Enterprise Spatial Data Management: The value of geographic data for business applications

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Information Management software

Agenda

- Why DB2 for z/OS
- Enterprise Spatial Data Solutions with ESRI
  - Location Information
  - Case Studies & Examples
- Spatial Support in DB2 9 for z/OS
  - Features
  - Usage Scenarios
- Q & A

Eras of IT Evolution

On Demand Era

Organizational
Productivity & Accountability

Client / Server Era

Personal & Departmental Productivity

Mainframe Era

Administrative Productivity

Notice that it is NOT over !!!
And… z is OPEN!!!

1960 **1970** **1980** **1990** **2000**

Source: U.S. Department of Commerce

Why Customers Choose DB2 on System z

- Delivers secure information services you can trust
  - Unmatched synergy with System z and z/OS
  - Offers the ideal platform for SOA
  - Cost effective choice for customers to scale up to an enterprise-wide solution
- Concurrent HW/SW upgrades provide the highest possible availability
- Better risk management that IT investments today will support future requirements
  - Helps address regulatory compliance with ability to establish centralized policies and procedures for privacy, security and audit
- Total Cost of Ownership advantages

Proven history, DB2 for z/OS in:

- **25 of the top 25 WW banks***
- **23 of the top 25 US retailers****
- **9 of the top 10 global life/ health insurance providers*****

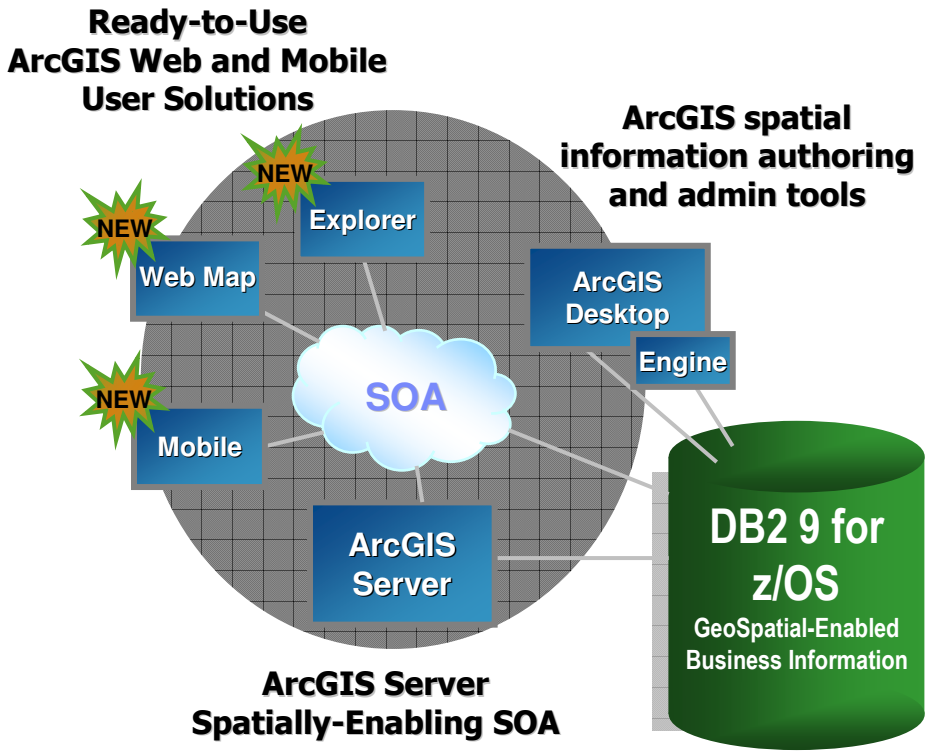
DB2 delivered the world's largest core banking benchmark result delivering a record 9,445 business transactions per second in real-time based on more than 380 million accounts with 3 billion transaction histories[1]

Top companies as identified in: WW Banks from The Banker.com:
•http://www.thebanker.com/news/fullstory.php/aid/1699/Tio_1000_World_Banks.html
**US Retailers from National Retail Federation July 2005:
http://www.stores.org/pdf/TOP100printwithad.pdf
***Insurance - 2005 Ward's 50 Benchmark Group: www.memic.com/news/Wards50.asp
http://www.marketwire.com/mw/release_html_b1?release_id=213236

ESRI & DB2 9 for z/OS Spatial Support

Enabling DB2 9 for z/OS for Enterprise Spatial Information Management on System z

- **Dynamic & continuous, spatially-enabled business information on System z**
- **Integration with ESRI ArcGIS™ spatial information authoring, serving, user, and hosted solutions**
- **ArcGIS™ Web-Based and Desktop Clients directly-connected to DB2 9**
- **Strongest, most secure spatial-information management platform with near-linear scalability and highest business resiliency for Insurance, Banking, Retail, Energy & Utilities, and Government**



ESRI ArcGIS: A Complete System for Authoring, Serving and Using Spatial Information on DB2 9 for z/OS

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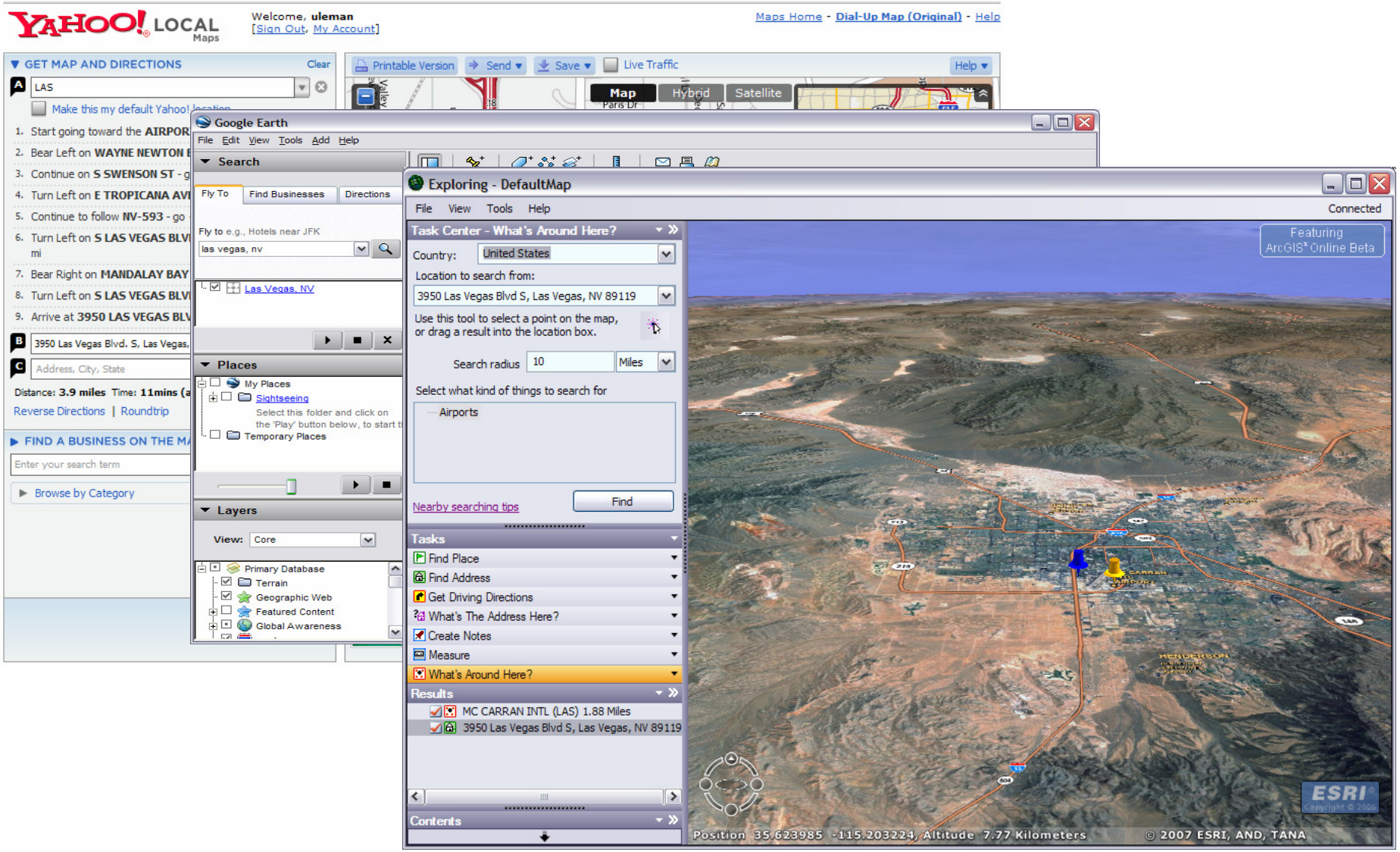
Finding Your Place: Maps

