

Routing Through the Web

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Goal...

- Develop a “**Get Driving Directions**” Web tool for citizens and employees using county data



Considerations...

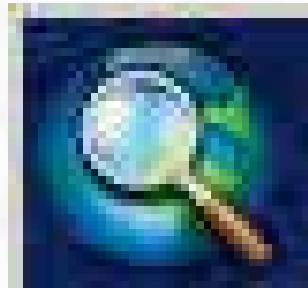
- Incorporate into existing Web application
- Building Point / Access Point features
- Daily Land Records data updates
- Rebuild Centerline Network

Workflow...

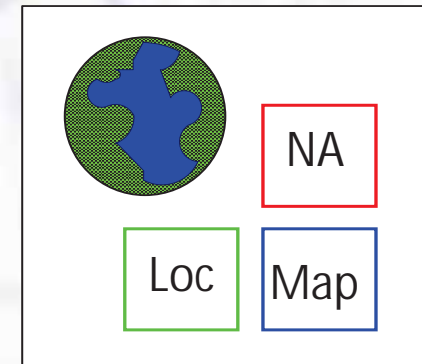
Network Data
(Python, Scheduled Task)



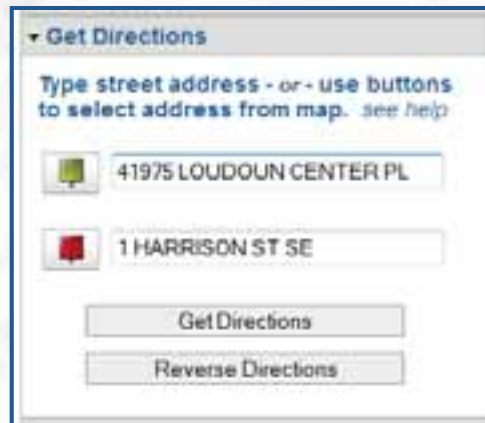
Network Analysis Layer
(ArcMap)



Services (ArcGIS Server)



User Interface



Incorporate into existing application...

The screenshot displays the 'Loudoun County, Virginia WebLogis - Online Mapping System' interface. The main map area shows a road network with several colored overlays (green, red, pink) and a dashed black line. A scale bar at the top left of the map indicates 1:400000. The interface includes a navigation menu with 'Map', 'Search', 'Tools', and 'Results'. On the left, there are sections for 'Find Address', 'Get Directions', 'Parcels - Search by PIN', 'Parcels - Click on Map', and 'Search Assessments'. A 'Get Directions' dialog box is overlaid on the right side of the map, containing the same 'Get Directions' and 'Reverse Directions' options as the main interface. The dialog box also includes a scale bar and a coordinate display at the bottom right showing X: 11,607,465 and Y: 7,133,819.

WebLogis – developed using Esri JavaScript API


Search options...




