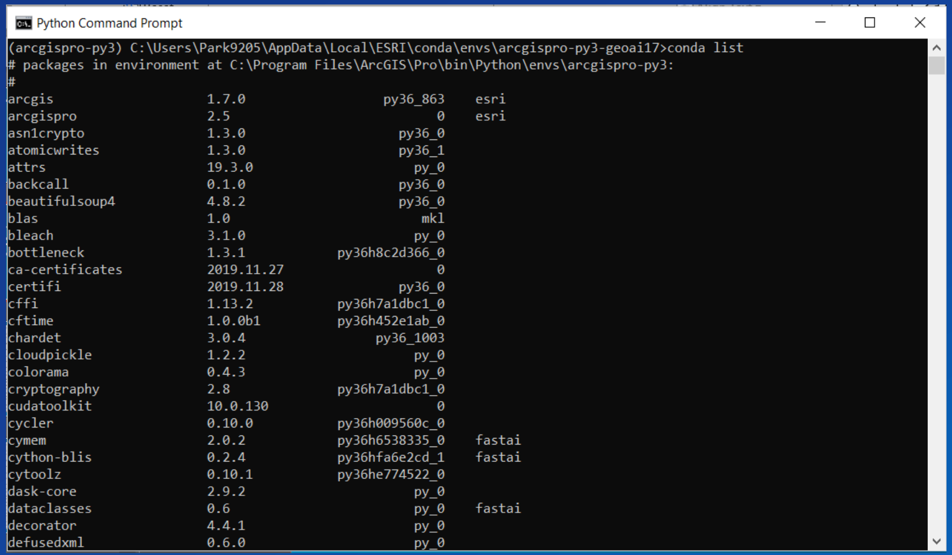
Why Python?

- “Python is an interpreted, high-level, general-purpose programming language”**

- No matter your system, if you can get ArcGIS Pro you have Python
  - 172 Packages Installed even offline (*based on ArcGIS Pro 2.5*)
  - Does not have to be used exclusively in ArcGIS Pro

ArcGIS
API for Python

- Large online user community and large GIS community group



```
(arcgispro-py3) C:\Users\Park9205\AppData\Local\ESRI\conda\envs\arcgispro-py3-geoai17>conda list
# packages in environment at C:\Program Files\ArcGIS\Pro\bin\Python\envs\arcgispro-py3:
#
arcgis                    1.7.0                py36_863    esri
arcgispro                 2.5                         0    esri
asn1crypto                1.3.0                  py36_0
atomicwrites              1.3.0                  py36_1
attrs                     19.3.0                   py_0
backcall                  0.1.0                  py36_0
beautifulsoup4            4.8.2                  py36_0
blas                      1.0                       mkl
bleach                    3.1.0                    py_0
bottleneck                1.3.1          py36h8c2d366_0
ca-certificates           2019.11.27                  0
certifi                   2019.11.28             py36_0
cffi                      1.13.2         py36h7a1dbc1_0
cftime                    1.0.0b1        py36h452e1ab_0
chardet                   3.0.4               py36_1003
cloudpickle               1.2.2                    py_0
colorama                  0.4.3                    py_0
cryptography              2.8            py36h7a1dbc1_0
cudatoolkit               10.0.130                    0
cycler                    0.10.0         py36h009560c_0
cymem                     2.0.2          py36h6538335_0    fastai
cython-blis               0.2.4          py36hfa6e2cd_1    fastai
cytoolz                   0.10.1         py36he774522_0
dask-core                 2.9.2                    py_0
dataclasses               0.6                      py_0    fastai
decorator                 4.4.1                    py_0
defusedxml                0.6.0                    py_0
```

