

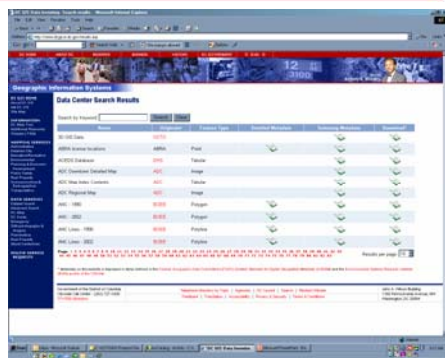
## DC GIS Steering Committee 4-28-2005

Barney Krucoff, GIS Director  
Office of The Chief Technology Officer  
Barney.Krucoff@dc.gov

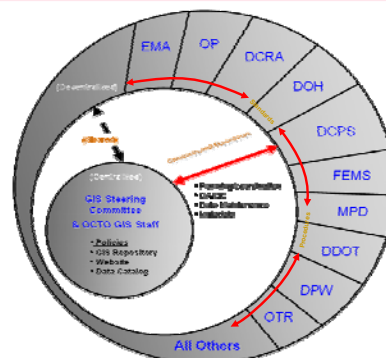
## Federated Data Model Follow-Up

- Distributed Email – January 2005
- Discussed at Steering Committee
- Included Data Listing by Agency
- Activities:
  - Some Agency Feedback
  - EMA and OCTO reviewed the Agency Data List
  - Full Data Catalog is on DC GIS Intranet ([dcgis.in.dc.gov](http://dcgis.in.dc.gov))
  - Currently has 830 Datasets, 200 for distribution

## Intranet Data Catalog



## Federated Data Model



## Agency Action Items

- Review and comment on the Federated Data Model document
- Identify a primary GIS contact(s) at the agency
- Coordinate the layers that each agency will own and maintain and determine update cycles for each
- Maintain a consolidated geospatial data maintenance plan

## Federated Data Model Follow-Up

- Anticipated changes/additions to the Federated Model
  - Accuracy and Precision
  - Snapbase
  - Cluster Tolerance
  - Metadata
  - Topology
  - Cartography (print and web)
  - Data Catalog

## Updated Data

- Dun and Bradstreet 12/2004
- CAMA 12/2004
- Charter School 1/2005
- Public School 1/2005
- School Attendance Zone 2/2005
- Metro Station 2/2005
- Metro Entrance 2/2005
- CAMA 1/2005
- Owner Point (draft) 4/2005
- Sales Point (draft) 4/2005

Slide 6

## Data Update - OwnerPoints

- Incorporates ITS Public Extract
- New Table Schema
- Impacts Applications and Services
- 205 Columns, down from 254
- Available as OwnerPt\_42705 and SalePt\_42705
- Currently updating Metadata

Slide 7

## New Data

- **Polling Place**  
10/2004
- **Parking Meter**  
11/2004
- **Property Lines CAD – Update**  
4/2005

Slide 8

## Current Data Update

- Street Centerline
  - Military Areas
  - Places of Worship
  - Embassy
  - Points of Interest
  - Library
  - DC Quad
  - Dun and Bradstreet
  - Owner Point
  - Sale Point
- » May 2005 publication

Slide 9

## Data Update - Street Centerline

- Before - 5 layers (Street, Alley, Service Road, Drive, and Ramp)
- Now - One Consolidated Layer
- Extracted from DDOT geodatabase
- Updated Table Schema
- Includes DDOT Centerline Updates

Slide 10

## Geographic Information System & Enterprise System Architecture

Zhen Lo, GIS Systems Architect

## Presentation

- Review of the current enterprise architecture
- Support federated data model
- One stop for geospatial data, services, and support
- Increase reliability and performance of the GIS infrastructure

Slide 12

## Central GIS System (Currently)

- Improved access and visibility of geospatial data within the District
- Establish a framework for data sharing (ESRI)
- Enabled District employees to use GIS technology via the Intranet
- Formed a GIS user community for collaboration

Slide 13

## Issues to resolve

- Difficulty performing data maintenance
  - Data access
  - Data integration
- Communication between data provider(Agency) and host (OCTO)
- Turn around time for expanding data inventory
- Lack of application framework or standards

Slide 14

## The Approach

- Use the ESRI Enterprise suite software
- Build upon current data standards
- Adopt OCTO server consolidation approach
- Work with Agencies independently to comply with architecture framework to enable data and services sharing

Slide 15

## Federated Data Model

Slide 16

## Enterprise Architecture Requirements

### Data

- Establish data standards
- Frequency of updates
- Metadata standards

### Portal

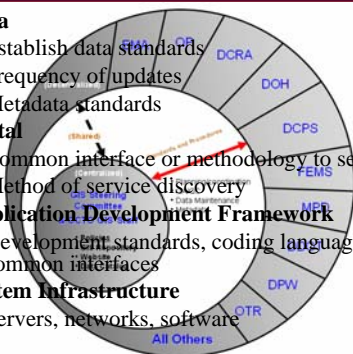
- Common interface or methodology to services
- Method of service discovery