Click address on map *

▼ Get Directions

Type street address - or - use buttons to select address from map. see help





Get Directions

41975

16591


Select "Start" Address


Reverse Geocode using
Geocode Service – Address Point

Type an address *

▼ Get Directions

Type street address - or - use buttons to select address from map. see help

 41975 LOUDOUN CENTER PL

 1 har

1 HARRISON ST SE

101 HARRISON RD S

11 HARR

111 HARR

121 HARR

121 HARR

▶ Parce 131 HARR


▶ Parce 141 HARR


▶ Search 201 HARR

21761 HA

▼ Get Directions

Type street address - or - use buttons to select address from map. see help

 41975 LOUDOUN CENTER PL

 1 HARRISON ST SE

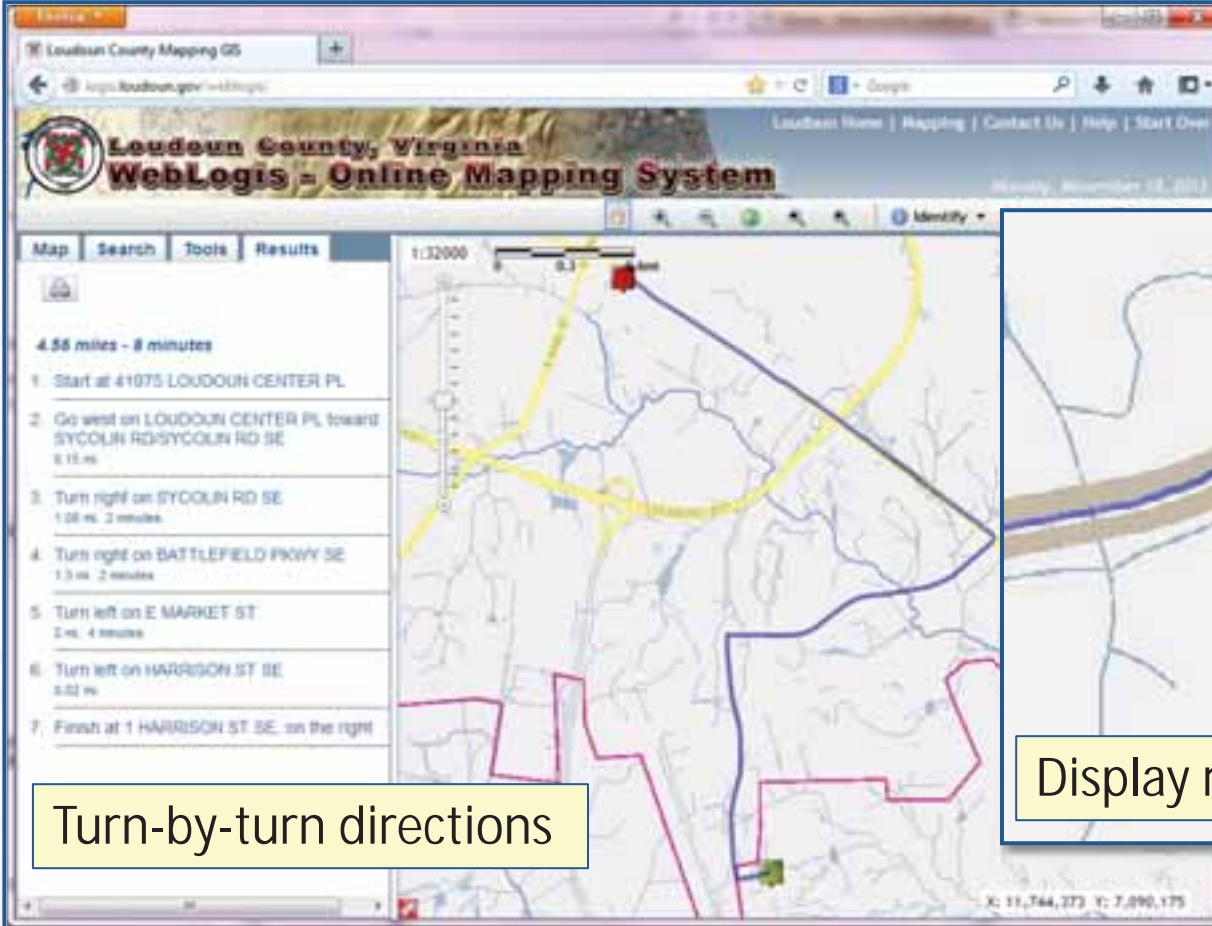
Get Directions

Reverse Directions

* Existing county addresses only

Results...

Uses *Geocode Service - Access Point* and *Centerline Network Service*



The screenshot shows a web browser window displaying the Loudoun County Mapping GIS application. The page title is "Loudoun County Mapping GIS" and the URL is "Apps.loudoun.gov/weblogs". The main heading is "Loudoun County, Virginia WebLogis - Online Mapping System". The interface includes a search bar, a map, and a list of directions. The directions are as follows:

1. Start at 41675 LOUDOUN CENTER PL
2. Go west on LOUDOUN CENTER PL toward SYCOLN RD/SYCOLN RD SE 0.15 mi.
3. Turn right on SYCOLN RD SE 1.08 mi. 2 minutes.
4. Turn right on BATTLEFIELD PKWY SE 1.3 mi. 2 minutes.
5. Turn left on E MARKET ST 2 mi. 4 minutes.
6. Turn left on HARRISON ST SE 0.02 mi.
7. Finish at 1 HARRISON ST SE, on the right

The map shows a yellow route starting from a red pin at 41675 Loudoun Center Pl and ending at a green pin at 1 Harrison St SE. A scale bar indicates 0.3 miles. The map also shows a small red car icon on the right side.

Turn-by-turn directions



The inset map shows a detailed view of the route to the access point. The route is highlighted in yellow and blue. The map shows a residential area with several houses and streets. The address 41975 is visible on one of the houses. The map also shows a small red car icon on the right side.

Display route to access point

Supporting Web Services...

- Map Services
- Geocode Service – Address Point
- Geocode Service – Access Point
- Centerline Network Service

Services:

- [Geocode/AddMastAccPts](#) (GeocodeServer)
- [Geocode/AddMastAddPts](#) (GeocodeServer)

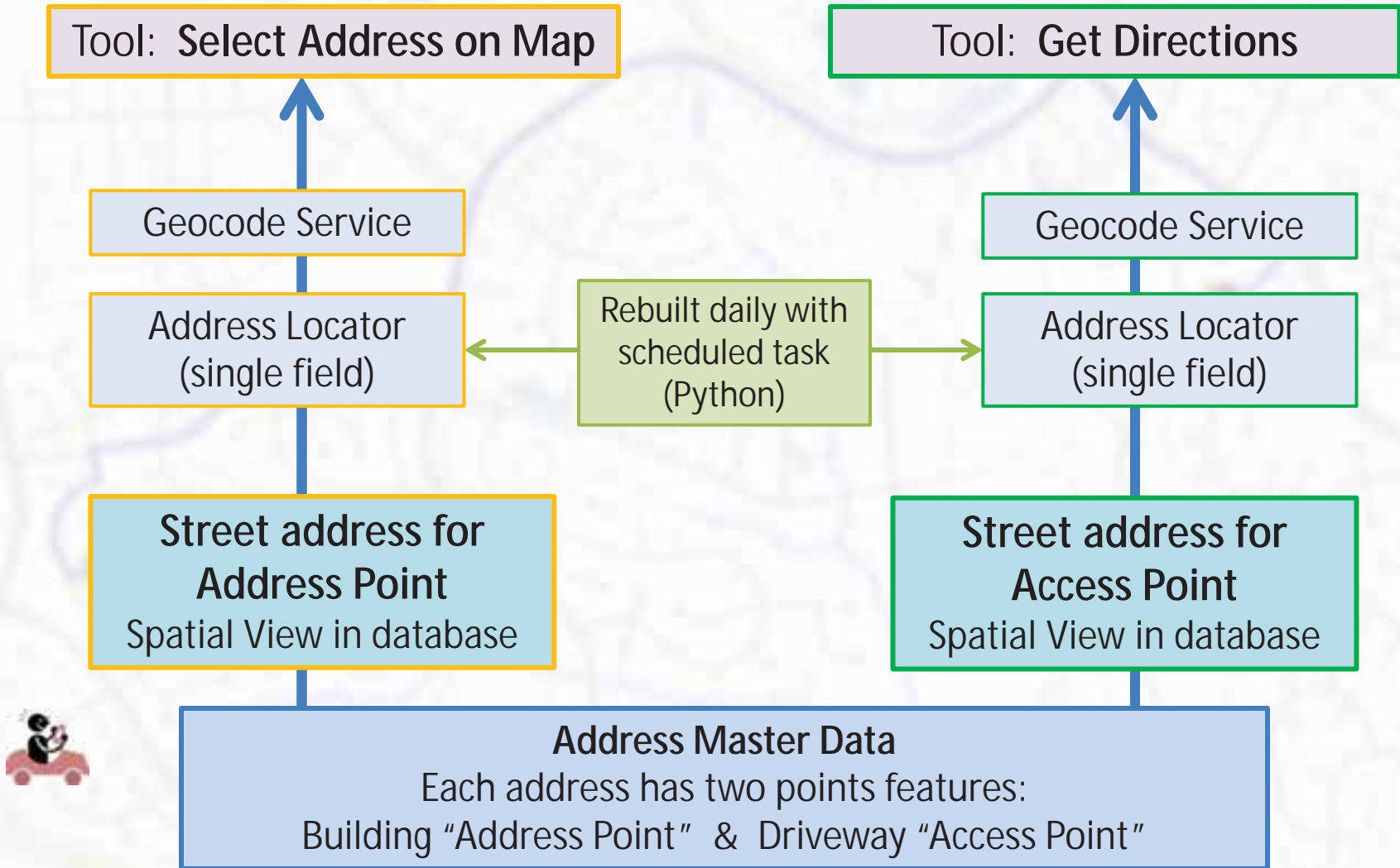
Geocode
AddMastAccPts
AddMastAddPts

Services:

- [Network/CenterlineNetwork](#) (MapServer)
- [Network/CenterlineNetwork](#) (NAServer)

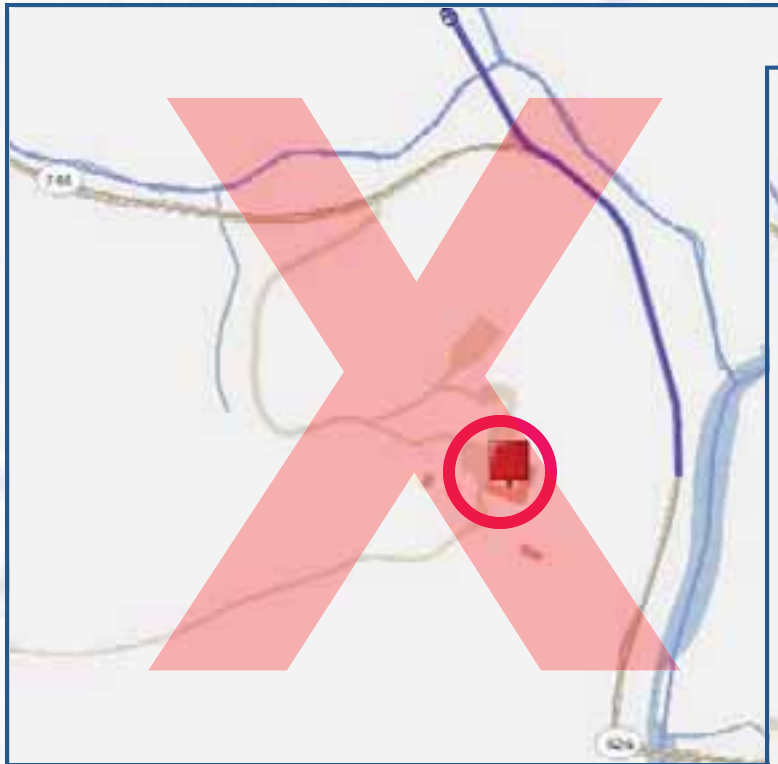
Network
CenterlineNetwork

Geocode Locators...



Routing issue...

Long driveways in Western part of county:



Route to building (Address Point)



Route to driveway (Access Point)

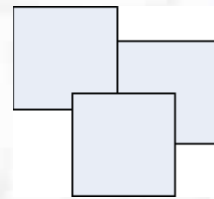


Network Dataset...



GDB

File *or* Personal *or* SDE



New feature Dataset

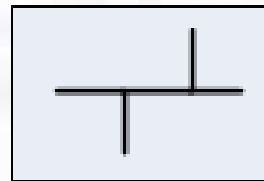
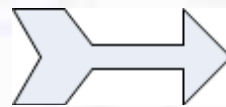
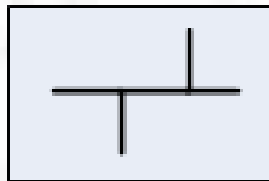


Centerline Feature Class

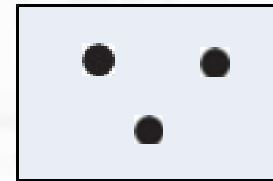
Network (Edges)

Network Junctions (Turns)

BUILD



AND



Network Dataset - Connectivity...

Parameters

From and To

Variables

SS_FROM_Z and SS_TO_Z

New Network Dataset

How would you like to model the elevation of your network features?

None

Using Z Coordinate Values from Geometry

Using Elevation Fields

Source	End	Field
Export_Output	From End	SS_FROM_Z
Export_Output	To End	

Click in the Field column to set elevation fields.

- CE_CHAIN_ID
- CE_LEFT_FROM
- CE_LEFT_TO
- CE_LF_SUB
- CE_LOUD_ID
- CE_LT_SUB
- CE_RF_SUB
- CE_RIGHT_FROM
- CE_RIGHT_TO
- CE_RT_SUB
- OBJECTID_1
- SS_FROM_Z
- SS_LOUD_ID
- SS_SPEEDLMT_R
- SS_SPEED_LMT
- SS_TO_Z
- SS_UPD_USER
- ST_CHAIN_ID
- <None>

Attributes & Evaluators...