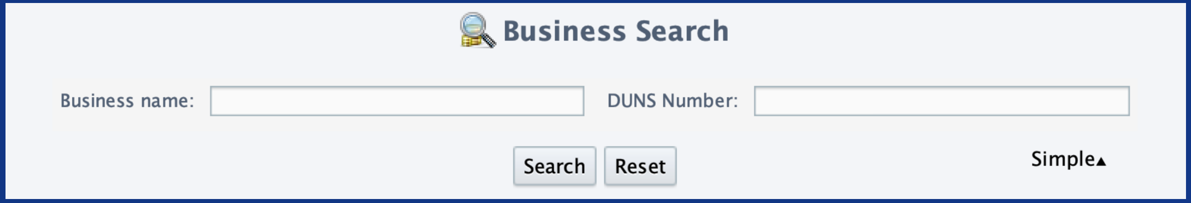
** Kuhlman, Dave. *"A Python Book: Beginning Python, Advanced Python, and Python Exercises". Section 1.1. Archived from the original (PDF) on 23 June 2012.*

Entity-Centric Cross-Sector Workflow Example

New User Start

- Unstructured
- Social Media Accounts
- People
- Phone Numbers
- Businesses
- Boats
- Planes
- Cyber / Ips
- License Plates
- Transactions
- Shipments

Simple UI



Business Search

Business name:
DUNS Number:

Workflows

Know your Target

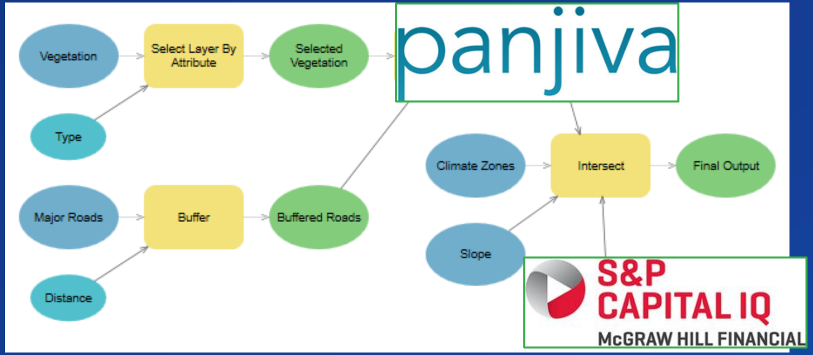
Ft. Bragg

Civilian

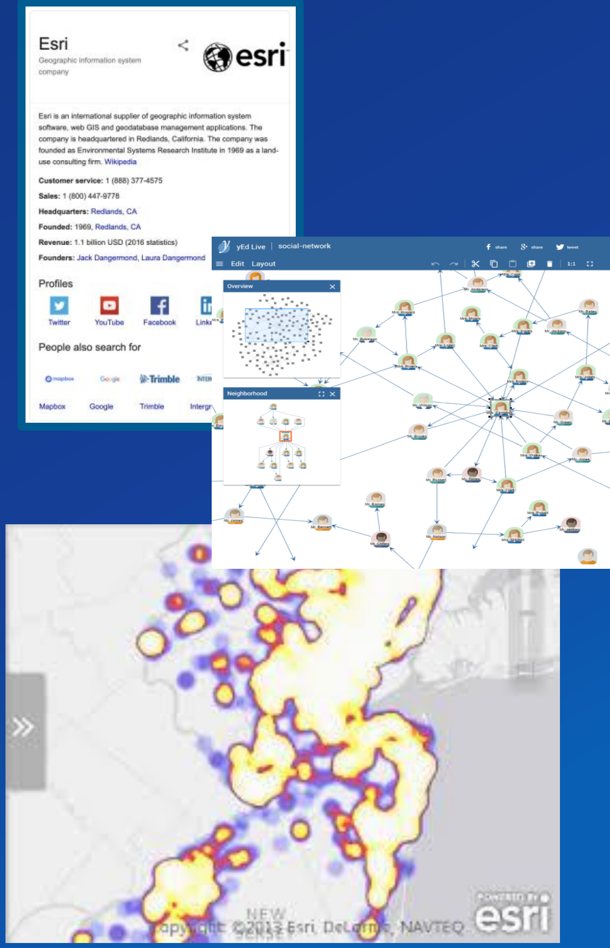
Due Diligence

SJ/Commercial

Automation



Results



Esri
Geographic information system company

Esri is an international supplier of geographic information system software, web GIS and geodatabase management applications. The company is headquartered in Redlands, California. The company was founded as Environmental Systems Research Institute in 1969 as a land-use consulting firm. Wikipedia