### Application Development Framework

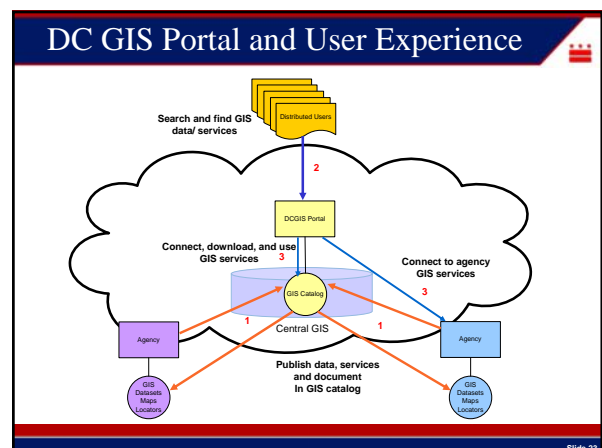
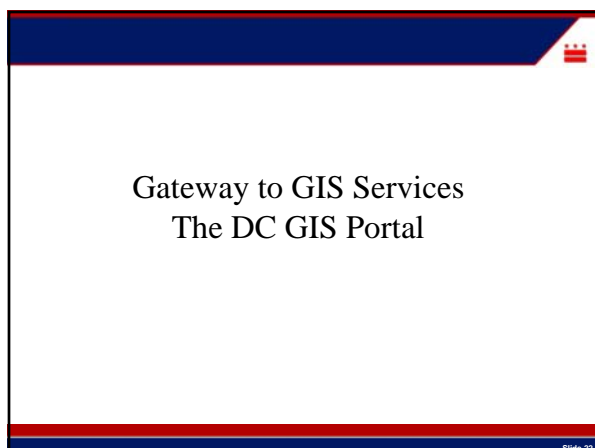
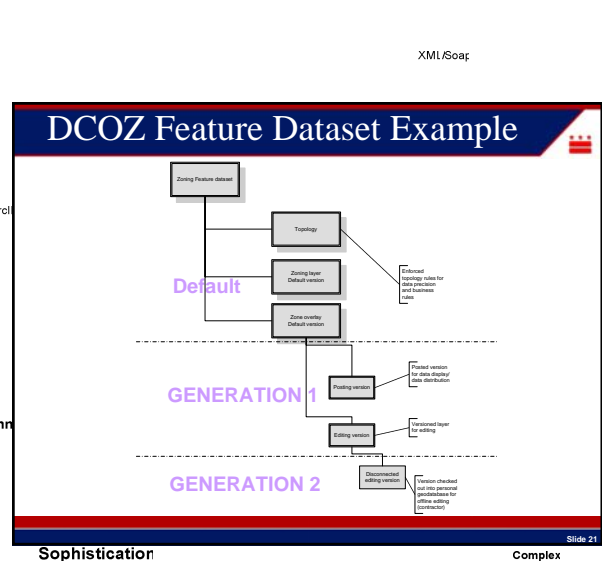
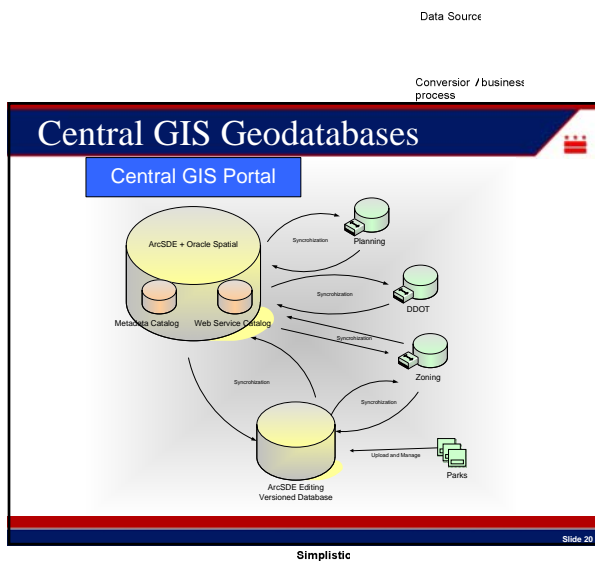
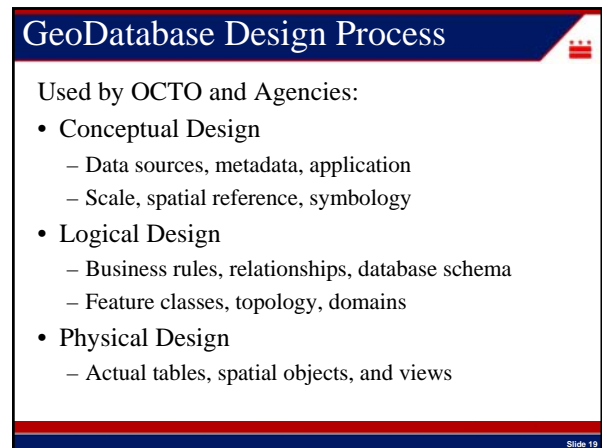
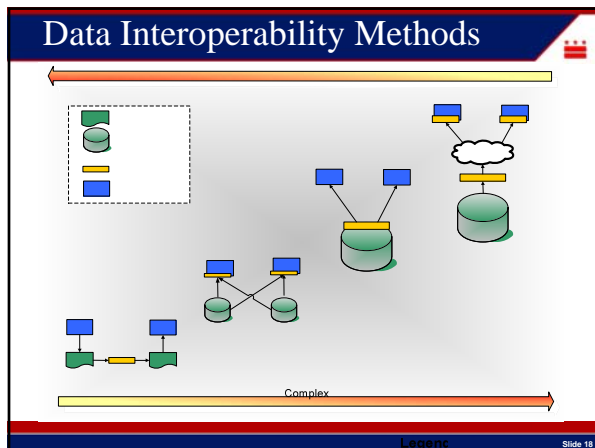
- Development standards, coding languages
- common interfaces