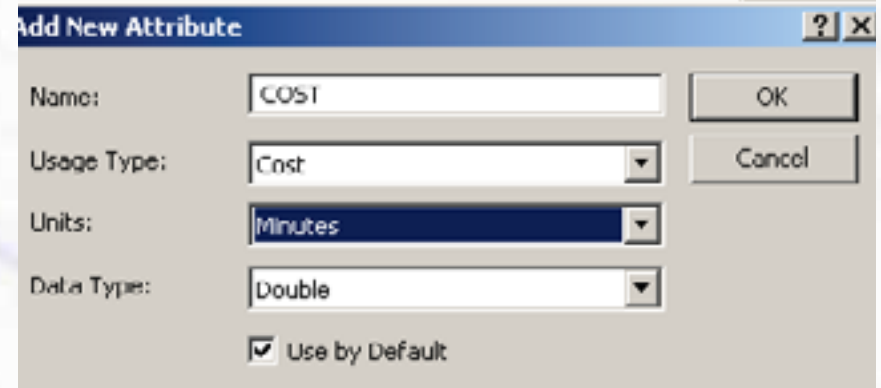
Attributes

Cost and Length

Evaluators

SS_FT_COST, SS_TF_COST

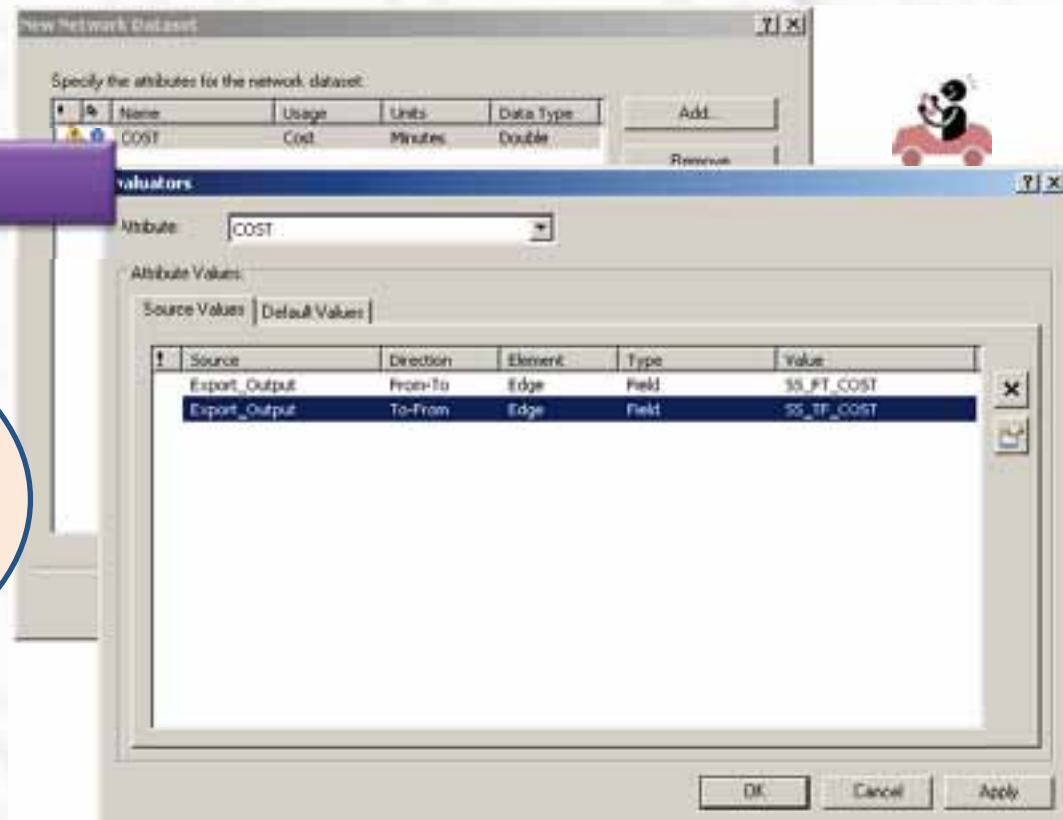
SS_LENGTH_FT, SS_LENGTH_TF



The 'Add New Attribute' dialog box is shown with the following fields:

- Name: COST
- Usage Type: Cost
- Units: Minutes
- Data Type: Double
- Use by Default

Buttons: OK, Cancel



The 'New Network Dataset' dialog box is shown with the following fields:

- Specify the attributes for the network dataset:
- Table with columns: Name, Usage, Units, Data Type
- Table with columns: Attribute, Source Values, Default Values

Name	Usage	Units	Data Type
COST	Cost	Minutes	Double

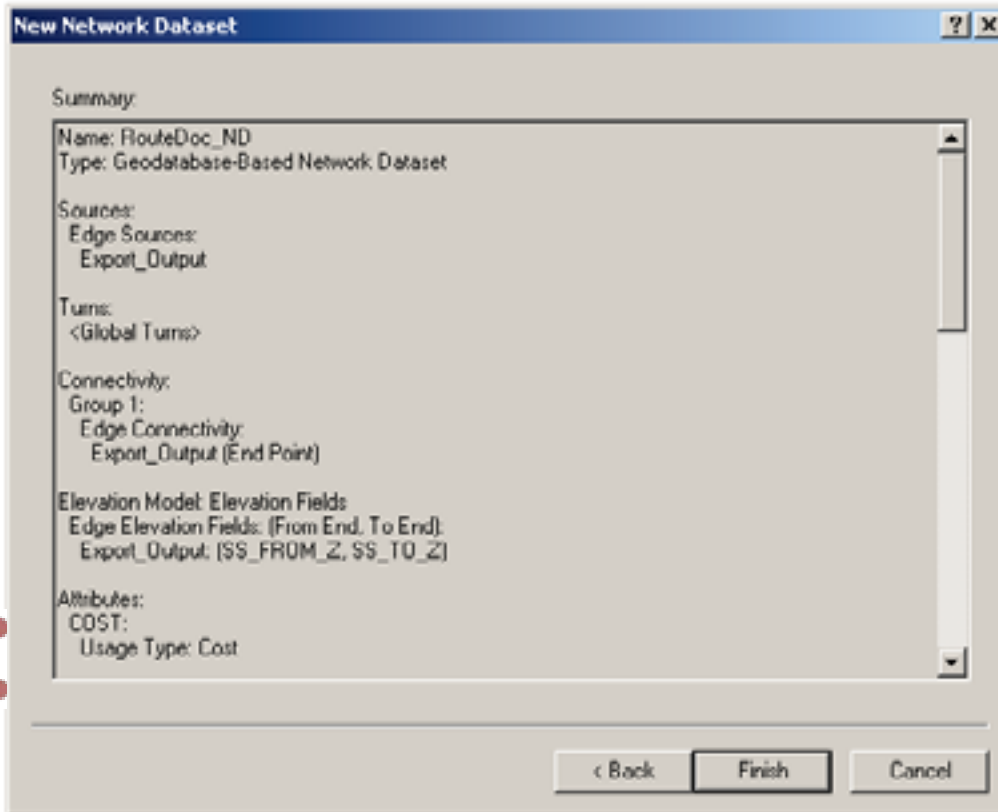
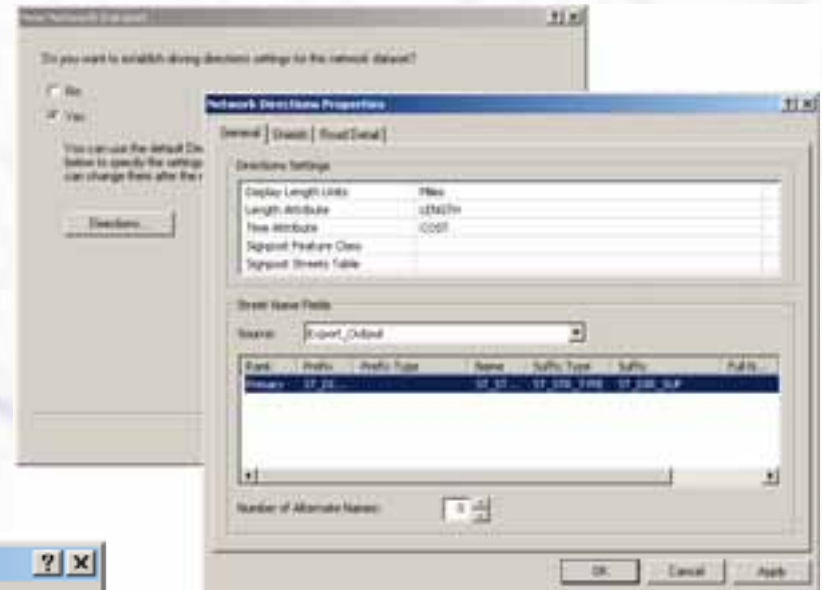
Attribute	Source Values	Default Values
COST		