Customer service: 1 (888) 377-4575

Sales: 1 (800) 447-9778

Headquarters: Redlands, CA

Founded: 1969, Redlands, CA

Revenue: 1.1 billion USD (2016 statistics)

Founders: Jack Dangermond, Laura Dangermond

Profiles

People also search for

arcgis	cymem	imageio	libpng	nbformat	pip	python-dateutil	sympy	wincertstore
arcgispro	cython-blis	importlib_metadata	libsodium	netcdf4	plac	pytorch	terminado	winkerberos
asn1crypto	cytoolz	intel-openmp	libtiff	networkx	pluggy	pytz	testpath	winpty
atomicwrites	dask-core	ipykernel	m2w64-gcc-libgfortran	ninja	preshed	pywavelets	thinc	x86cpu
attrs	dataclasses	ipython	m2w64-gcc-libs	nose	pro_notebook_integration	pywin32	tk	xeus
backcall	decorator	ipython_genutils	m2w64-gcc-libs-core	notebook	prometheus_client	pywin32-ctypes	toolz	xlrd
eautifulsoup4	defusedxml	ipywidgets	m2w64-gmp	numexpr	prompt_toolkit	pywinpty	torchvision	xlwt
las	despatch	jdcal	m2w64-libwinpthread-git	numpy	psutil	pyyaml	tornado	xz
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ifi	fastcache	json5	mkl	openpyxl	pygments	scipy	urllib3	zstd
	fastprogress	jsonschema	mkl-service	openssl	pyopenssl	send2trash	vc	
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ickle	gdal	jupyter_core	more-itertools	pandoc	pyrsistent	six	wcwidth	
na	h5py	jupyterlab	mpmath	pandocfilters	pyshp	soupsieve	webencodings	
raphy	html5lib	jupyterlab_server	msys2-conda-epoch	parso	pysocks	spacy	wheel	
lkit	icc_rt	keyring	murmurhash	pickleshare	pytest	sqlite	widgetsnbextension	
	idna	kiwisolver	nbconvert	pillow	python	srsly	win_inet_pton	

