

Automation and Visualization of Crime Analysis

Applying GIS tools to improve workflow and data
dissemination in the Denver Police Department

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Capstone Peer Review
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Overview

- Background/Problem
- Objectives
- Methodology
- Workflow development
- Timeline



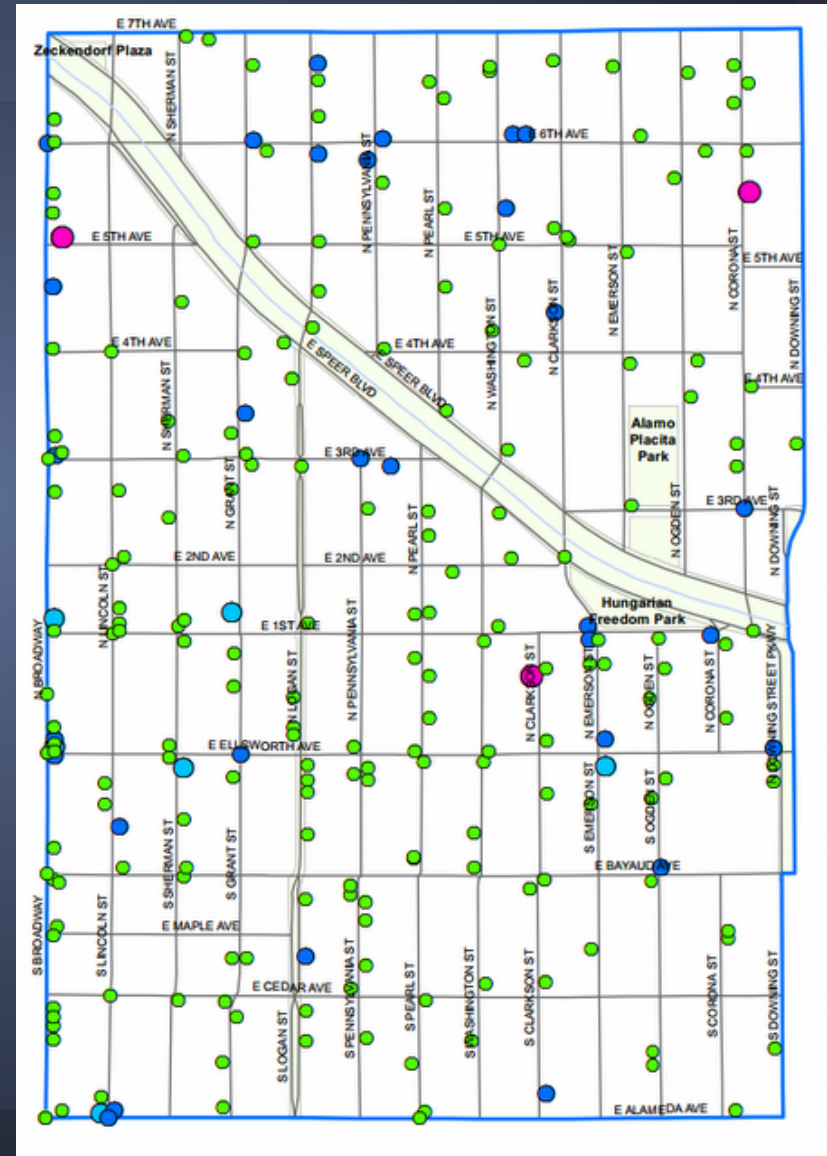
Background

- Spatial crime analysis has a long history
- Analysis focuses
 - Tactical analysis
 - Basic (counts)
 - Advanced (predictive)
 - Strategic analysis
- Despite research trends, many departments still focus on basic tactical crime analysis