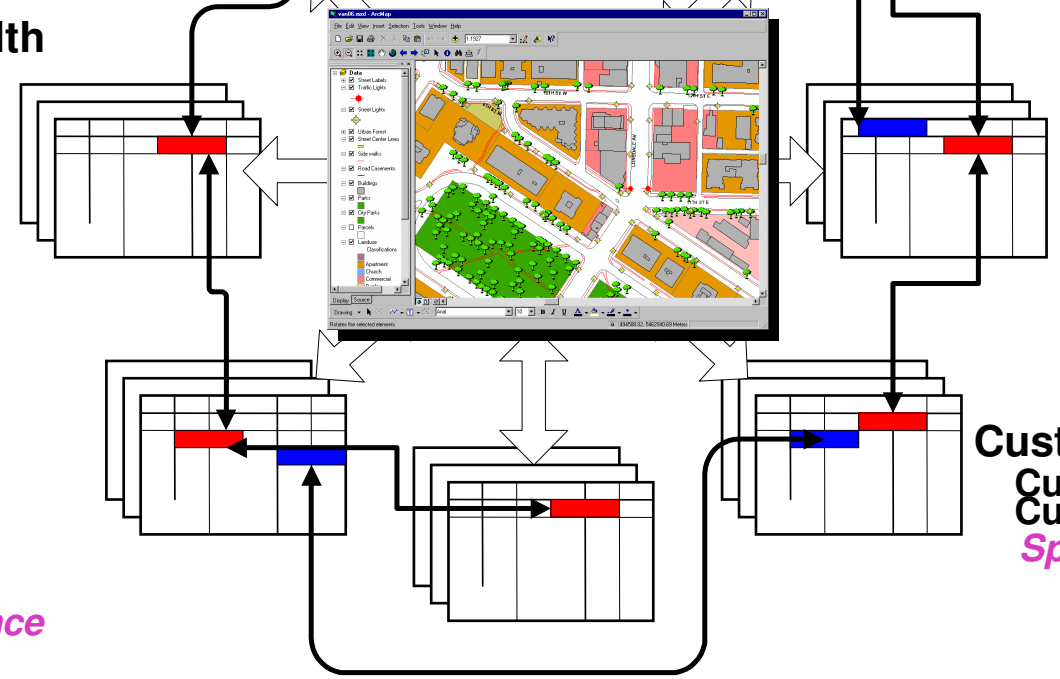


Place Information: It's Everywhere

Asset Management
Equipment ID
Spatial Reference

Human Resources
Staff
Grade
Spatial Reference
Utilization

Maintenance
Work order
Spatial Reference
Equipment history



Environmental Health And Safety
Source
Material Type
Spatial Reference
Reporting

Logistics
Inventory ID
Routing
Spatial Reference

Projects
Capital
WBS #
Spatial Reference

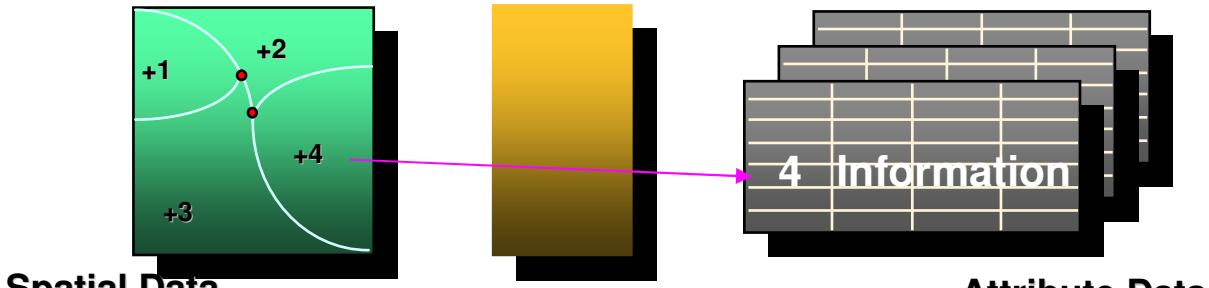
Customer
Cust #
Cust Type
Spatial Reference

Place Information is a Business Asset

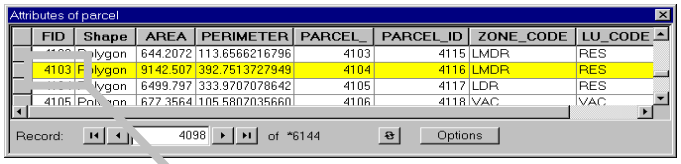
- A spatial context:
  - Location
  - Orientation
  - Distance
  - Area...
- A business necessity:
  - Where are new customers? How many? How close?
  - Competitor locations?
  - Cost of doing business...?
- Analyze Outcomes:
  - Is the supply-chain efficient?
  - Business continuity- risk from natural and manmade perils?
  - What if I used 10 trucks instead of 15?

The "Secret Sauce"
Linking features and attributes, plus…

- **Each feature has a record in the table**

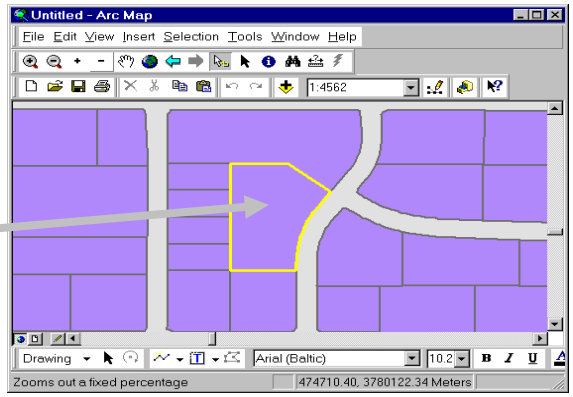


Unique identifier links feature and attributes



FID = 4103

(Feature IDentifier)

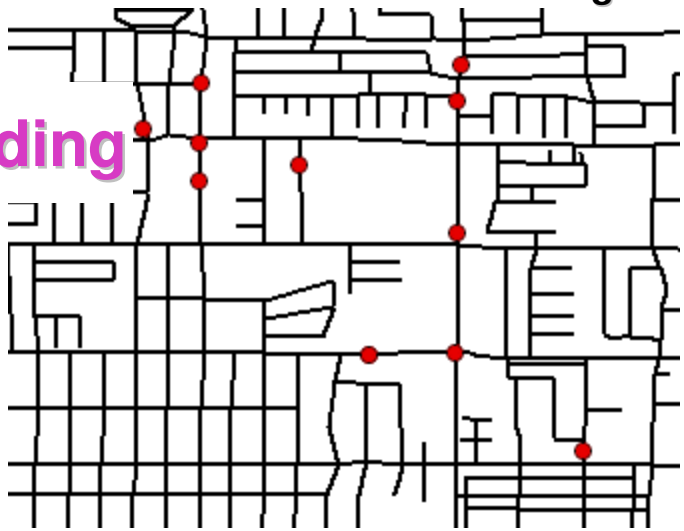


…Getting at Corporate Data Thru Geocoding

- Linking descriptive data, such as address, to a geographic location.
- Address is matched to address range on street data
- A real-world location is assigned to each address

LOCATION	OBJECTID	CASE_NUM	TYPE	REP
145 S CHURCH ST	33	990302252	7	3/20/
1711 N ORANGE ST	36	990100032	3	1/2/99
1702 N ORANGE ST	38	990302093	3	3/15/99
1144 OCCIDENTAL DR	53	990302239	6	3/20/99

Geocoding



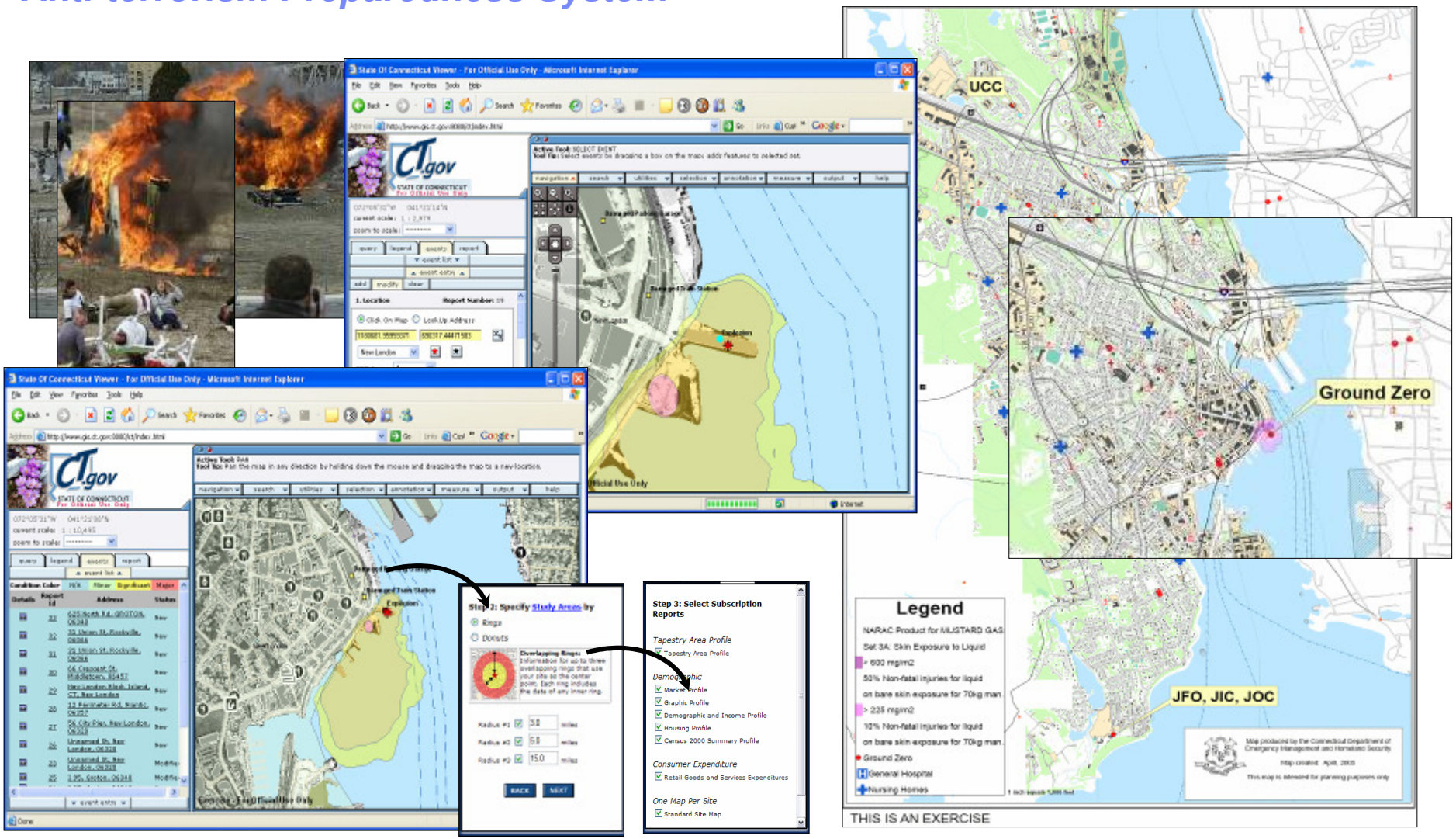
Why is Place So Important?