arcgis	cymem	**imageio**	libpng	nbformat	pip	python-dateutil	sympy	wincertstore
arcgispro	cython-blis	importlib_metadata	libsodium	netcdf4	plac	pytorch	terminado	winkerberos
asn1crypto	cytoolz	intel-openmp	libtiff	networkx	pluggy	pytz	testpath	winpty
atomicwrites	dask-core	ipykernel	m2w64-gcc-libgfortran	ninja	preshed	pywavelets	thinc	x86cpu
attrs	dataclasses	ipython	m2w64-gcc-libs	nose	pro_notebook_integration	pywin32	tk	xeus
backcall	decorator	ipython_genutils	m2w64-gcc-libs-core	notebook	prometheus_client	pywin32-ctypes	toolz	xlrd
beautifulsoup4	defusedxml	ipywidgets	m2w64-gmp	numexpr	prompt_toolkit	pywinpty	torchvision	xlwt
las	despatch	jdcal	m2w64-libwinpthread-git	numpy	psutil	pyyaml	tornado	xz
each	entrypoints	jedi	markupsafe	numpy-base	py	pyzmq	tqdm	zeromq
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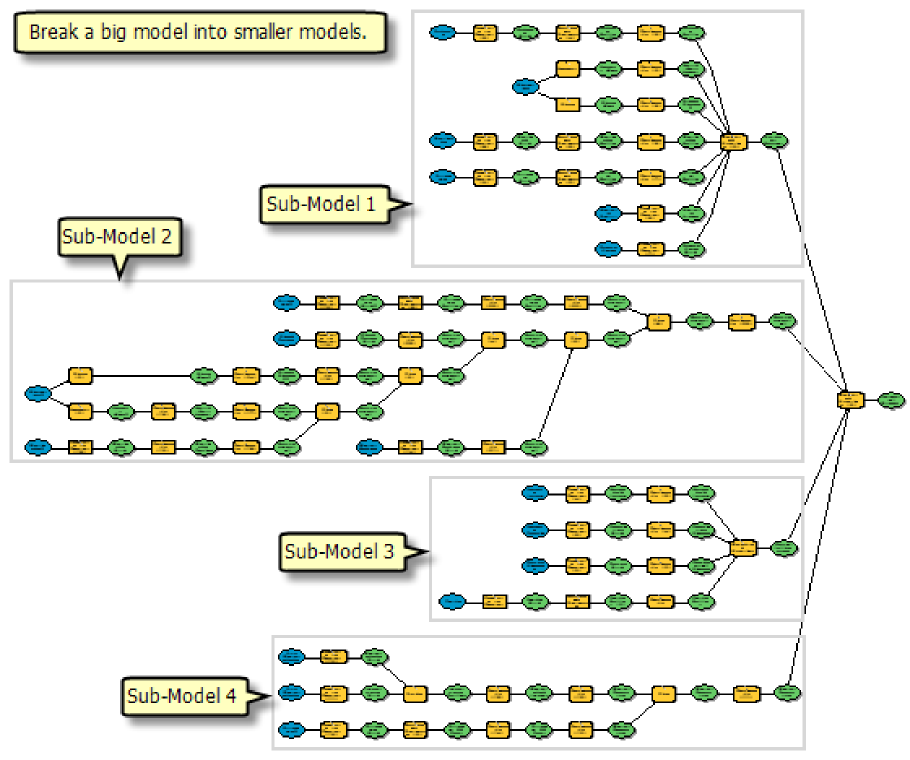
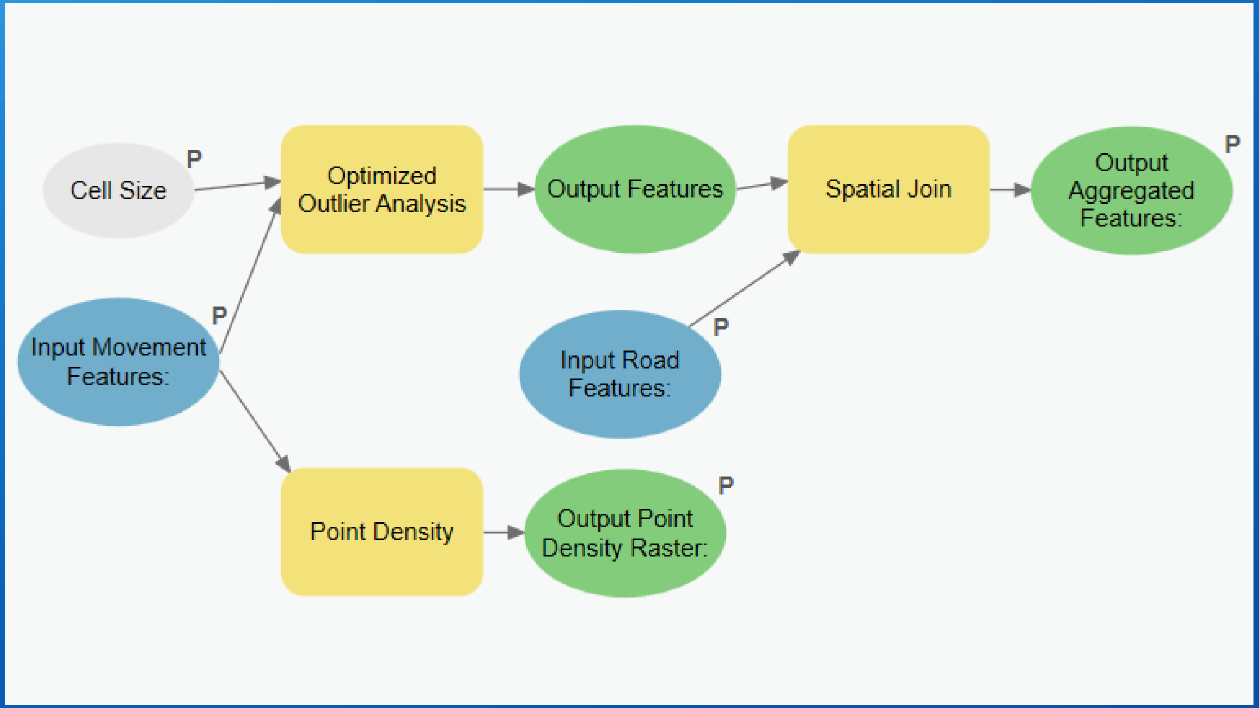
e	freetype	jupyter_client	mkl_fft	packaging	pyparsing	setuptools	vs2015_runtime	
et	future	jupyter_console	mkl_random	pandas	pypdf2	simplegeneric	wasabi	
pickle	gdal	jupyter_core	more-itertools	pandoc	pyrsistent	six	wcwidth	
ma	h5py	jupyterlab	mpmath	pandocfilters	pyshp	soupsieve	webencodings	
raphy	**html5lib**	jupyterlab_server	msys2-conda-epoch	parso	**pysocks**	spacy	wheel	
lkit	icc_rt	keyring	murmurhash	pickleshare	pytest	**sqlite**	widgetsnbextension	
	idna	kiwisolver	nbconvert	pillow	python	srsly	win_inet_pton	