### System Infrastructure

- Servers, networks, software



Slide 17



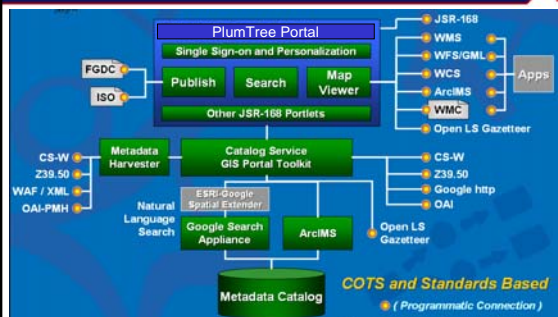
## Central GIS Portal

- Web page interface
- Gazetteer
- Harvesting
- Web mapping application



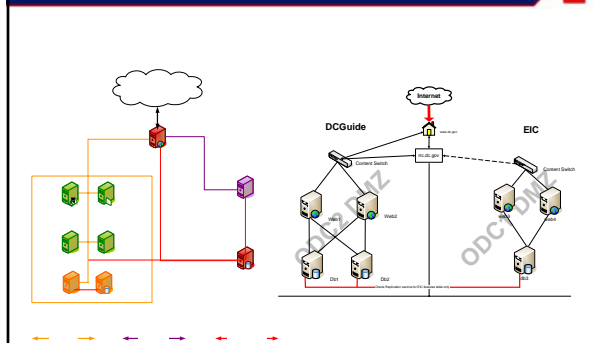
## Application Framework

## DC GIS Portal Framework

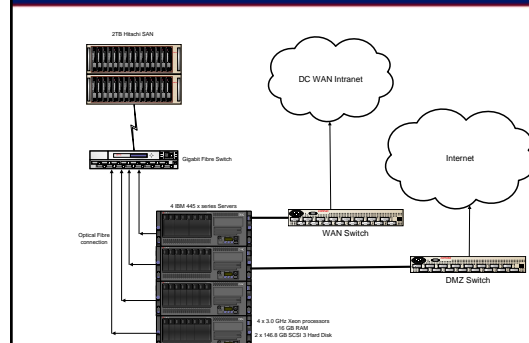


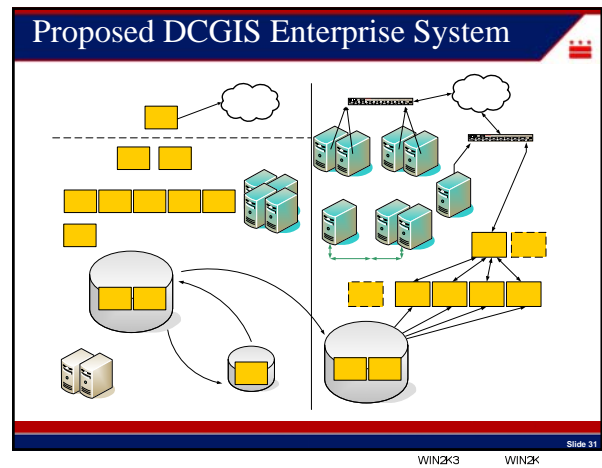
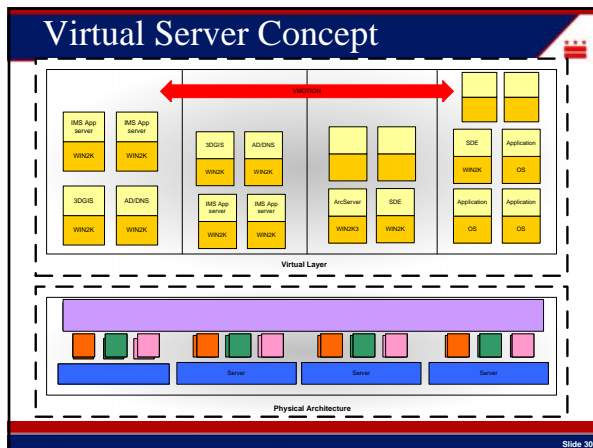
## Enterprise System Infrastructure

## Current DC GIS Production Systems



## Proposed System Hardware





- ### Summary: New GIS Enterprise Architecture
- A framework for GIS application development, data sharing, and agency cooperation
  - Continue to expand and improve the District's geospatial data and services
    - Increased flexibility
    - Increased reliability
    - Increased in performance and quality of service
- Slide 32



### Agency GIS Strategic Planning Process

- ### Agency GIS Strategic Plan Outline
- Mission
  - GIS-related Agency Goals (FY2005 budget)
  - Agency GIS Goals
  - Applications
  - FY 2005 Projects
  - Accomplishments
- NOTE: THIS IS OCTO'S FIRST DRAFT OF A GIS STRATEGIC PLAN FOR YOUR AGENCIES. PLEASE CHANGE THIS AS YOU WISH TO MAKE IT YOURS. We think the focus on using GIS to achieve this year's agency goals can increase agency awareness of GIS
- Slide 35