- Save Money/Cost Avoidance
- Save Time
- Increase Efficiency
- Increase Accuracy
- Increase Productivity
- Increase Communication
- Increase Collaboration
- Generate Revenue
- Make Better Decisions
- Aid Budgeting
- Automate Workflow…

- …. Build an Information Base
- Manage Resources
- Assist Consumers Locate Resources
- Improve Access to Government
- Streamlining Business Processes
- Making Informed Decisions
- Create multiple scenarios
- Optimum Resource Management
- Effectively allocate, analyze, track, and conserve assets
- Maximize investments and control inventories

…Lets look at some examples

State of Connecticut
Anti-terrorism Preparedness System



State of New York Dept of Motor Vehicles (DMV)

Accident Location Information System

Logistics

Consistently Saves 15-30% Costs, Reduces Fuel Consumption & Improves Services

Cook County Housing

- 25,000 inspections per year
- 33% more inspections

Nashville Electric

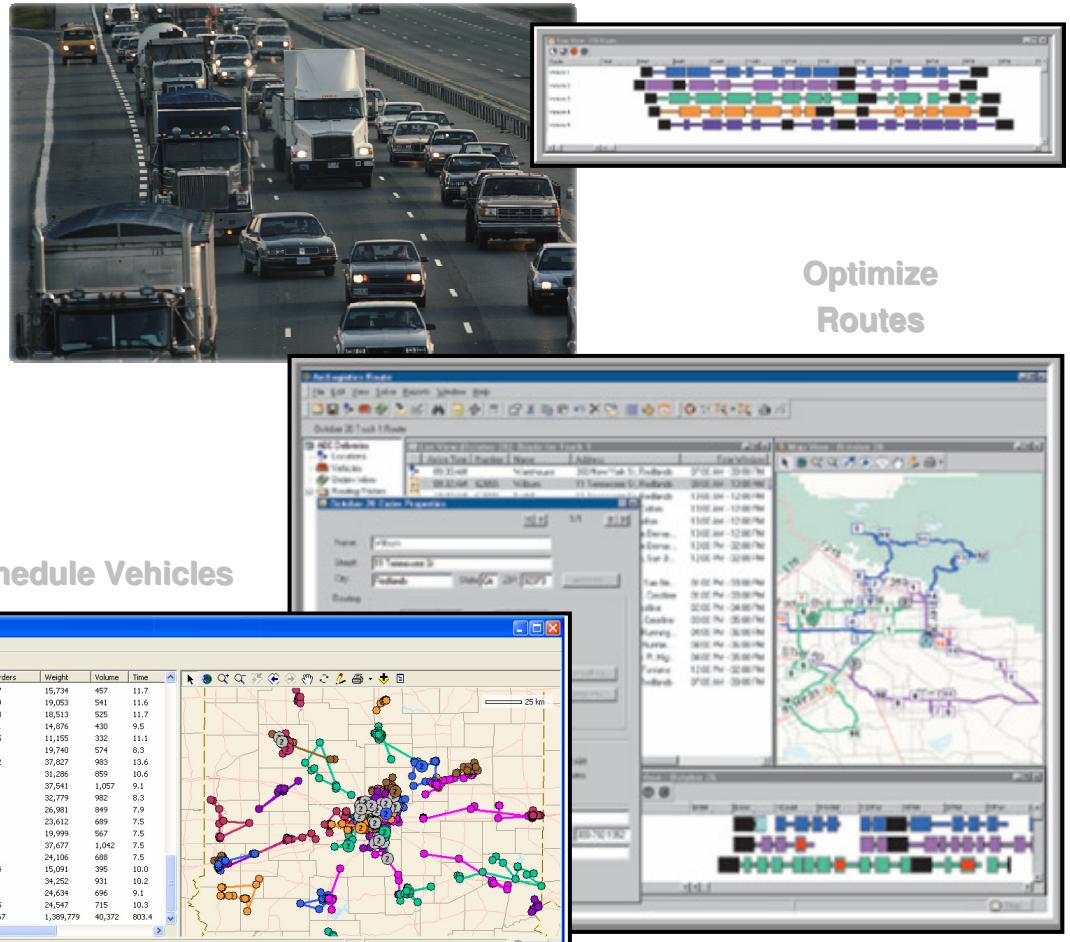
- 100 calls / day
- 23% increase in service calls