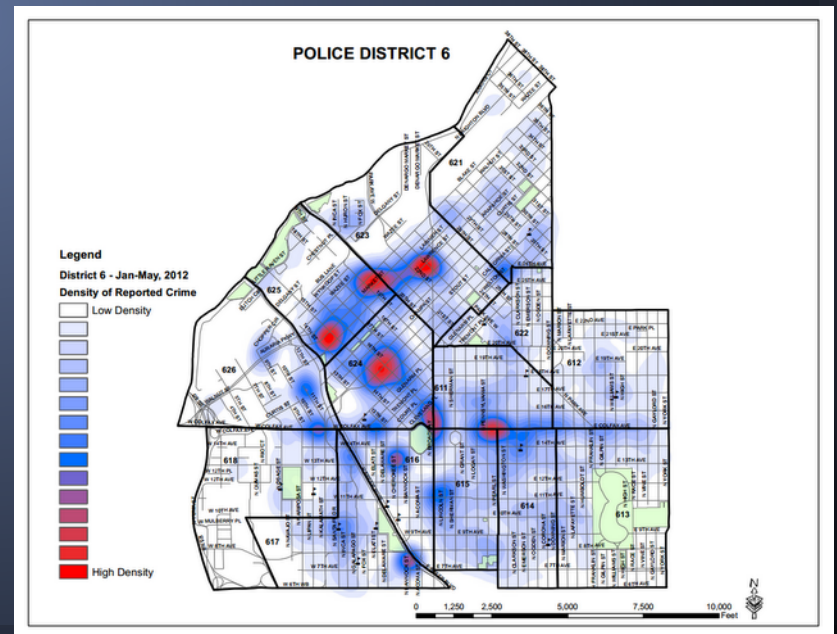
Background

- Crime mapping tools
 - GST CrimeMap
 - CrimeStat III
 - CrimeView
 - + many more
- Automation
- Cost



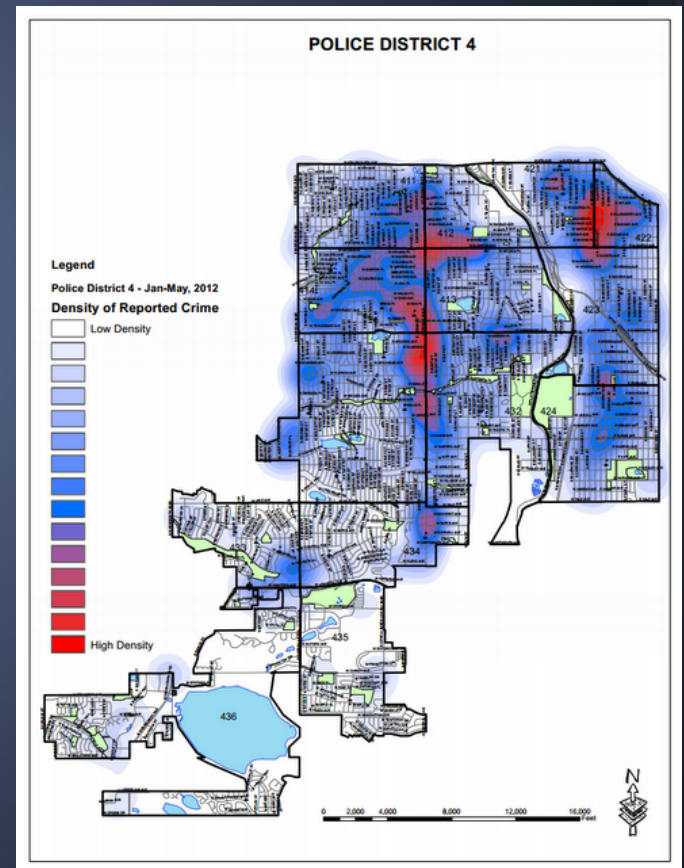
Problem

- New Denver police chief better analysis of Denver's crime data
- Denver Crime Analysis Unit struggles to meet demand for tactical analysis while needing to apply resources to more advanced analysis
- Need to get analysis products to police daily
- Analysts seek to apply their training to more advanced methods of crime analysis