## Inventories

### Data

- Datasets are listed in the inventory if your agency is an Originator, GIS Lead, or Cooperating Agency
- Please review, correct, and add to the inventory

### GIS Applications & Software Inventory

- Inventory A lists relevant ESRI GIS software licenses and maintenance agreements
- Inventory B is for GIS applications or customizations of standard ESRI packages

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## Automated Routing Streamlines Bulk Trash Collection in Washington DC

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## Project Background

The Department of Public Works (DPW) is developing an automated routing and reporting system based on Geographic Information System (GIS) and Routing software;

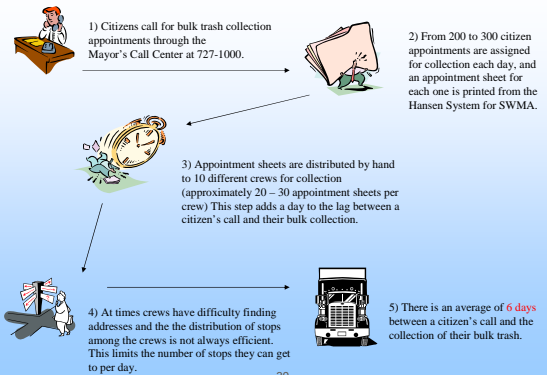
DPW successfully implemented computerized bulk trash routing in the period from November 2003 to November 2004;

Now DPW is seeking to automate the steps to make the process user friendly and to extend it to other operations.

Slide

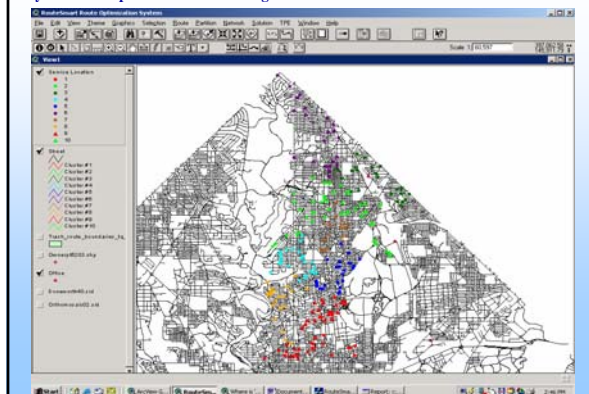
38

### Without Computerized Routing

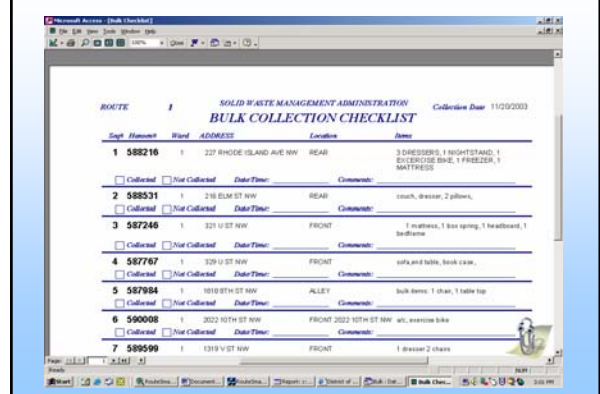


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With computerized routing, the 200 - 300 appointments are delivered from the Hansen System as computer files and are assigned to crews in moments.

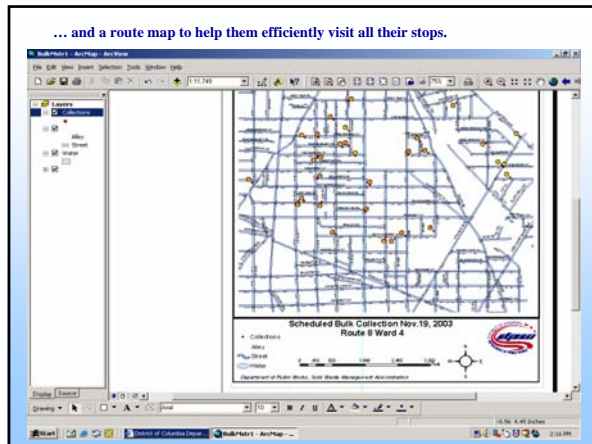


Each crew receives a succinct checklist of their stops.....



Stop	Household	Ward	ADDRESS	Location	Items
1	588216	1	227 RHODE ISLAND AVE NW	REAR	3 DRESSERS, 1 NIGHTSTAND, 1 EXERCISE BIKE, 1 FREEZER, 1 MATTRESS
2	588531	1	218 ELM ST NW	REAR	couch, dresser, 2 pillows,
3	587246	1	321 V ST NW	FRONT	1 mattress, 1 box spring, 1 headboard, 1 bed frame
4	587767	1	329 U ST NW	FRONT	sofa and table, book case,
5	587984	1	1810 8TH ST NW	ALLEY	bulk items: 1 chair, 1 table top
6	590008	1	2022 10TH ST NW	FRONT 2022 10TH ST NW	wp, exercise bike
7	589599	1	1319 V ST NW	FRONT	1 dresser 2 chairs





### The impact was immediate and dramatic:

Crews completed their work returned to the yard **1.5 to 2 hours earlier** than before, and there was a significant decrease in mileage needed to service a similar number of service requests. The crews enjoy working with the maps and reports.