San Diego Paratransit

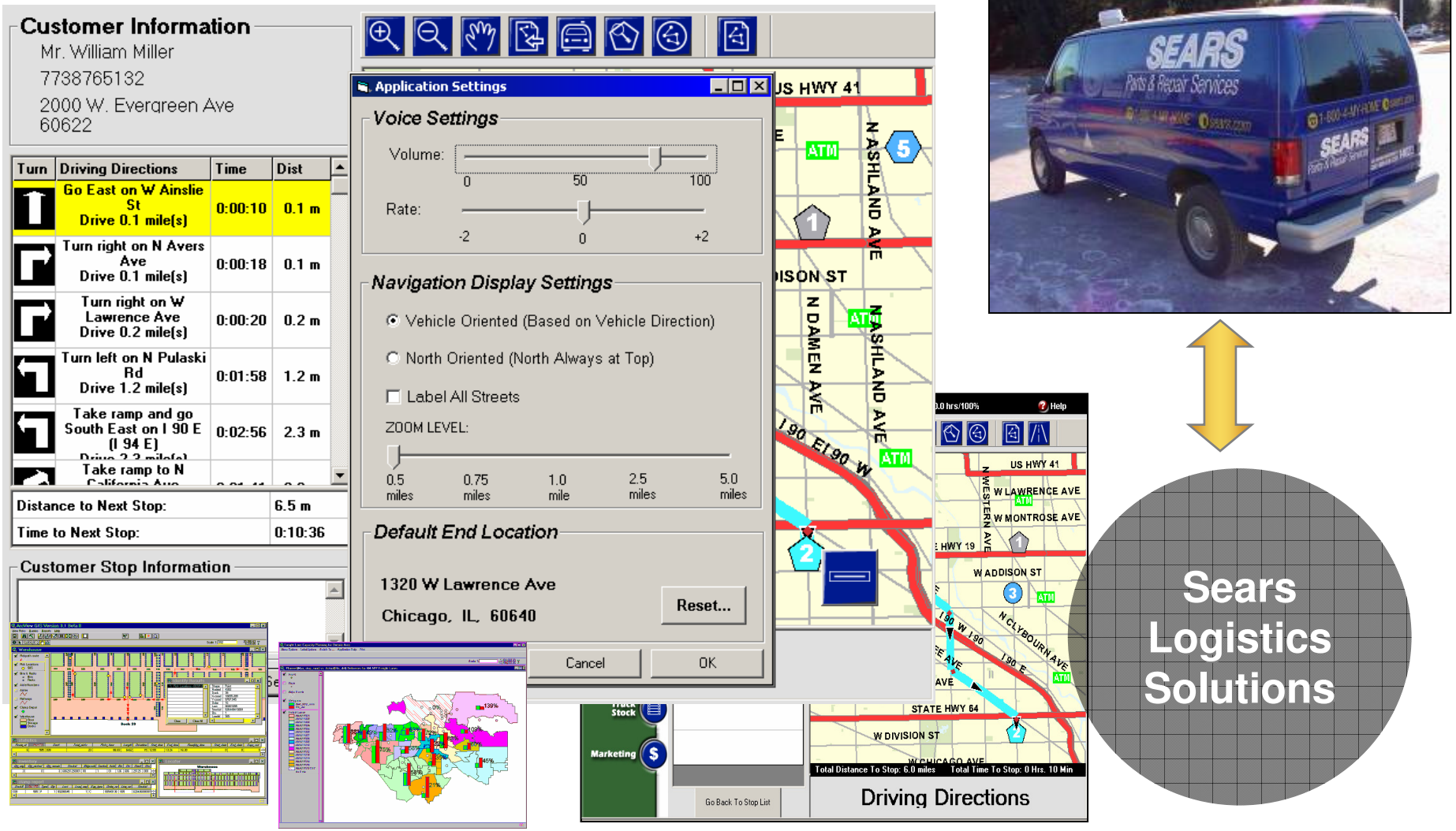
- 20% more trips per hour

Monarch Beverage

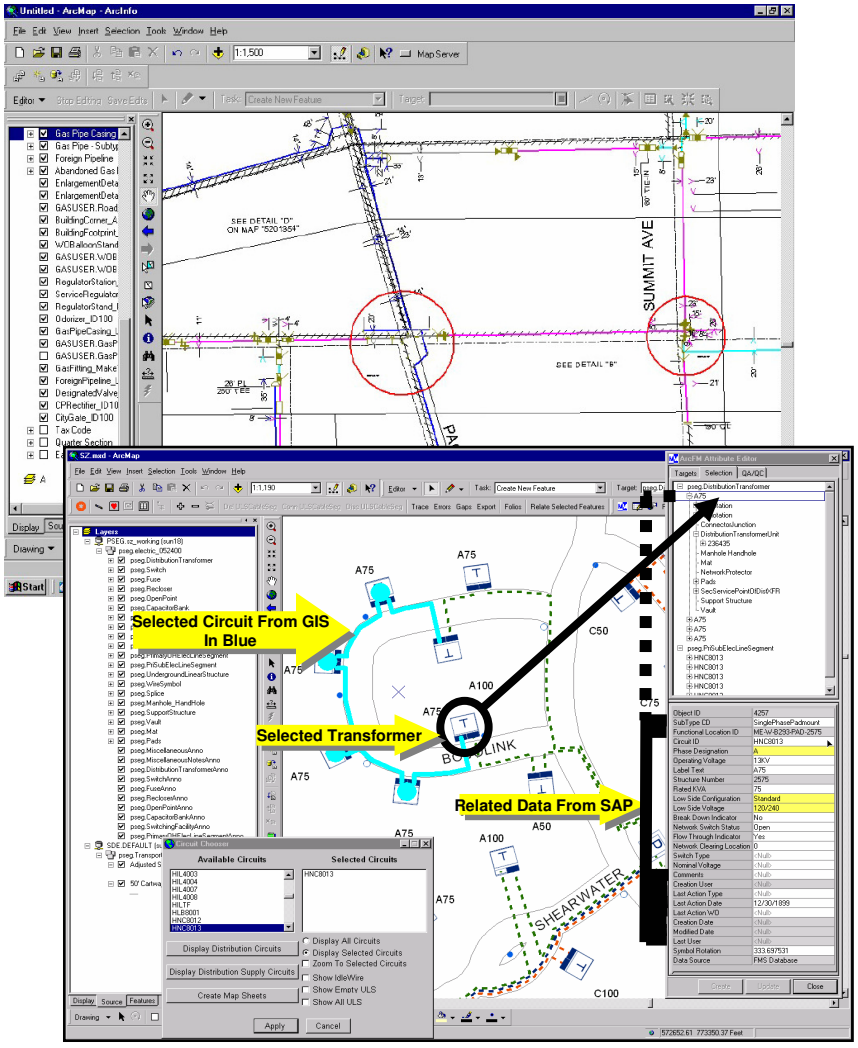
- 300,000 deliveries / year
- Large savings
- Mission critical to business process



Sears Holding Company
Mobile Mapping System



Centerpoint Energy

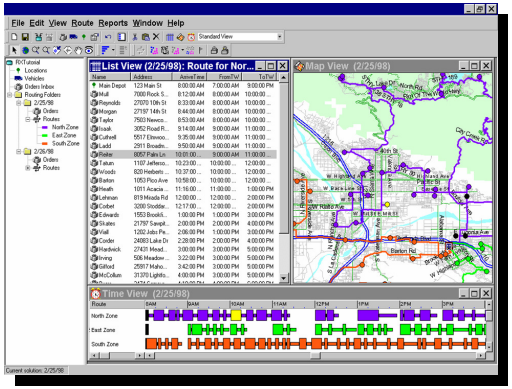


Solution Business Areas for Utilities

- Asset Management
- ERP Integration
- Network Analysis
- Predictive Maintenance

Some Centerpoint Benefits:

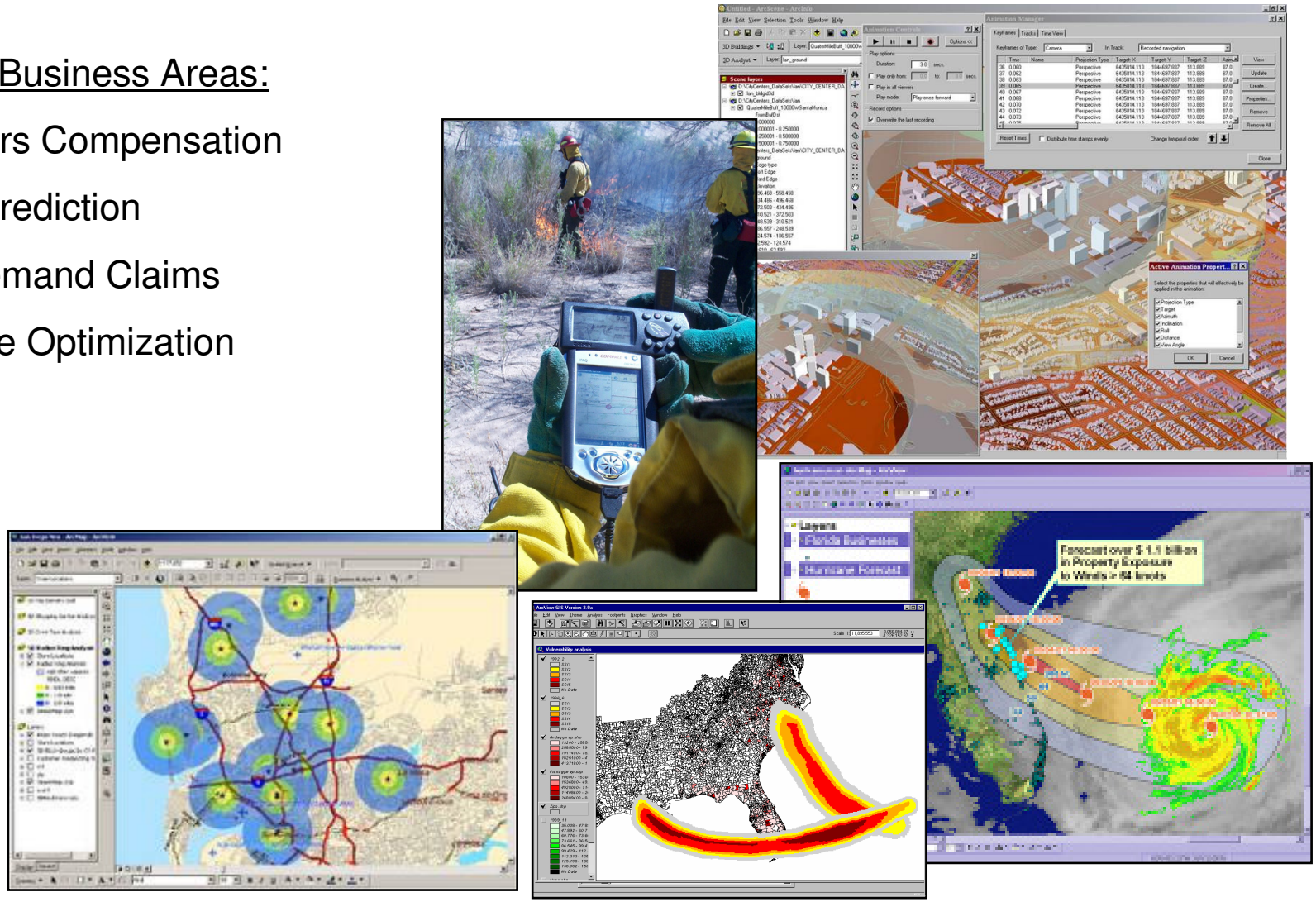
- Support Pole Attachment Program $4M/yr
- Underground facility locator $1M/yr savings
- Streetlight/Meter Reading $80K/yr savings
- Land Management $80K/yr savings
- Address Verification $50K/yr savings



Insurance and Banking

Solution Business Areas:

- Workers Compensation
- Risk Prediction
- On-Demand Claims
- Service Optimization



How can the Insurance Industry use GIS?