Source	Direction	Element	Type	Value
Export_Output	From-To	Edge	Field	SS_FT_COST
Export_Output	To-From	Edge	Field	SS_TF_COST

Buttons: OK, Cancel, Apply

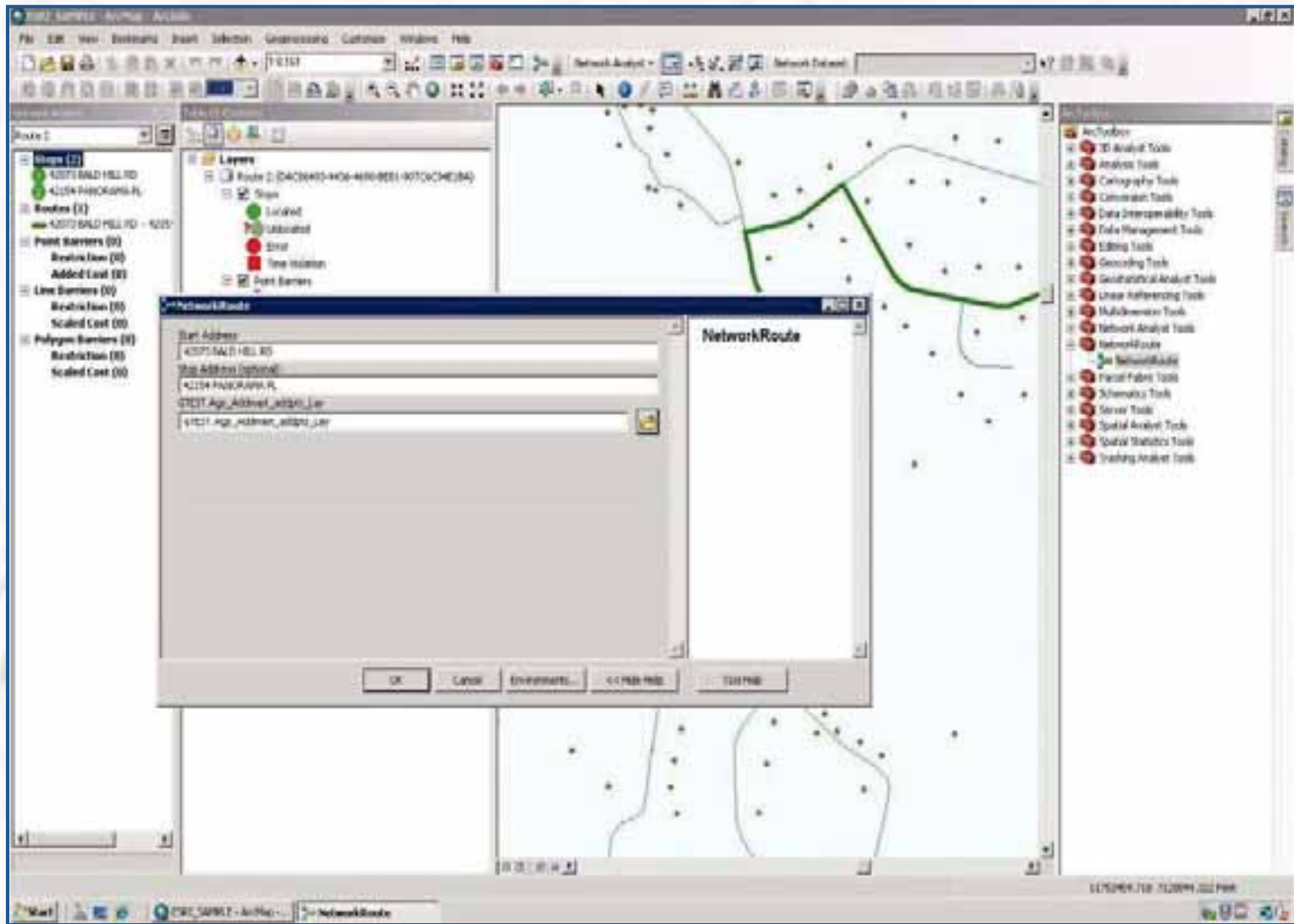
Driving Directions...

Street Name Fields



ST_DIR_PREF
ST_STR_NAME
ST_STR_TYPE
ST_DIR_SUF

Network layer...