Development vs. development

Part 1: ModelBuilder

- Key Points:
  - Fast
  - Easy-to-use application for creating and running workflows containing a sequence of tools.
  - Gets you most to all the way there with out of the box components
  - Use Python field calculator to do basic custom function
  - Tools you create here can be used in Python scripting and other models
  - ModelBuilder with scripting allows you to interact with other applications.





ModelBuilder

Parker

Part 1: Modelbuilder

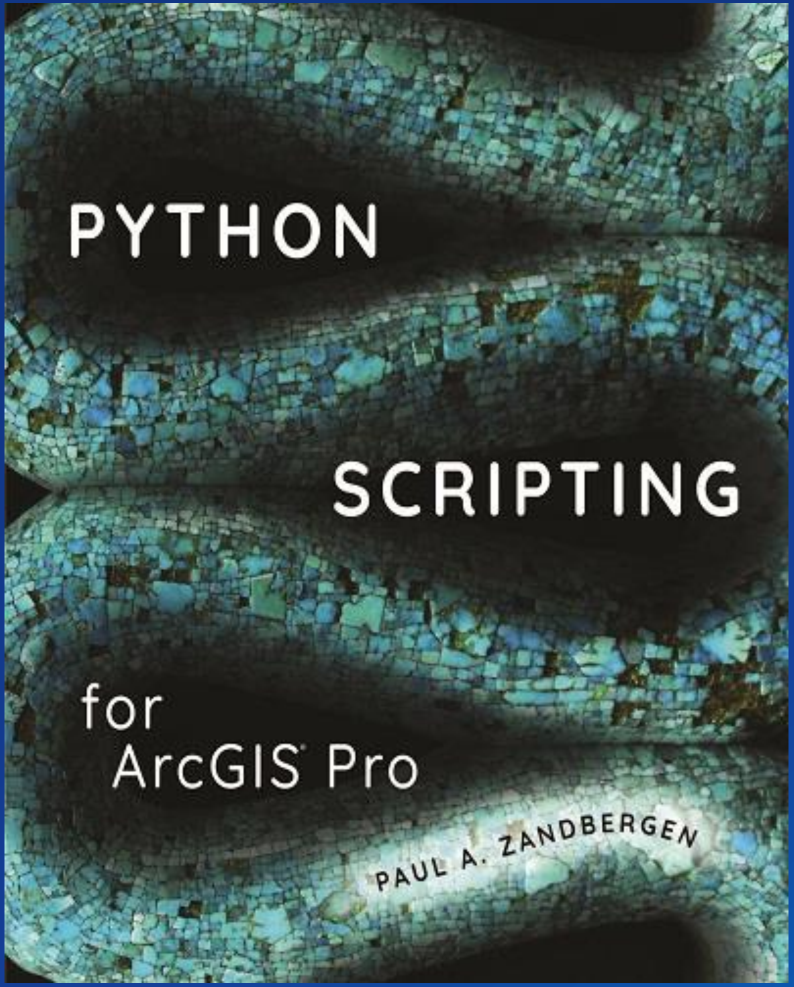
- Best Practices:
  - Use for repetitive workflows
  - Think of it as a “big red button builder”
  - We’re not building tools, but rather simplifying workflows