- Every insured RISK has a location

  House, office, vehicle, warehouse, person, goods, etc

- This location can change

  Vehicle, property, policy, restructuring, merger, acquisition, etc

- Every PERIL influencing the risk can be geolocated

- The perils are influenced by geography

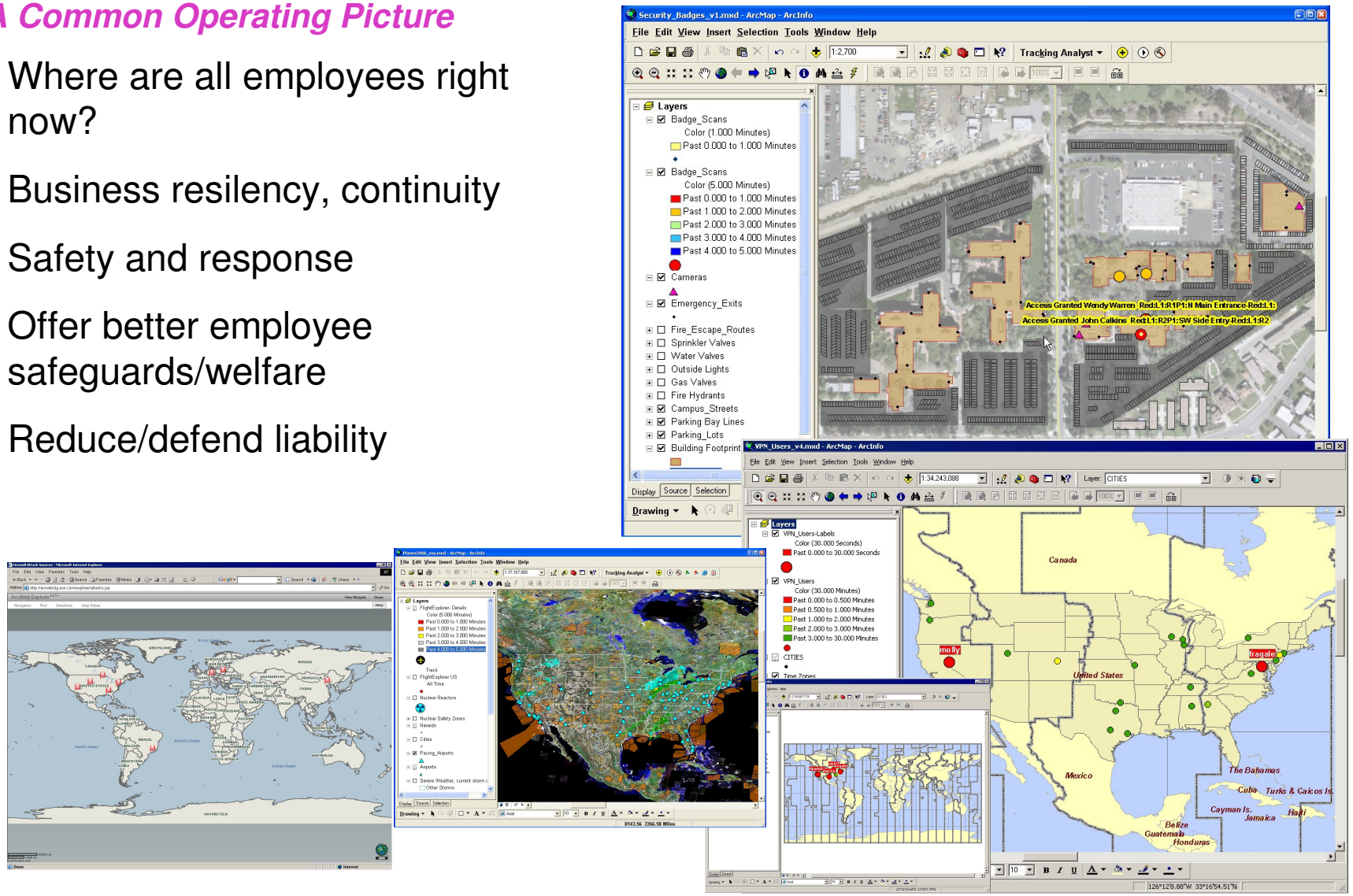
  Urban development, population, demographics, climate, postal units, flood, fire, crime, earthquake, tsunami, landslip, etc

- The locations impacted change over time

ESRI: Employee Locator

A Common Operating Picture

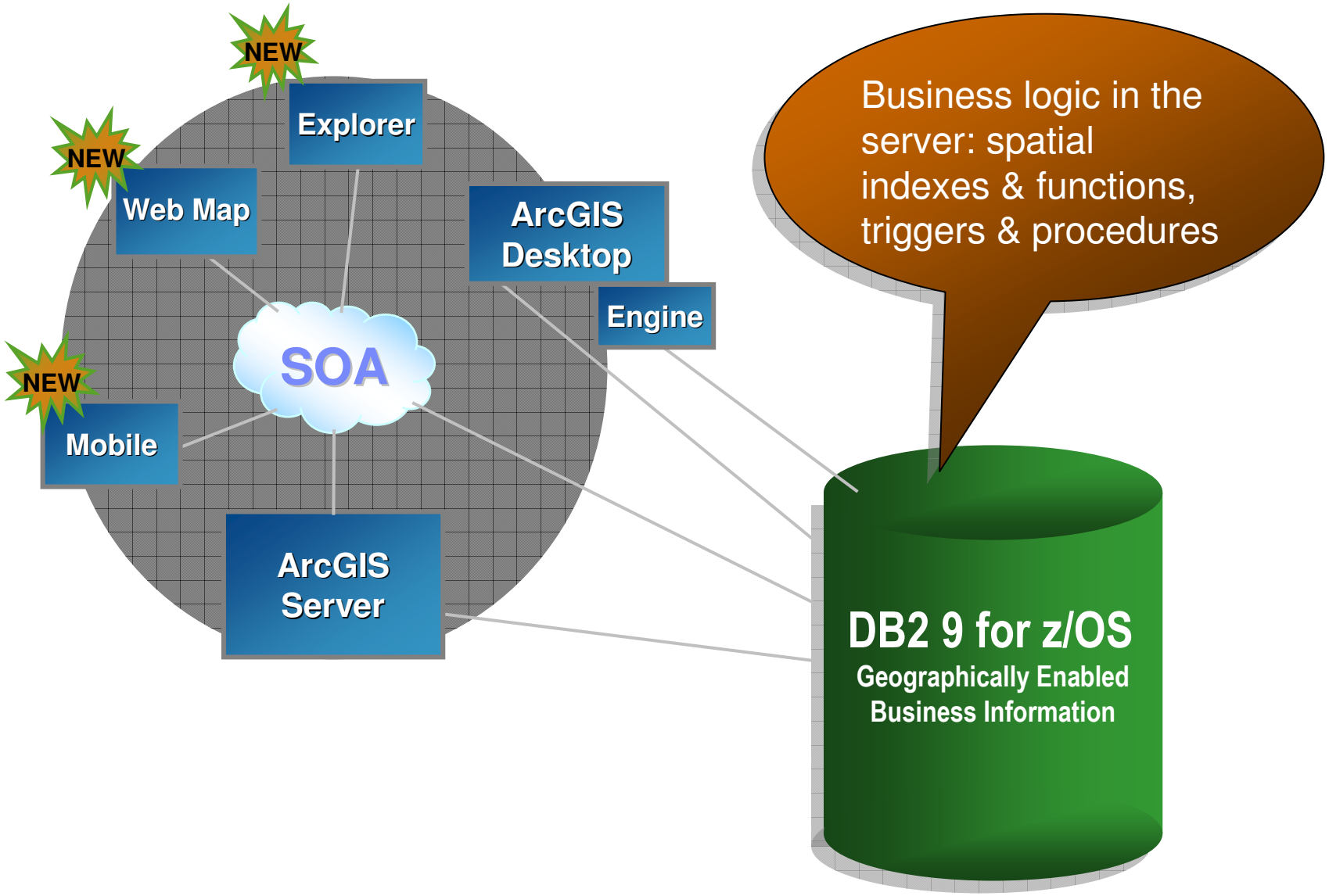
- Where are all employees right now?
- Business resiliency, continuity
- Safety and response
- Offer better employee safeguards/welfare
- Reduce/defend liability



So Why is Place Important to Any Organization?

- Integrates data and improves processes
  - *contributes to process performance*
  - *reduces "silo" thinking*
- Supports evidence-based decision making
  - *provides a sound and relevant analytical frameworks*
  - *communicates differential outcomes - visually*
- Adds considerable value to new and existing information
  - *improves geographic data accuracy*
  - *leverages existing IT and data investments*
- Brings a relevancy to data analysis and information presentation
  - *empowers people to take action*
  - *allows rapid evaluations of alternatives*

Geographically Enabled IT Stack



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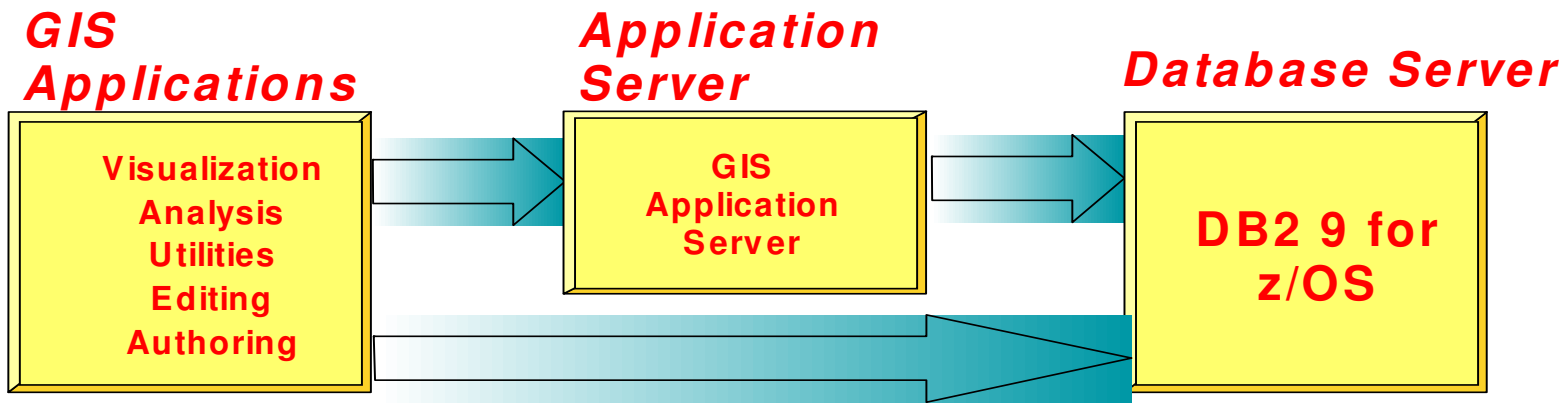
DB2 9 Spatial Support Overview



Third Party Venders
or
Home grown

Standard SQL APIs

Spatial data types
Spatial operations
Spatial predicates
Spatial indexes
OGC standard

Spatial Support for DB2 9

- Seamless integration with DB2
  - Spatial data types
  - Spatial functions
  - Spatial catalog tables and views
  - Spatial stored procedures
  - Spatial indexes
  - Implement Open Geospatial Consortium (OGC) SQL specification and ISO SQL/MM Spatial standard for types and functions

Spatial Support for DB2 9 – cont.