Network dataset is added to ArcMap as Network layer and published as service.

Daily Updates



Land Records data is updated daily in the enterprise database.

Daily scheduled tasks rebuild:

- Array for address dropdown list
- Address Point Locator
- Access Point Locator
- Centerline Network

Update Python Script

```
CI_to_Network_arcpy.py - C:\ScheduledTasks\Connect_CI_to_Network_gis\scripts\CI_to_Network_arcpy.py
File Edit Format Run Options Windows Help
##
## Name: CI_to_Network.py
## Date: 10/20/14
## Created By: Mike Fautz
##             Office of Mapping
##             Loudoun County, Virginia
## Purpose: Process centralline data into a network
##
## Documentation url: C:\ScheduledTasks\Connect_CI_to_Network_gis\scripts\Documentation\Connect_CI_to_Network_arcpy.py
##
## History:
##
#####
# Import system modules
import sys
import string
import os
import arcpy
import shutil

# Set up time
from time import *

# Set OverwriteOutput
arcpy.OverwriteOutput = 1

# define wabs

def GetRecordCount (inTable):
    try:
        result = arcpy.GetCount_management(inTable)
        count = int(result.getOutput(0))
        return count
    except:
        print 'Error in GetRecordCount Module'

def CleanFC(etcPy)FC_def):
    try:
```

- Update Network Dataset
- Manage Network Analyst license
- Reporting
- Run as scheduled task

```
CI_to_Network_arcpy.py - C:\ScheduledTasks\Connect_CI_to_Network_gis\scripts\CI_to_Network_arcpy.py
File Edit Format Run Options Windows Help
'''
# Defines
strEM = strEM + '\n\n  Begin 10:00am Update Event)' + strftime('%d %b %Y %H:%M:%S', localtime())

# Stop Service
# run stop task
os.system('C:\ScheduledTasks\Connect_CI_to_Network_gis\scripts\runstopnetcat.bat')
sleep(5)

# save FGD
strSourceFGD = 'C:\ScheduledTasks\Connect_CI_to_Network_gis\scripts\INT_CENTERLINE_NETWORK.gdb'
strTargetFGD = '\\lga11ga11\apps_data\lga11\Network\CENTERLINE_NETWORK.gdb'

MoveFGD(strSourceFGD, strTargetFGD)

# Start Service
# run start task
os.system('C:\ScheduledTasks\Connect_CI_to_Network_gis\scripts\runstartnetcat.bat')
sleep(5)

strEM = strEM + '\n\n  End 10:00am Update Event)' + strftime('%d %b %Y %H:%M:%S', localtime())

except:
    strEM = strEM + '\n\n ERROR: failed to update 10:00am event'

try:
# Defines
strEM = strEM + '\n\n  Begin 4:00 Update Event)' + strftime('%d %b %Y %H:%M:%S', localtime())

# Stop Service
# run stop task
os.system('C:\ScheduledTasks\Connect_CI_to_Network_gis\scripts\runstopnetcat.bat')
sleep(5)

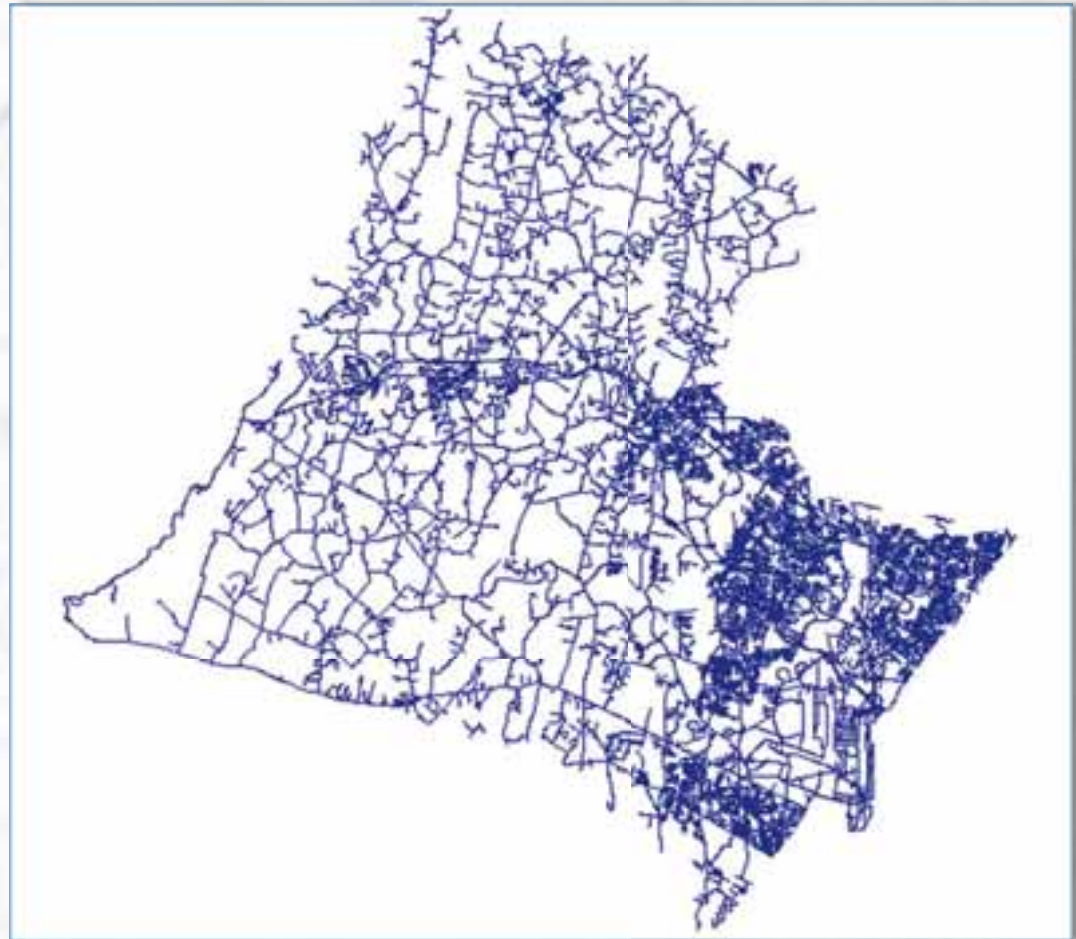
# save FGD
strSourceFGD = 'C:\ScheduledTasks\Connect_CI_to_Network_gis\scripts\INT_CENTERLINE_NETWORK.gdb'
strTargetFGD = '\\lga11ga11\apps_data\lga11\Network\CENTERLINE_NETWORK.gdb'

MoveFGD(strSourceFGD, strTargetFGD)

'''
In: 08/0
```