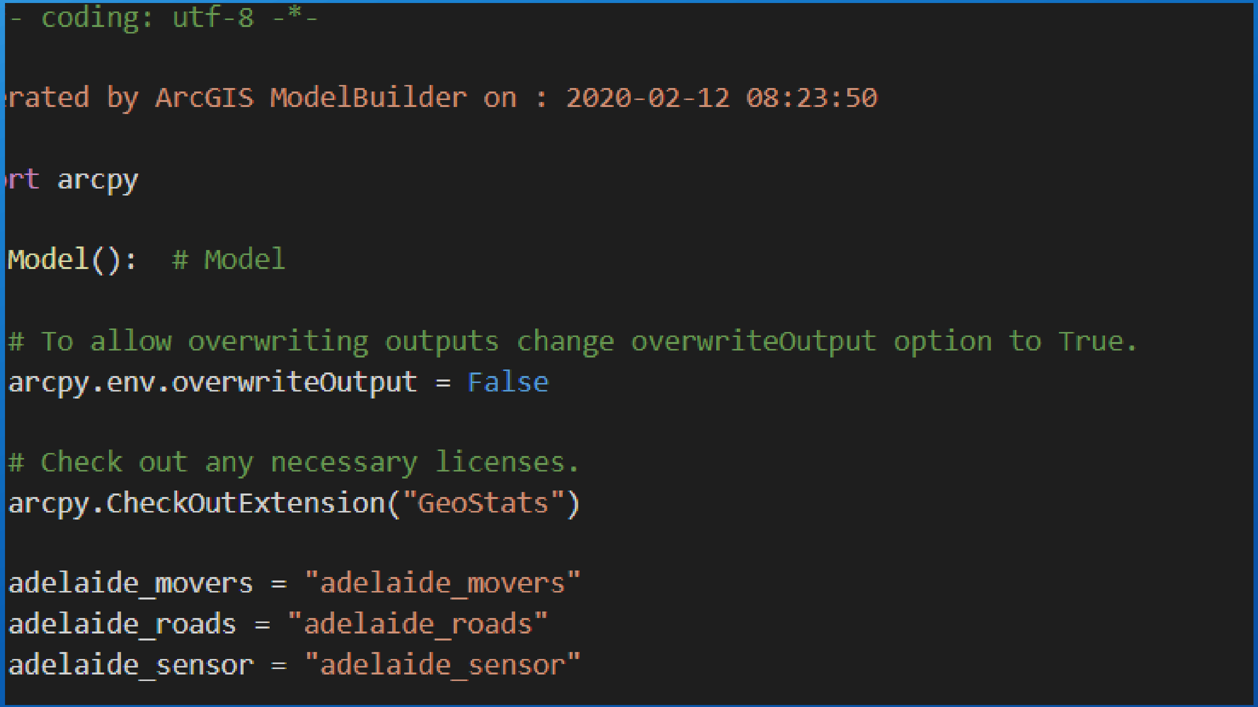
Automation vs. Customization

Part 2: Python Automation

- Key Points:
  - Turn models into Python scripts
  - Fine tune models
  - Add some custom abilities/functions not out of the box
  - Automating workflows that need to be repeated
    - Example: Loading data into a database
      - Attribute mapping
      - Field calculation
      - Collation
      - Clipping
      - Sorting