- Spatial Data Types
  - ST_POINT
  - ST_LINESTRING
  - ST_POLYGON
  - ST_MULTIPOINT
  - ST_MULTILINESTRING
  - ST_MULTIPOLYGON
  - ST_GEOMETRY (Abstract)

Spatial Support for DB2 9 – cont.

- Data can be represented by a single geometry or a collection of geometries
  - Point: IBM SVL (-121.736658, 37.201095)
  - Linestring: road, earthquake fault line
  - Polygon: property line, lake
  - Multipoint: all the fire stations in a city
  - Multilinestring: all the public bus routes of a county
  - Multipolygon: all the lakes in the western USA

Spatial Support for DB2 9 – cont.

- Spatial Functions
  - Constructor
  - Observer
  - Predicate
  - Cast
  - Conversion
  - Analysis
  - Utility

Spatial Query

Sample Spatial Query

```
SELECT sid  ,count(*),  avg(income)
FROM  stores s, customers c
WHERE  ST_Distance(s.loc, c.loc)<100
GROUP BY sid;
```

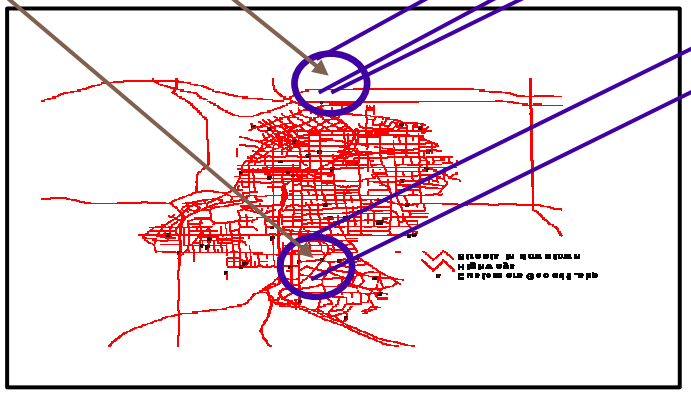
"tell me the average income, and number of all customers who live within 100 miles of each store"

STORES

SID	NAME	ADDR	LOC	ZONE

CUSTOMERS

CID	NAME	INCOME	ADDR	LOC



Spatial Support for DB2 9 – cont.

- Spatial Catalog Tables:
  - GSE_COORDINATE_SYSTEMS
  - GSE_COORDINATE_SYSTEMS_ID
  - GSE_GEOMETRY_COLUMNS
  - GSE_SPATIAL_REFERENCE_SYSTEMS
  - GSE_SIZINGS
  - GSE_UNITS_OF_MEASURE
- Spatial Catalog Views:
  - GEOMETRY_COLUMNS
  - SPATIAL_REF_SYS
  - ST_COORDINATE_SYSTEMS
  - ST_GEOMETRY_COLUMNS
  - ST_SIZINGS
  - ST_SPATIAL_REFERENCE_SYSTEMS
  - ST_UNITS_OF_MEASURE

Spatial Support for DB2 9 – cont.

- Spatial Administrative Stored Procedures
  - ST_ALTER_COORDSYS
  - ST_ALTER_SRS
  - ST_CREATE_COORDSYS
  - ST_CREATE_INDEX
  - ST_CREATE_SRS
  - ST_CREATE_SRS_2
  - ST_DROP_COORDSYS
  - ST_DROP_INDEX
  - ST_DROP_SRS
  - ST_IMPORT_SHAPE
  - ST_REGISTER_SPATIAL_COLUMN
  - ST_UNREGISTER_SPATIAL_COLUMN

Spatial Support for DB2 9 – cont.

- Spatial Indexing Capability
  - 2-D Grid Index
  - Utilized when spatial predicate functions are used
- Support various input and output formats
  - ESRI's shapefile format
  - Geographic Markup Language (GML)
  - Well-Known Binary (WKB)
  - Well-Known Text (WKT)
- Supported by ESRI's GIS tools
  - ArcSDE, ArcGIS

Getting Started

- Order DB2 Accessories Suite (no cost)
- Install and enable Spatial Support
  - Required DB2 9 for z/OS New Function Mode (NFM)
  - (FMID J2AG110 + PK51010 + PK54451)
- Order ESRI ArcGIS 9.3 (Beta - 4Q 2007, GA - 1Q 2008)
- Install and run post-installation setup job for ArcSDE & ArcGIS 9.3
- Use ArcSDE to import various shape files
- Use ArcCatalog to manage spatial and non-spatial data
- Use ArcMap to manage and display different map layers