Objectives

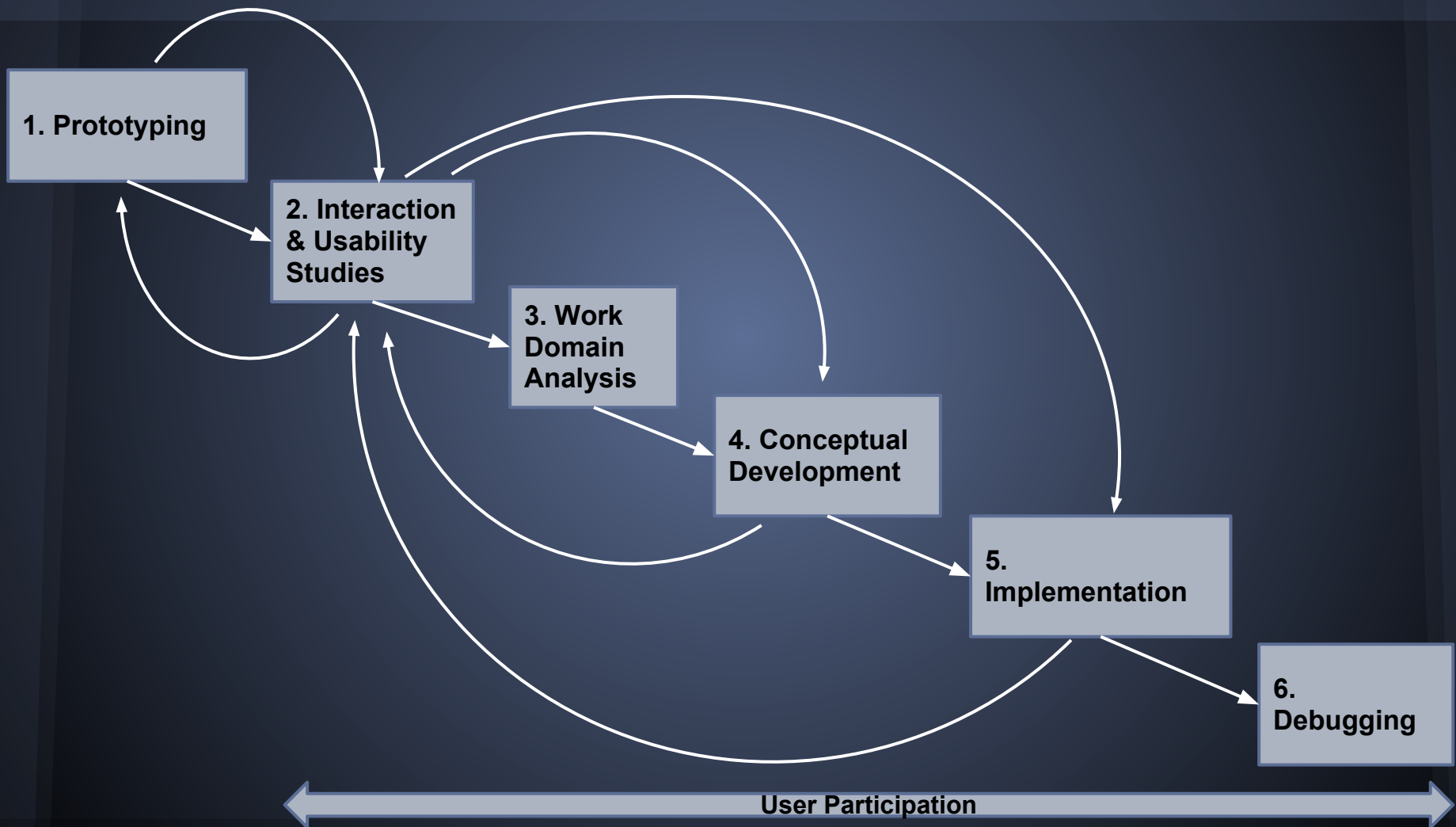
- Understand workflows and requirements of DPD crime analysts
- Develop automated tools for mapping and analysis at low- to no-cost
- Develop tool to better disseminate crime analysis to police officers (fast & focused)



Methodology

- Using modified user-centered design process proposed by Roth, et al (2010)
 - Release initial prototype first, then engage user in all remaining refinements through release of final product
- Iterative design process focused on increasing feature set building toward police officer visualization tool
- Using already available tools (ArcGIS) and free open source tools where feasible
 - Primarily Python-based programming