Network Ready Centerline Feature Class

CE_CHAIN_ID	Integer
CE_PLAT_NUM	String
CE_RIGHT_FROM	Integer
CE_LEFT_FROM	Integer
CE_RIGHT_TO	Integer
CE_LEFT_TO	Integer
CE_RF_SUB	Integer
CE_LF_SUB	Integer
CE_RT_SUB	Integer
CE_LT_SUB	Integer
CE_C_STAT	String
CE_LOUD_ID	Integer
CE_ADD_DATE	Date
CE_UPD_SOURCE	SmallInteger
CE_UPD_DATE	Date
CE_UPD_USER	SmallInteger
CE_END_DATE	Date
CE_LENGTH	Double
SM_ST_CHAIN_ID	Integer
SM_ST_DIR_PREF	String
SM_ST_STR_NAME	String
SM_ST_STR_TYPE	String
SM_ST_DIR_SUF	String
SM_ST_RTNO	String
SS_LOUD_ID	Integer
SS_LENGTH_FT	Double
SS_MTFCC	String
SS_RD_CLASS	Double
SS_FROM_Z	SmallInteger
SS_TO_Z	SmallInteger
SS_ONE_WAY	String
SS_SPEED_LMT	SmallInteger
SS_FT_COST	Double
SS_TF_COST	Double



Join Centerline feature class with attribute tables



CENTERLINE Feature Class

Field Name	Data Type
CE_CHAIN_ID	Long Integer
CE_PLAT_NUM	Text
CE_RIGHT_FROM	Long
CE_LEFT_FROM	Long Integer
CE_RIGHT_TO	Long Integer
CE_LEFT_TO	Long Integer
CE_RF_SUB	Long Integer
CE_LF_SUB	Long Integer
CE_RT_SUB	Long Integer
CE_LT_SUB	Long Integer
CE_C_STAT	Text
CE_ADD_DATE	Date
CE_LOUD_ID	Long

CE_CHAIN_ID

CE_LOUD_ID

STREET MASTER Table

Field Name	Data Type
ST_DIR_PREF	Text
ST_STR_NAME	Text
ST_STR_TYPE	Text
ST_DIR_SUF	Text
ST_PO	Text
ST_SUBDV	Text
ST_SUBDV_SEC	Text
ST_C_STAT	Text
ST_JURIS	Text
ST_STR_DIR	Text
ST_CHAIN_ID	Long Integer
ST_FROM	Text
ST_TO	Text

ST_CHAIN_ID

STREET SEGMENTS Table

Field Name	Data Type
SS_LOUD_ID	Long Integer
SS_LENGTH_FT	Double
SS_RTNO	Text
SS_MTFCC	Text
SS_RD_CLASS	Double
SS_FROM_Z	Short Integer
SS_TO_Z	Short Integer
SS_ONE_WAY	Text
SS_SPEED_LMT	Short Integer
SS_SPEEDLMT_R	Short Integer
SS_FT_COST	Double
SS_TF_COST	Double
SS_ALT_NAME	Text

SS_LOUD_ID

Network Dataset

Source File Geodatabase

Network Dataset (DS)