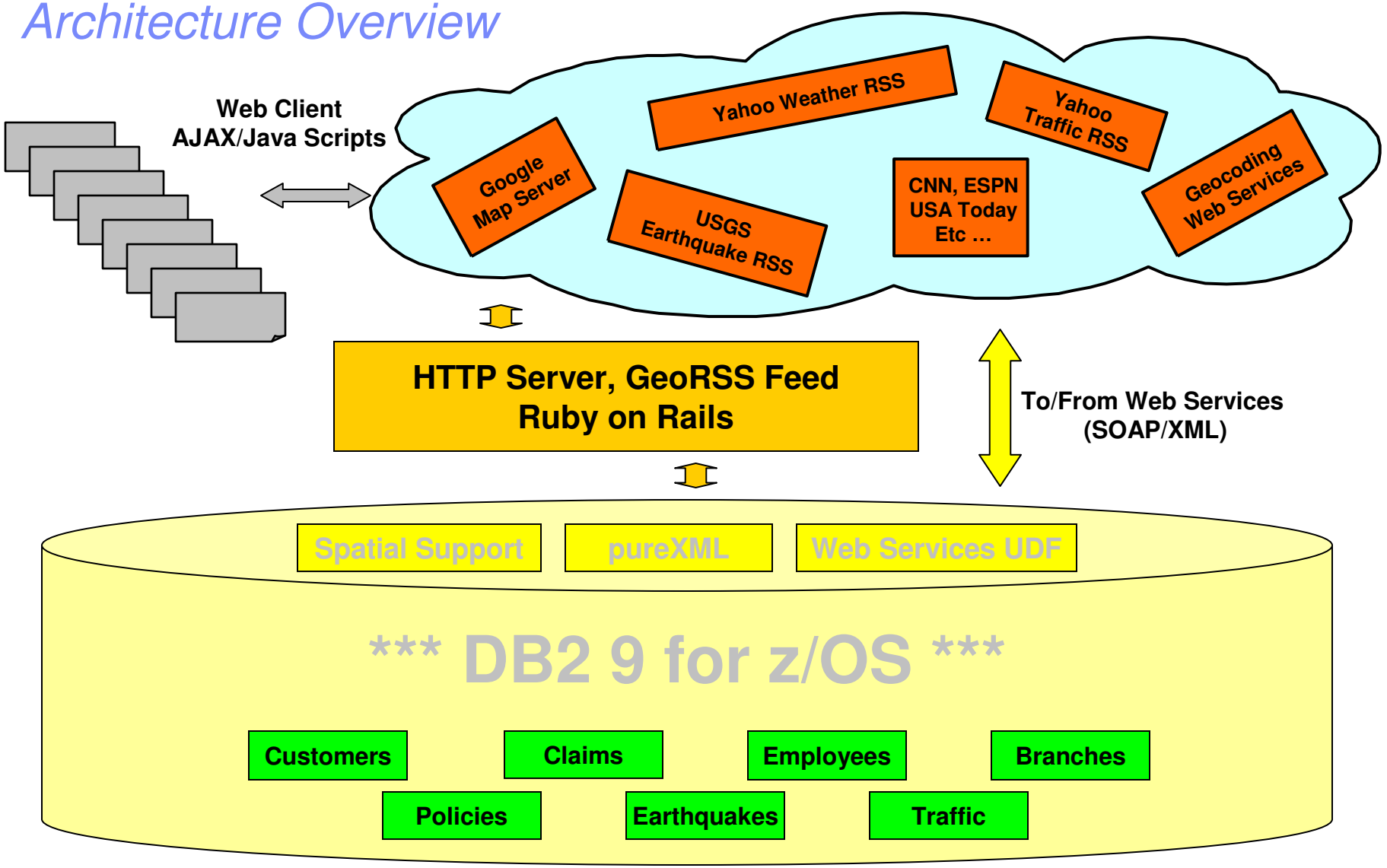
Usage Scenarios

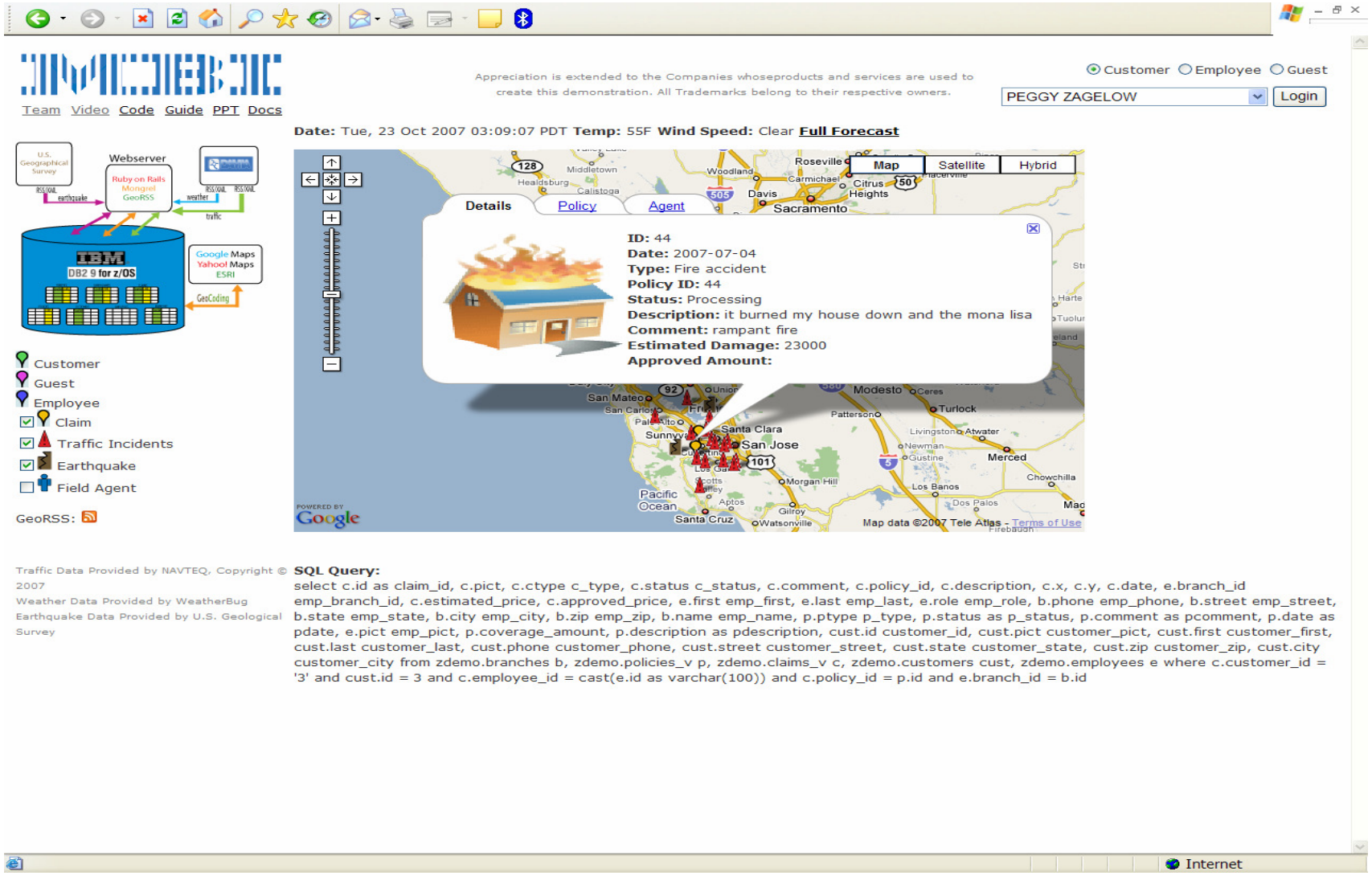
- Scenario #1 – Insurance Company
- Scenario #2 – City Government

Problem Statement #1:

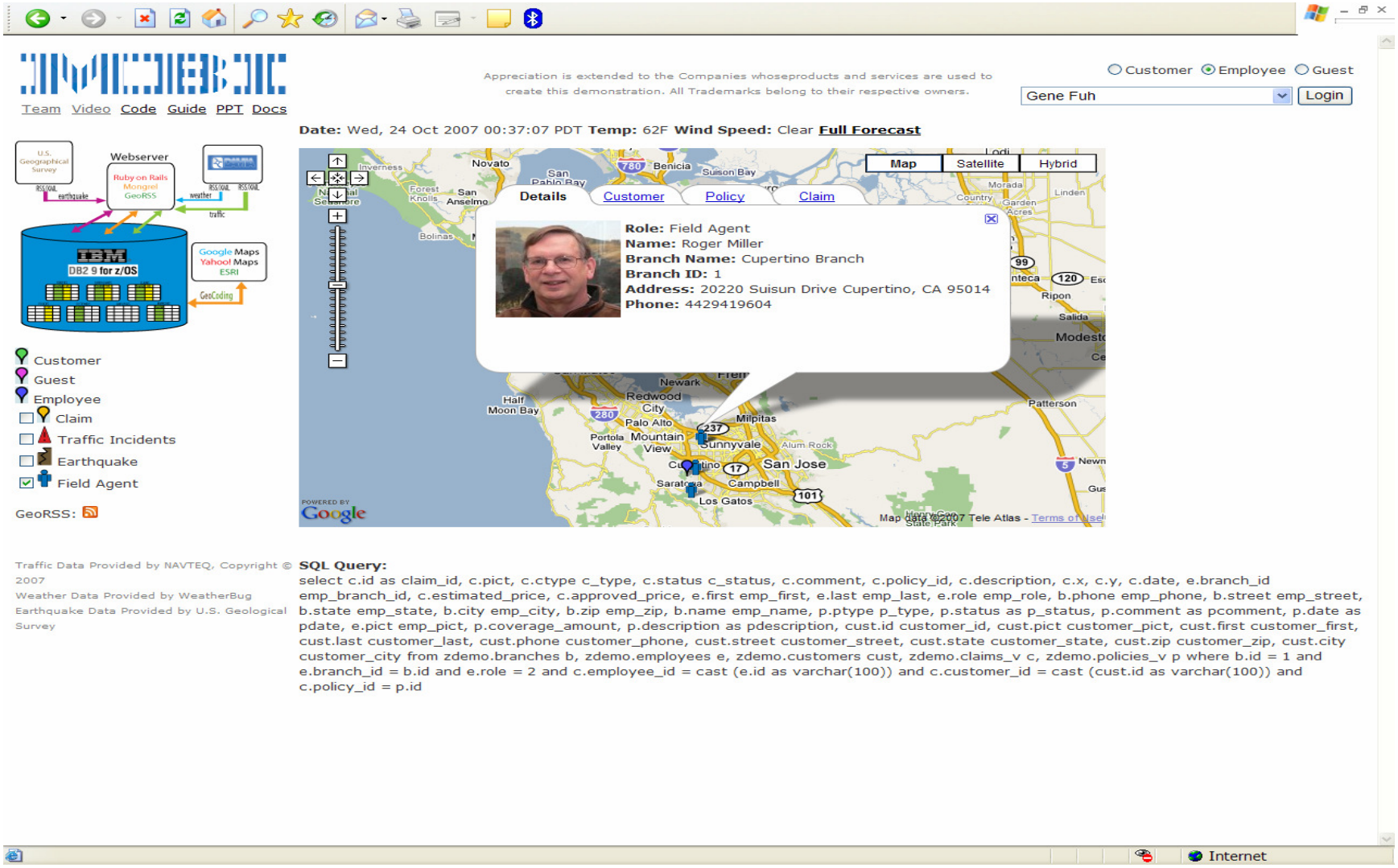
- An insurance company, MBI, needs a website for both customers and employees. The website needs the capabilities that can satisfy the following objectives:
  - Use web based mapping services such as Google Maps for the user interface.
  - Allow customers to review their policy and claim information. Allow user to search for traffic and earthquake related data near their location.
  - Allow employees to see what the customers see. In addition, employees can determine risk assessment for a customer based on their locations. Information such as earthquake activities and accident frequencies can influence insurance premiums for individual customer.
  - Allow simple asset management by tracking insurance field agents for optimal routing in customer visits.
  - Provide a GeoRSS feed for customers and other online visitors.

Architecture Overview

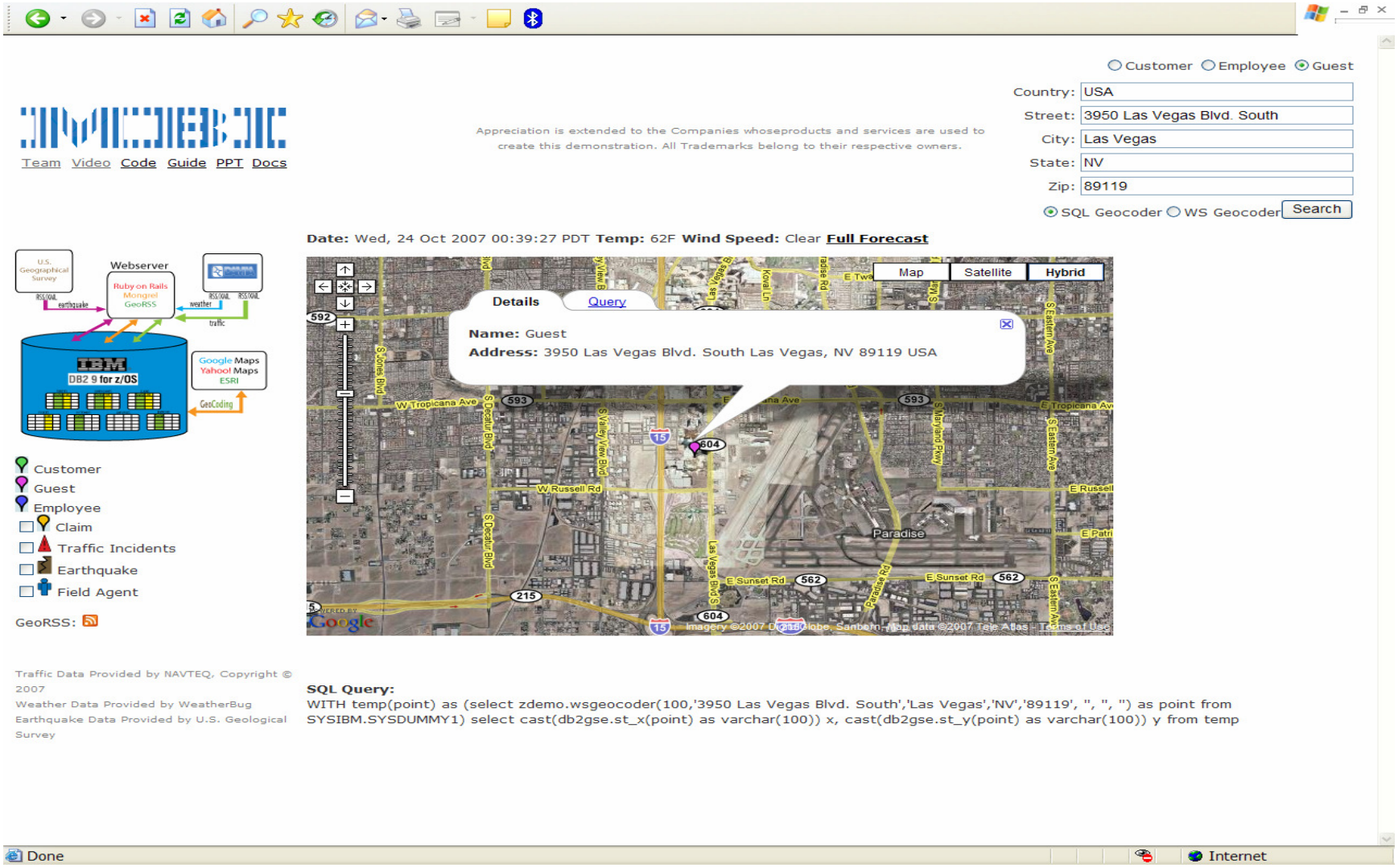




Risk assessment and geographical claim management are possible using a map interface