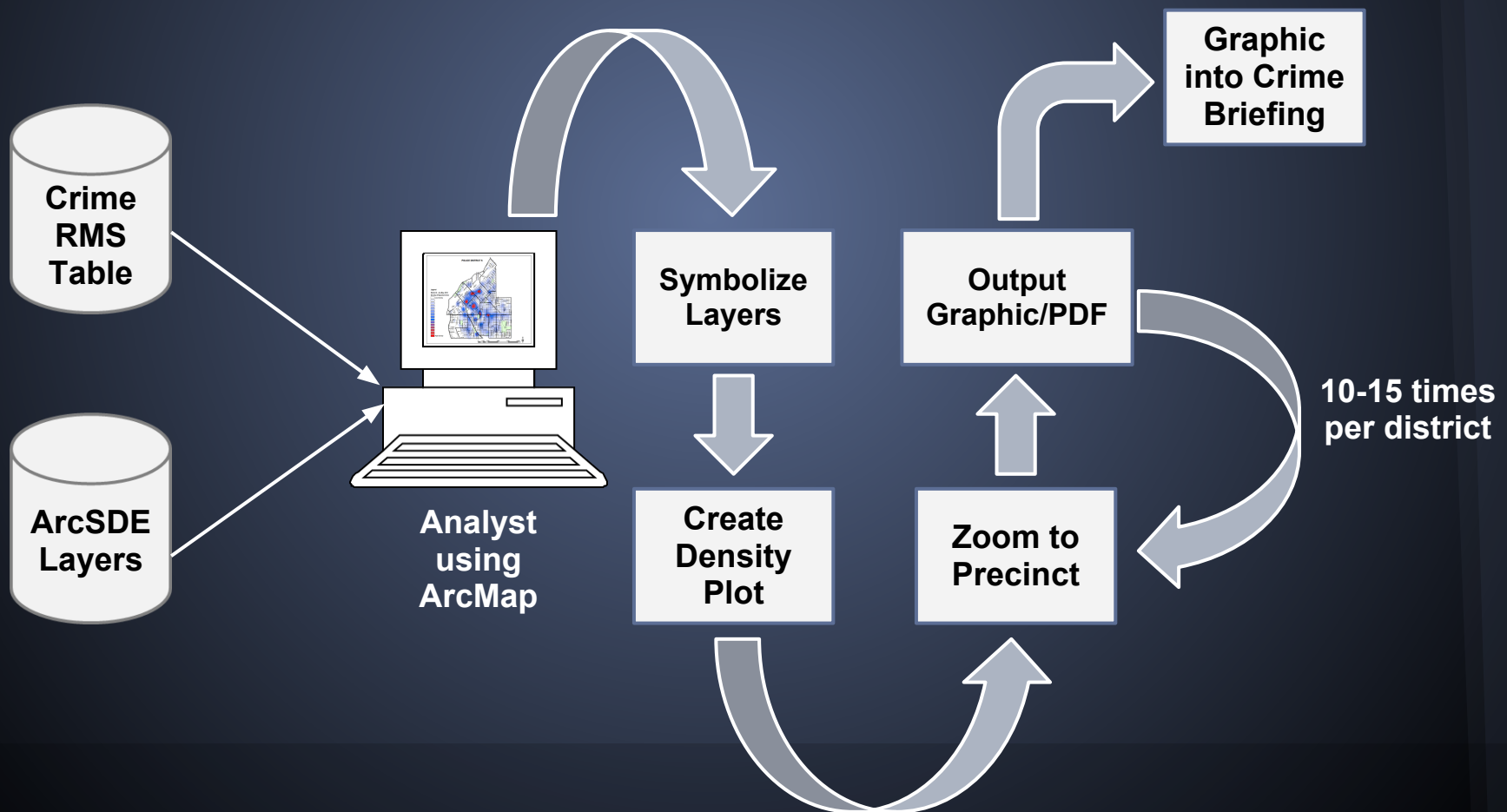
User-centered process



Source: Roth, R. E., Ross, K. S., Finch, B. G., Luo, W., & MacEachren, A. M. (2010). A user-centered approach for designing and developing spatiotemporal crime analysis tools. In: *Proceedings of GIScience 2010*. Zurich, Switzerland: September 15.