These results create opportunities for SWMA managers:

- 1) To increase the number of bulk appointments served each day;
- 2) To reduce the average time between a citizen's call and the collection of their bulk;
- 3) To deal with absent workers, down trucks, and special tasks, through quick reassignment of work when necessary;
- 4) To increase opportunities for staff training.

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	Route Smart 11-03 to 2-04	Post Route Smart 11-04 to 2-05
# of Days	67	73
# of Routes	664	772
Routes Ran per Day	10	11
Scheduled SR's	13,205	13,356
Completed SR's	10,754	9,597
Unscheduled SR's	3,872	3,654
Total Hours on Collection	4,343	5,003
Collection Hours per Route	6.54	6.48
Total Miles	19,987	27,672
Collection Miles	11,078	18,905
Travel Miles	8,909	8,750
Total Miles per Day	298	379
Collection Miles per Day	165	259
Travel Miles per Day	133	120
Total Vehicle Cost	\$ 190,185	\$ 216,348

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## Limitations of Initial Routing Implementation

- GIS technical knowledge and time is required to perform routing;
- It takes approximately 40 minutes per day to perform the routing;
- The routing software and data are stored on a single desktop PC;
- In the initial form of implementation it was not practical to extend the routing to other types of activities.

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## Proposed Solution – System Integration

**Integration of standard software components to automate the existing process will create:**

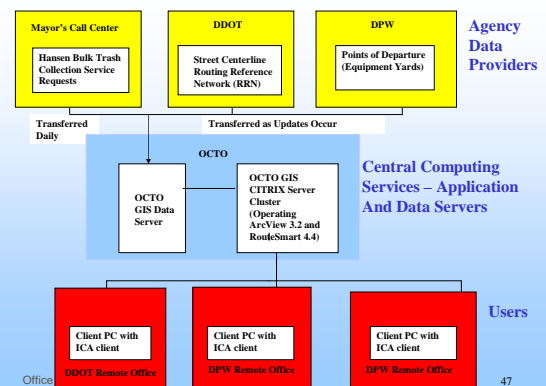
- An application that routes multiple bulk collection crews and creates succinct crew-specific reports and maps resulting from a review of several routing options each day;
- A system that successfully interfaces with the Mayor's Call Center Hansen Service Request System;
- A user-friendly application interface to be operated by a foreman and supervisors directly responsible for the bulk trash collection work;
- An application that can be easily adapted to a variety of Hansen service request activities.

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## Proposed Configuration:



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**User Chooses Between Solutions**

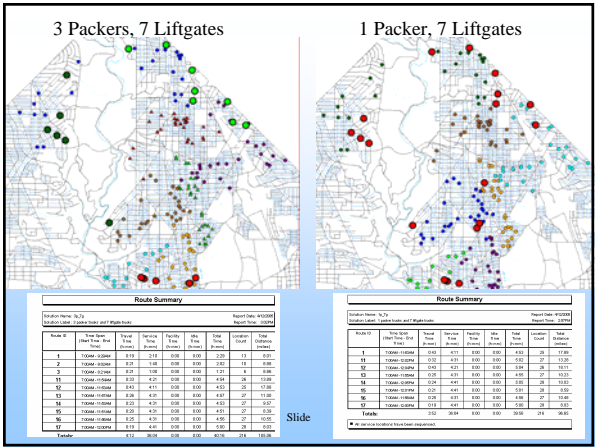
The screenshot displays the 'RoadNet1 Solution Manager' window. It contains a table with the following data:

Name	Label	Date Created
2p	2-park to trails and 6 Wagon trails	3/29/2005 12:14 PM
7p	2-park to trails and 7 Wagon trails	3/29/2005 12:21 PM
2p	2-park to trails and 6 Wagon trails	3/29/2005 12:21 PM
7p	2-park to trails and 7 Wagon trails	3/29/2005 12:20 PM
2p	2-park to trails and 6 Wagon trails	3/29/2005 12:18 PM

Below the table, there is a checkbox labeled 'Filter solutions' which is checked. At the bottom of the dialog, there are buttons for 'Load', 'Delete', and 'Replot'. The background map shows various colored points (green, purple, red, black) representing different solutions overlaid on a street network.



**Liftgate Truck** – A hydraulic platform raises items to the level of the truck bed. It is small enough to service any street or alley.



# After the Route Choice is Made and Saved, a Map and a Manifest Report will be Generated and Printed for each Crew

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# Benefits


- Operational supervisors will be able to choose the routing solution and create the maps and reports themselves;
- By developing the application in a client server configuration it will be accessible from any computer on the network. This will facilitate data entry and printing at any DPW remote office;
- Now approximately 40 minutes are spent each day by 1 GIS technician. The application will free up the GIS technician for that amount of time each day while still saving 1.5 –2 hours per crew per day;
- Routing reports and maps for other service request activities will be established. Some possibilities are abandoned and junk vehicle investigations and potholes. Similar improvements in efficiency are expected for those activities.

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This process can be applied to many other activities that DPW and other agencies perform in the City. We believe there are dozens of opportunities to apply this combination of teamwork and technology to increase efficiency throughout DC government.