- Treat these solutions as Microservices





```
- coding: utf-8 -*-

rated by ArcGIS ModelBuilder on : 2020-02-12 08:23:50

rt arcpy

Model():  # Model

# To allow overwriting outputs change overwriteOutput option to True.
arcpy.env.overwriteOutput = False

# Check out any necessary licenses.
arcpy.CheckOutExtension("GeoStats")

adelaide_movers = "adelaide_movers"
adelaide_roads = "adelaide_roads"
adelaide_sensor = "adelaide_sensor"
```

Python Automation

Parker

Part 2: Python Automation

- Key functionality:
  - “Taking your model/tool from 95% to 100%”

  - Think of Microservices
    - Small interchangeable components and functions

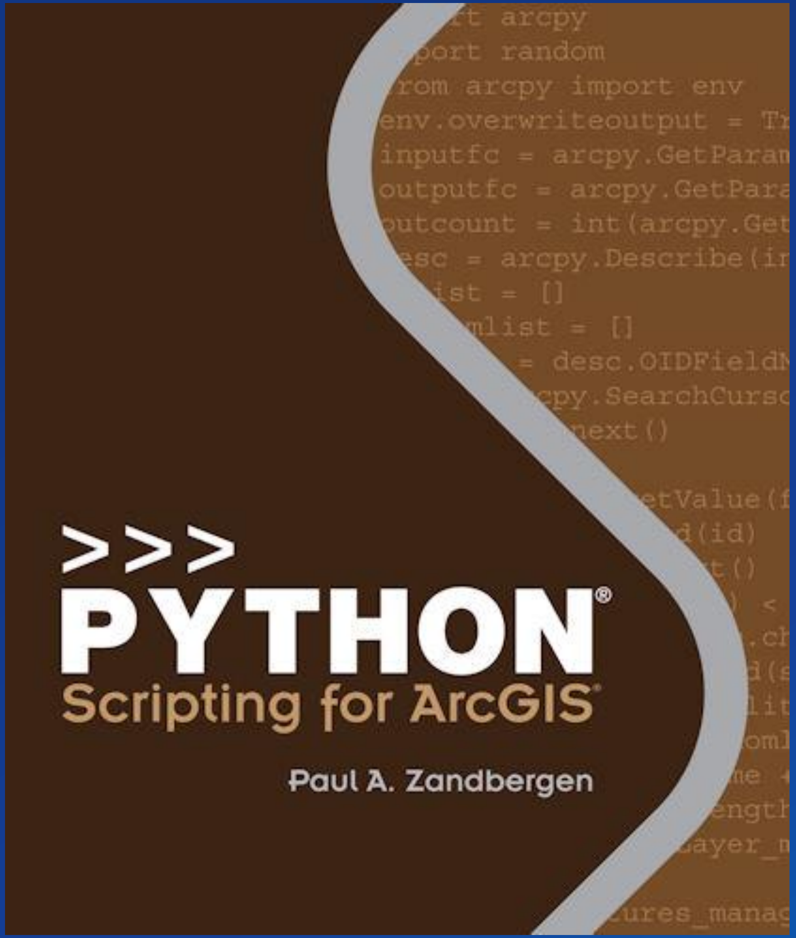
  - Great for one-offs for a specific workflow