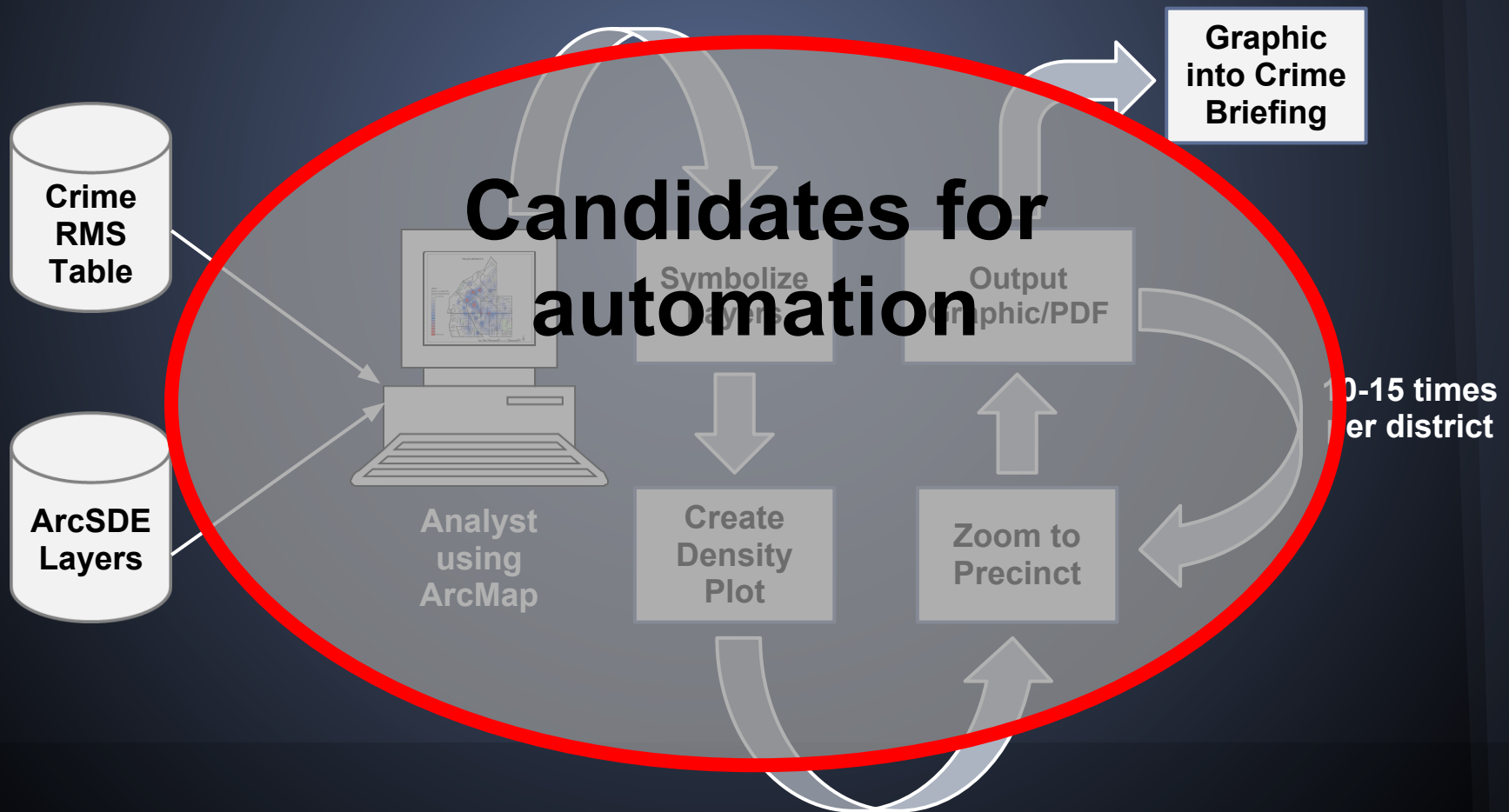
Denver current process

Weekly Precinct Crime Maps



Denver current process

Weekly Precinct Crime Maps

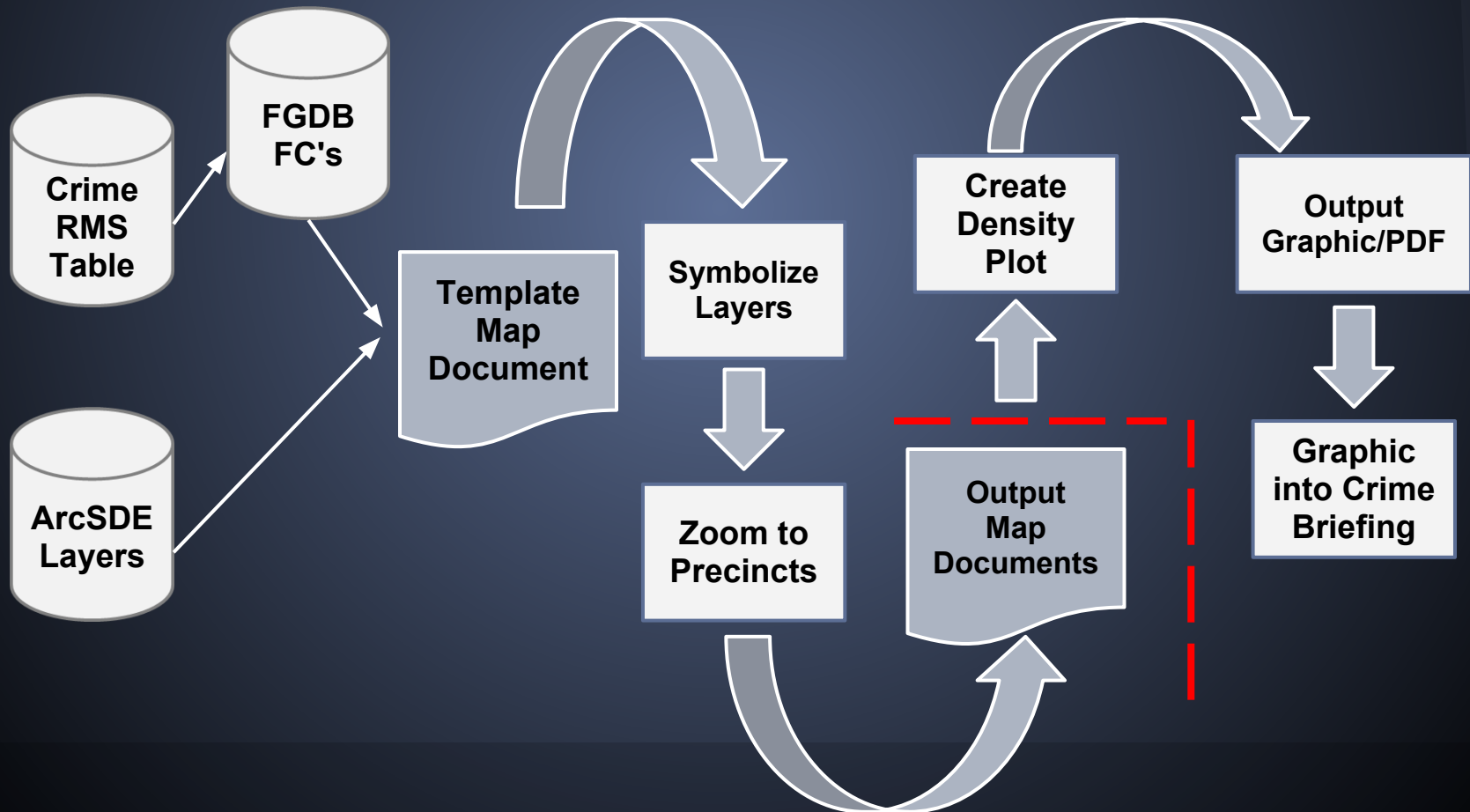


Example Python script

```
25 precinctSet = set(valueList1)
26 precinctList = list(precinctSet)
27 precinctList.sort()
28
29 del rows
30 del row
31 del valueList1
32
33 #####
34
35 # Define variables for next step
36 template_filename = arcpy.GetParameterAsText(1)
37 template_mxd = arcpy.mapping.MapDocument(template_filename)
38
39 df = arcpy.mapping.ListDataFrames(template_mxd)[0]
40
41 #define Police dist/prec for definition queries
42 polDistSrc = arcpy.GetParameterAsText(2)
43 polPrecSrc = arcpy.GetParameterAsText(3) |
44
45 savefolder = arcpy.GetParameterAsText(4)
46 modifiedmxdpath = str(savefolder)+"\AllDists.mxd" #was last_saturday
47 template_mxd.saveACopy(modifiedmxdpath)
48 modifiedmxd = arcpy.mapping.MapDocument(modifiedmxdpath)
49 mmyrlist = arcpy.mapping.ListLayers(template_mxd)
50
51 #update definition queries and save separate files for each district
52 - for precinct in precinctList:
53     template_mxd.tags = str(precinct)
54     - for lyr in mmyrlist:
55     -     if lyr.isGroupLayer == False:
56     -         if lyr.dataSource == NIBRS2010:
57     -             lyr.definitionQuery = u'"Zone" = \''+str(precinct)+u'\'' AND "NewDesc" = \''+str(lyr.name)+u'\''
58     -         elif lyr.dataSource == polDistSrc:
59     -             lyr.definitionQuery = u'DIST_NUM = \''+(str(template_mxd.tags[:1]))+u'\''
60     -         elif lyr.dataSource == polPrecSrc:
61     -             lyr.definitionQuery = u'PRECINCT LIKE \''+(str(template_mxd.tags[:3])+u'\''
```