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## Conclusions

- An automated bulk routing application will improve an already successful process by saving even more time;
- The operational supervisors will be empowered to create their own routes, reports and maps by choosing from a set of solutions;
- The output will be printed on site – daily pickup of a packet of maps and reports at 2750 South Capitol and delivery to Brentwood will no longer be necessary;
- The application will be designed for adaptation to other service request-based activities.

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## Development of Master Address Repository (MAR)

## Project Background

- Strategic Plan completed in 2001
  - updated in 2003
- Address Steering Committee formed in 2001
- Address Standards completed in 2001
- Contracts for Database Design/Development and Data Development signed in September 2003
- Project completion scheduled for Spring of 2005

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## Project Objectives

- Create a repository that is real-time, and contains 100% of all valid DC addresses
- Create an enterprise system that is capable of allowing **ALL** DC agencies to verify addresses for their business purposes
- Create an enterprise application tool that is capable of cleaning address data and purging incorrect address data

Slide 58

## Standards

- Developed Addressing Standards to begin getting all this information into shareable form
- Standards have 2 parts:
  - Data format: how will addresses be parsed, what types of fields will be used, domain of values
  - Address assignment rules (how addresses are determined in the field)

Slide 59

## AddressPoints vs. OwnerPoints

- For condo buildings: MAR will only have one AddressPoint. OwnerPoints will have one point per unit.
  - MAR has 122,916 address points. OwnerPoint has 176,293 records
  - Units are in a related table
- For rental apartment buildings: Both MAR and OwnerPoints will have one address for the entire building.
- There may be many address points for a single SSL that would have only one OwnerPoint.
  - Campuses
  - Building with multiple addressed front doors
- MAR points are located at the center of the building whereas the OwnerPoints are located somewhere on the property as defined by old georeferenced scans.
- In MAR the complete address will be 1420 Corcoran Street NW whereas in OwnerPoints it would be 1420 Corcoran St NW (street type abbreviated)
- OwnerPoints also includes properties without an address. MAR does not include properties without addresses.
- AddressPoints don't replace OwnerPoints, but the vector property map will replace OwnerPoints

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## How Agencies Will Interact w/ The MAR

- Web Service (XML)
  - Inputs
    - Addresses "441 4th Street NW"
  - Returns
    - If verified
      - Return Code
      - AID (if verified)
      - Status
      - Full Address
      - Phrased Address
      - X,Y
      - USNG
      - Ward
      - ANC
      - SMD
      - PSA
      - PD
    - If not verified
      - Return Code
      - Candidate Addresses w/ information
      - Feedback Link
        - User can follow the link to have a tracking number assigned to an address they want checked.
- Backwards compatible with the existing mini-MAR web service

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## Interaction w/ MAR Continued

- Related Web Services
  - Inputs
    - Square Suffix Lot: 0100 0037
    - Intersection: 4th Street NW AND/& D Street NW
    - Block: 400 BLOCK(BLK) of 4th Street NW
    - Cross Streets: 4th Street NW BETWEEN D Street NW AND/& E Street NW
    - Place Name: One Judiciary Square
  - Location+

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## ArcGIS MAR Geocoding Extension

## What the extension does

- Calls the MAR Web Service (currently mini-MAR)
- Populates the input table with the matched address, Address ID, and X, Y coordinate pairs.
- Allows interactive match

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Geocode an Access Table

Access Database File

Access Table

Address Field

Match Address Field

X Field

Y Field

OCTO ID Field (Optional)