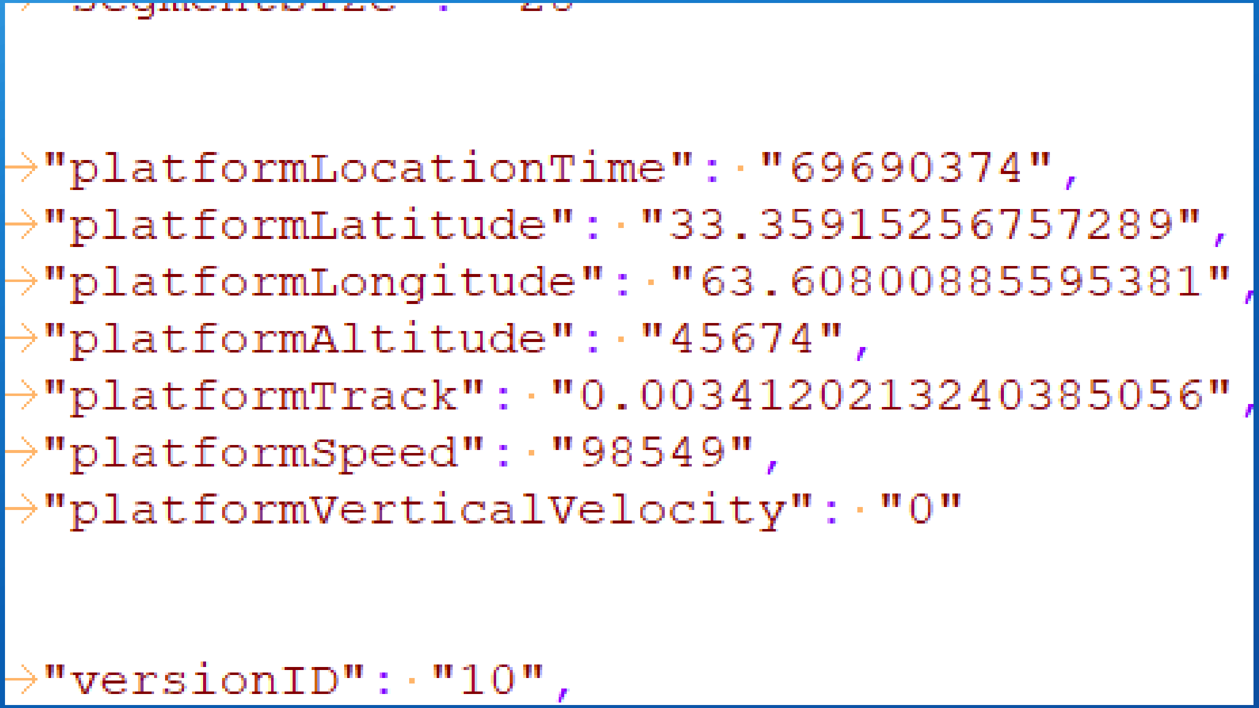
  - The go to when non-spatial processes are needed
    - System processes
    - Making requests to websites
    - Passing certificates and credentials

When to go custom?

Part 3: Python Customization

- Key Points:
  - Exactly what you need:
    - Unique data: Waypoint Files, custom message types, custom data
    - GCCS messages
  - Full customization
  - But! You have to maintain it yourself
  - Build a community of practice?
  - Iterative Approaches





```
	"segmentSize": "20"


	"platformLocationTime": "69690374",
	"platformLatitude": "33.3591525675 7289",
	"platformLongitude": "63.60800885595381",
	"platformAltitude": "45674",
	"platformTrack": "0.003412021324038 5056",
	"platformSpeed": "98549",
	"platformVerticalVelocity": "0"


	"versionID": "10",
```

Python Customization

Parker

Part 3: Python Customization

- Key Points:
  - Use common data types
  - Iterative Approaches
  - Build components you can re-use

Build a community of practice?

- Rely on our SMEs
  - Within your organization
  - Forums (GeoNet)
  - Reach out to your Esri Account Representative
- Tech exchanges
- Talk to each other… most of us have similar problems

Resources

- ArcGIS trainings:
  - https://www.esri.com/training/
  - In-Person, Online Self-paced, and Online Instructor
- Python APIs
  - https://developers.arcgis.com/python/api-reference/
- SMEs
  - Within your organization
  - Esri solution engineers and onsite support
  - GeoNet: https://community.esri.com/
  - Stack Overflow

Questions?

esri

THE
SCIENCE
OF
WHERE