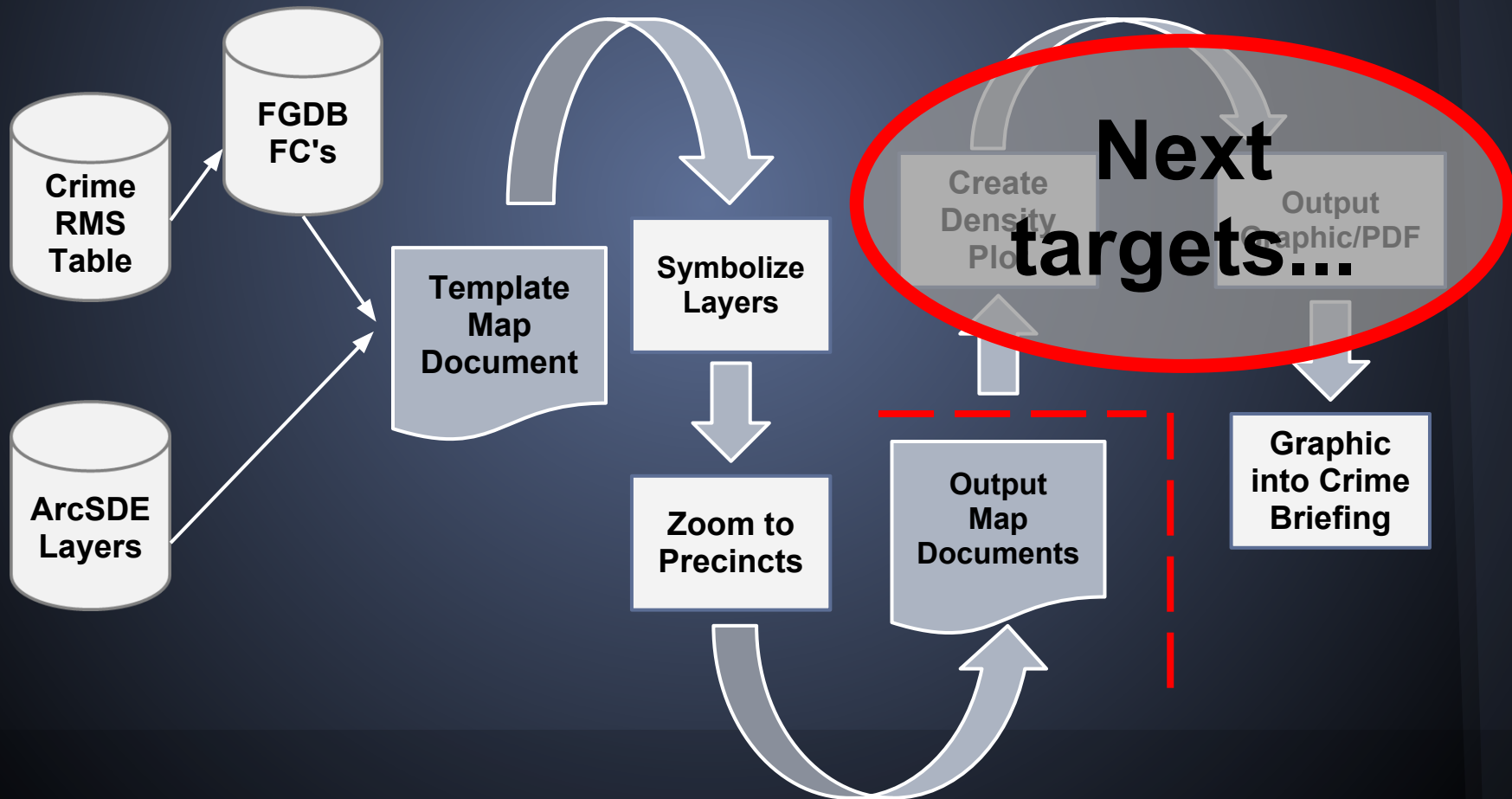
Automation progress so far

Weekly Precinct Crime Maps



Automation progress so far

Weekly Precinct Crime Maps



...and beyond

- Automate generation of other common maps
- Begin daily generation of maps for police officer use and create tool to get the maps to the officers at the start of shifts

Workflow development

- Basic automation tools have been prototyped and demoed
- Meeting weekly with CAU Director & Staff

Timeline

- Initial prototype automation tool already released and in use/revision
- End of 3Q 2012: automation toolset completed
- End of 4Q 2012/Early 1Q 2013: final release of police officer analysis visualization tool

Plan to submit project as paper presentation for 2013 AAG meeting in April 2013

Questions