Batch Match

Interactive Match

Exit

Start Time

End Time

Browse for Input Database containing the table to be matched

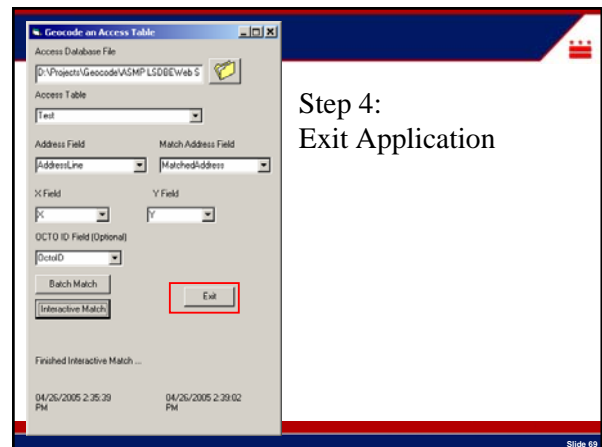
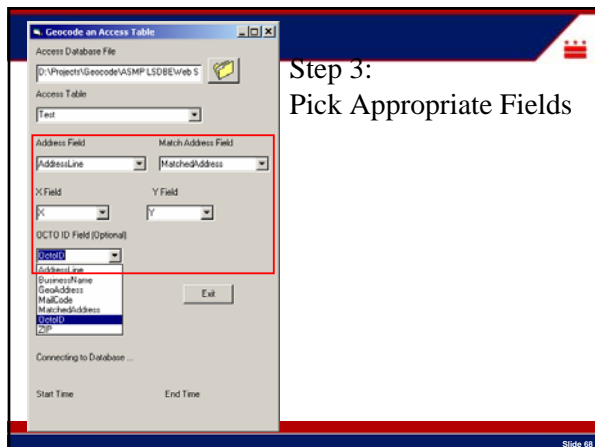
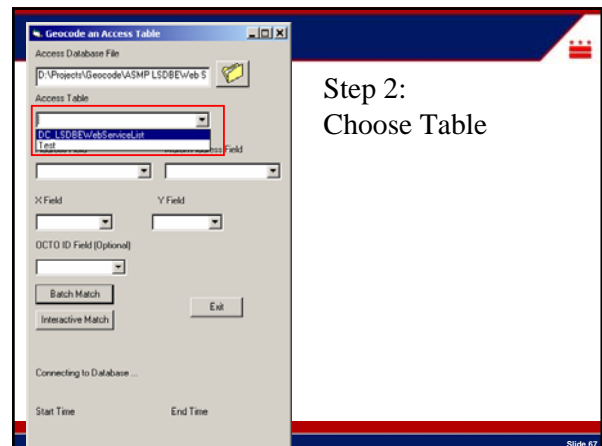
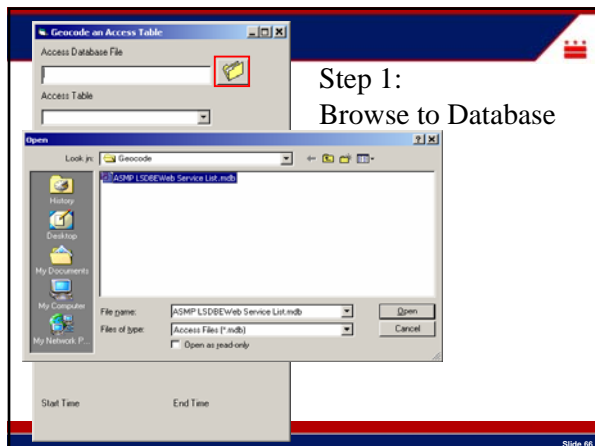
Input Table with address to be matched (select from a drop-down list of tables in the Database).

Field containing Addresses

Output fields containing the address found, AID, and the coordinates

OCTO ID Field (Optional)

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**Input Table**

Test   Table	AddressLine	MatchedAddress	OctoID	X	Y
1	100 EASTERN AVE. NW SUITE 200		0	0	0
2	1427 CONNECTICUT AVE NW SUITE 303		0	0	0
3	1129 KANSAS AVE. NE		0	0	0
4	1100 17th STREET, NW		0	0	0
5	913 U ST NW		0	0	0
6	2201 STREET NE SUITE 200		0	0	0
7	1806 BRENTWOOD ROAD NE SUITE 100		0	0	0
8	1818 NEW YORK AVENUE, NE SUITE 206		0	0	0
9	1717 K STREET NW SUITE 600		0	0	0
10	2036 HUCKLEBERRY PLACE, NW		0	0	0
11	2121 K STREET NW SUITE 800		0	0	0
12	515 FERN PLACE, NW		0	0	0
13	913 U STREET NW		0	0	0
14	410 8th STREET, NW 3RD FLOOR		0	0	0
15	1200 G STREET, NW SUITE 800		0	0	0
16	634 QUEBEC PLACE NW		0	0	0
17	733 15th STREET NW		0	0	0
18	4408 GAULT PLACE NE		0	0	0
19	11th 17th STREET NW SUITE 110		0	0	0

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**Output Table**

Test   Table	AddressLine	MatchedAddress	OctoID	X	Y
1	100 EASTERN AVE. NW SUITE 200	708 Eastern Avenue NW	142077	397036.809	148223.08
2	1427 CONNECTICUT AVE NW SUITE 303	5429 Connecticut Avenue NW	111054	373005.54	153947.674
3	1129 KANSAS AVE. NE	8129 Kansas Avenue NE	141099	399341.676	144900.603
4	1100 17th STREET, NW	1429 18th Street NW	149099	397099.91	137036.52
5	913 U ST NW	913 U Street NW	36863	397866.151	139812.579
6	2201 STREET NE SUITE 200	2201 Street NE	12827	399779.035	137069.749
7	1806 BRENTWOOD ROAD NE SUITE 100	1806 Brentwood Road NE	54122	405046.94	139068.549
8	1818 NEW YORK AVENUE, NE SUITE 206	1818 New York Avenue NE	63969	402015.77	139871.214
9	1717 K STREET NW SUITE 600	1717 K Street NW	149069	396495.792	137206.334
10	2036 HUCKLEBERRY PLACE, NW	2036 Huckleberry Place NW	60172	393600.092	139063.695
11	2121 K STREET NW SUITE 800	2121 K Street NW	149067	396911.797	137206.89
12	515 FERN PLACE, NW	515 Fern Place NW	19065	396239.152	146521.399
13	913 U STREET NW	913 U Street NW	36863	397866.151	139812.579
14	410 8th STREET, NW 3RD FLOOR	410 8th Street NW	16126	397979.224	139068.673
15	1200 G STREET, NW SUITE 800	1200 G Street NW	43615	397522.406	136991
16	634 QUEBEC PLACE NW	634 Quebec Place NW	20574	396216.616	142027.724
17	733 15th STREET NW	733 15th Street NW	142049	397102.102	136091.439
18	4408 GAULT PLACE NE	4408 Gault Place NE	90187	405036.195	139817.629
19	11th 17th STREET NW SUITE 110	915 17th Street NW	90961	396967.476	137116.911