Centerline_Network
Network_ND
Network_ND_Junctions



CENTERLINE_NETWORK



NETWORK_ND



NETWORK_ND_Junctions



Update the Network



Network Ready Centerline



CENTERLINE_NETWORK

Append line features

Network Dataset

Build Network



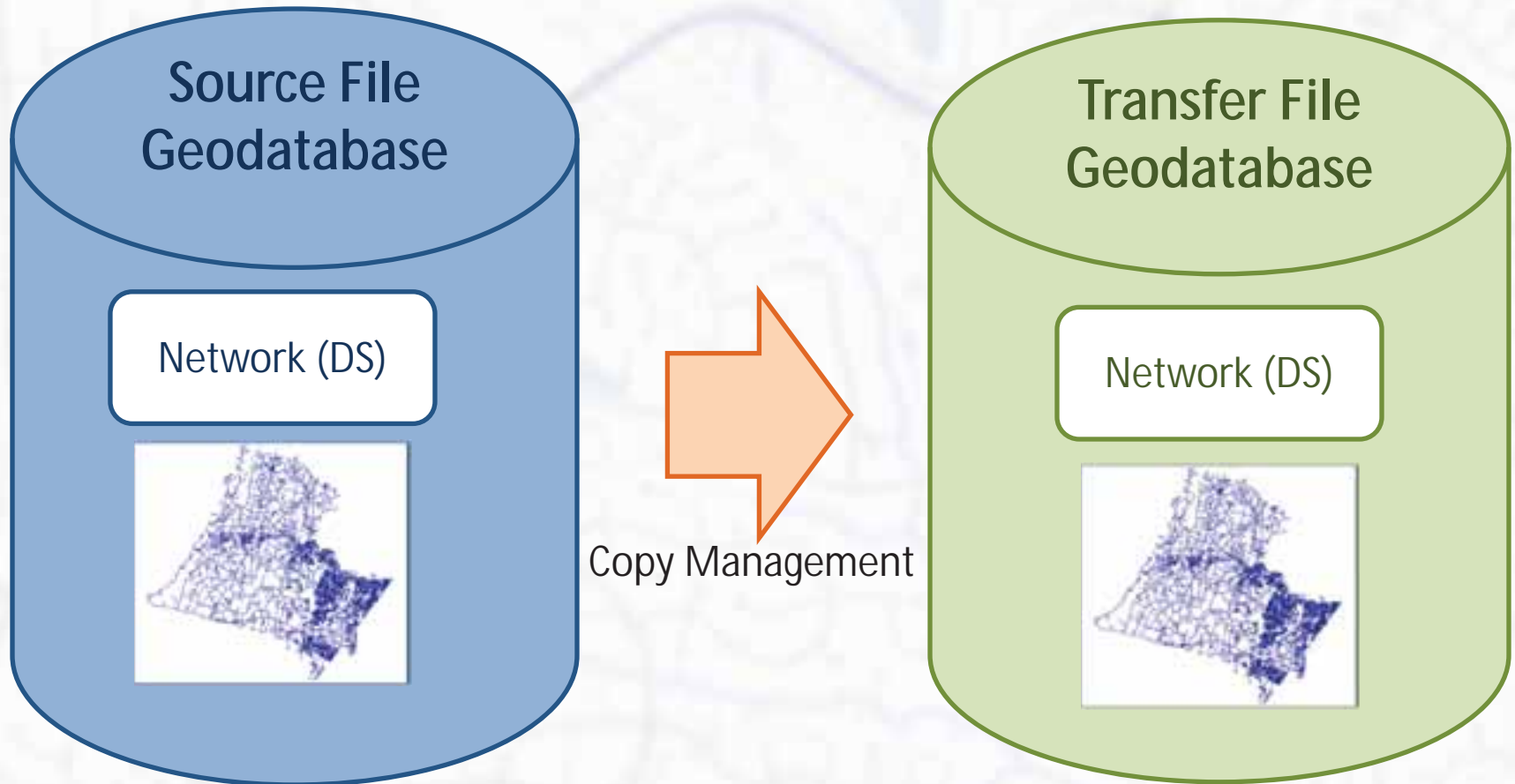
NETWORK_ND



NETWORK_ND_JUNCTIONS



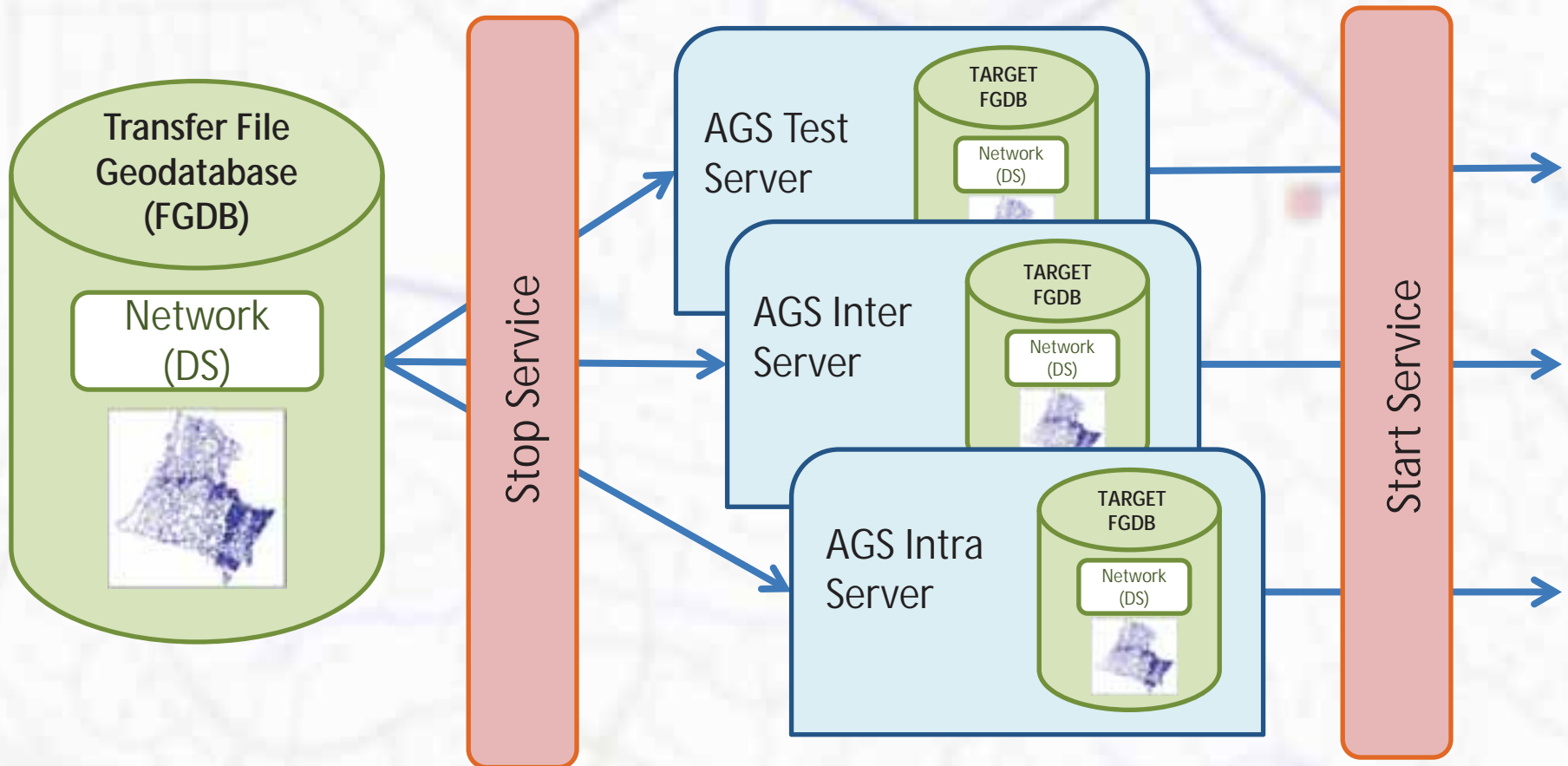
Create Transfer File Geodatabase



Update Production Networks



Replace Target FGDB with Transfer FGDB



Future goals...

- Extend network outside county boundary
- Add routing to
 - Intersections
 - Centerline address range
 - Multiple addresses
- Develop tools for
 - Service Area Routing
 - Find Closest Facility
- Add routing tools to more applications



Thank you!

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