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## MAR Data Scrubbing Tool

## MAR Data Scrubbing Tool

- MDS tool works with the MAR database in ORACLE
- It parses, validates and verifies addresses against the MAR
- Generates exception reports
- Address Editor to edit addresses

## How to run the MDS tool



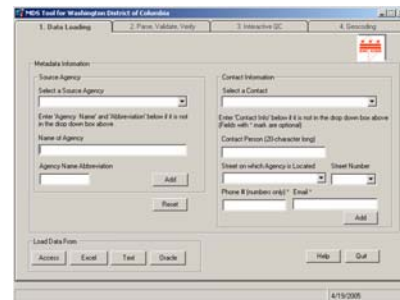
MDS Tool Icon on the desktop



Login Screen

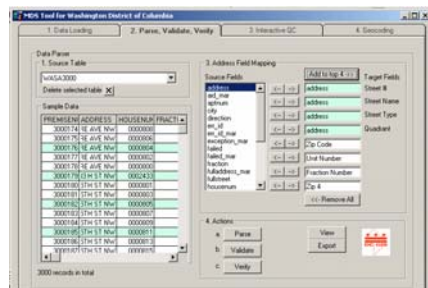
Only authorized users can access it.

## Data Loading



Access, Excel, dBase, ORACLE

## Parsing & Field Mapping



Address Components

Street #  
Street Name  
Street Type  
Quadrant  
Unit #  
Zipcode  
Zip4

## Validating Addresses



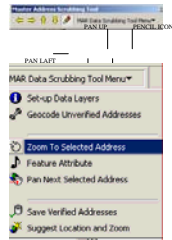
MDS Tool checks for every address component





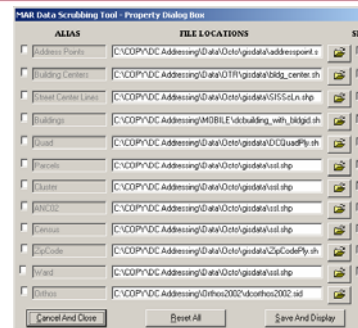
## ArcGIS Interface

- Unverified records will be geocoded
- An analyst will move the geocoded point to a building
- GIS data layers will be displayed to help the analyst



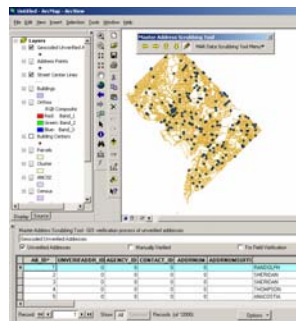
Slide 84

## One-time layer set-up



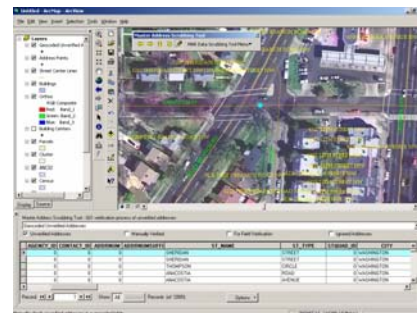
Slide 85

## Processing valid but unverified addresses



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## Verification process



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## MAR Maintenance

- DCRA
  - Responsible for maintaining individual addresses
    - Including Field Work
    - Actual Address Ranges (tentative)
- OCTO
  - Responsible for technical support
    - Database
    - Web Service
    - Batch Processing
    - Initial Field Work
    - Initial address range push (tentative)
- DDOT
  - Responsible for maintaining street segments
    - Street Names
    - Theoretical address ranges (redefined)

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## Project Issues

- The MAR (as scoped) handles addresses but the data for units is incomplete and unchecked.
  - Condo units are well represented
  - The quality of rental units is unknown
  - AID relates to the building/address not the unit
- Address ranges are inconsistent and incomplete
  - Not part of the MAR contractor's scope
  - Can cause erroneous results
- Public housing is not well represented well in the current dataset. This is being fixed by OCTO and the contractor.
- Web service was delayed while the data model was in flux.

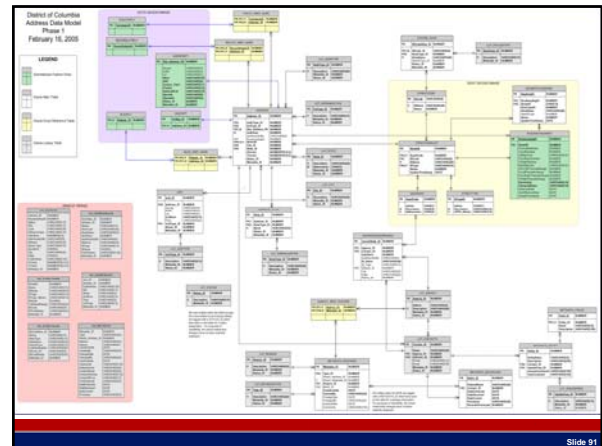
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## What's Next?

- Once the MAR is established and tested, it will be available for address verification:
  - through a web-interface that provides basic verification of a single address (open to the public as well as DC staff)
  - through web services to specific address users, so that queries can be made as part of the business of that agency
  - through the Address Administrator for address cleanup and batch verification activities

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