Asset management is performed by tracking field agents as they are working in the field



Using ESRI's geocoding web service, a guest can input a valid address for risk assessment

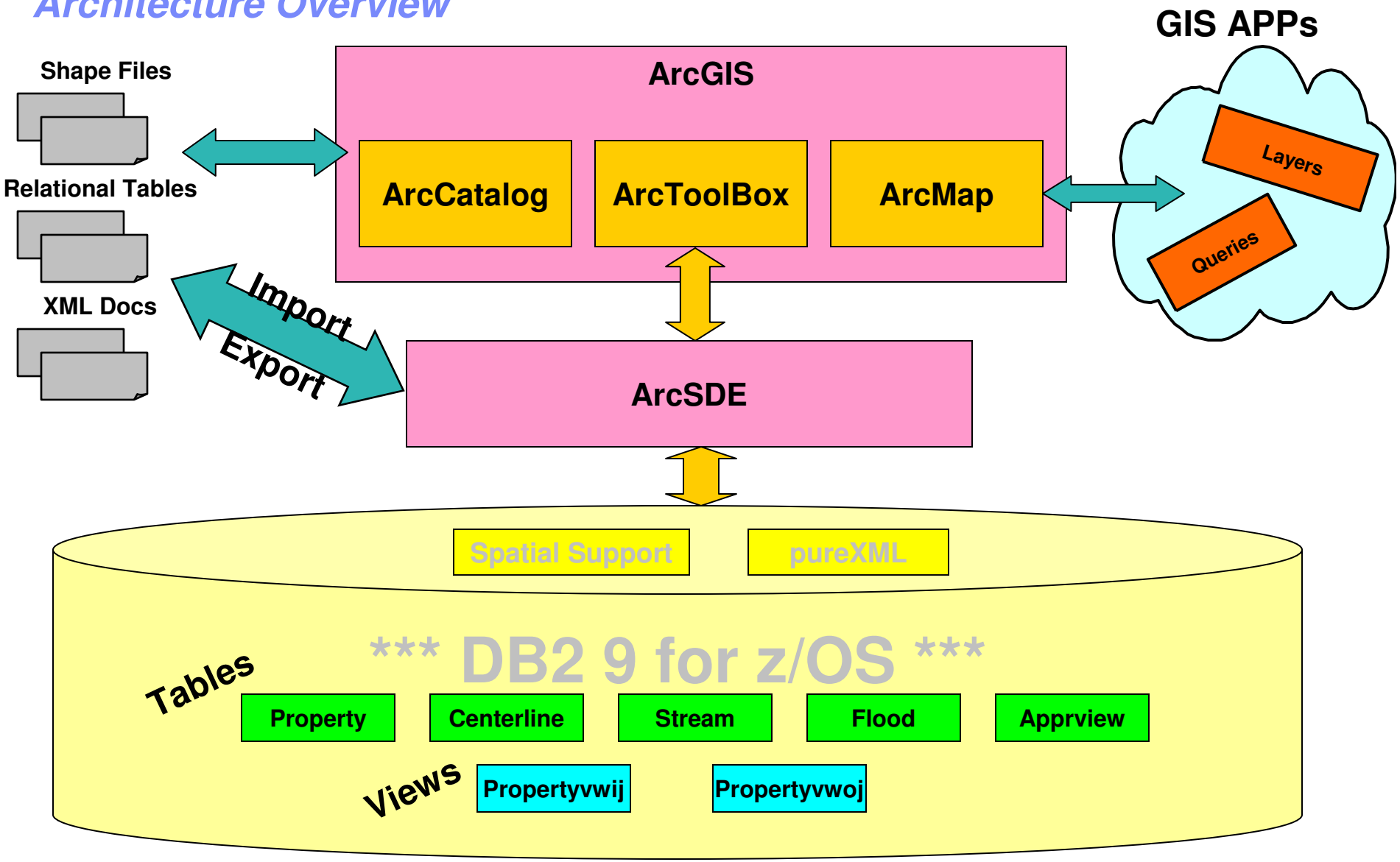
Implementation Summary #1

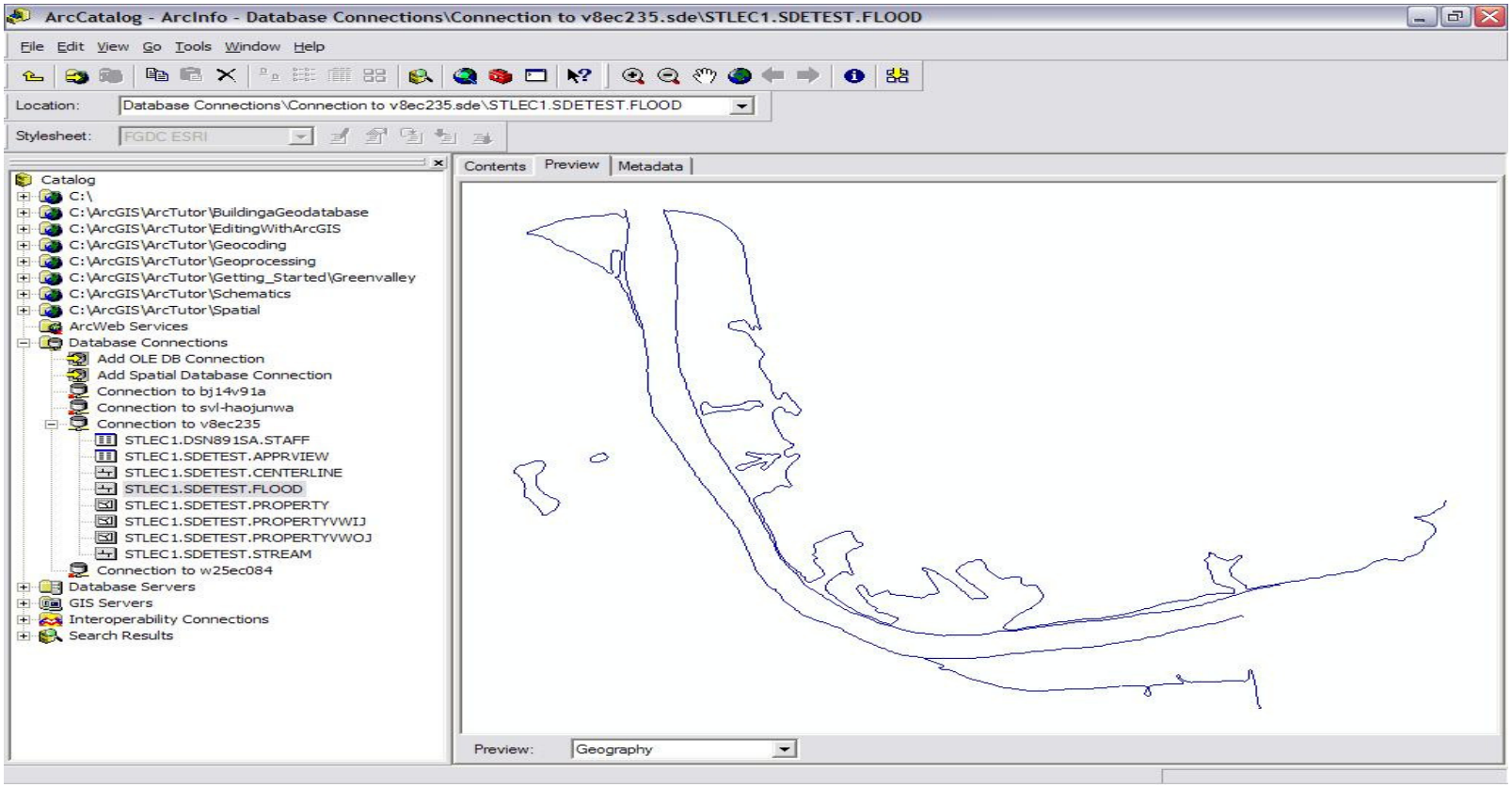
- Can design, prototype, and deploy a scalable and customizable solution
- Can be time consuming to build web based application from scratch
- Take advantage of ESRI's ArcWeb Services for Web-based geocoding
- Loose coupling relationship between DB2 for z/OS spatial database server and spatial application server
- Unlimited usage scenarios

Problem Statement #2:

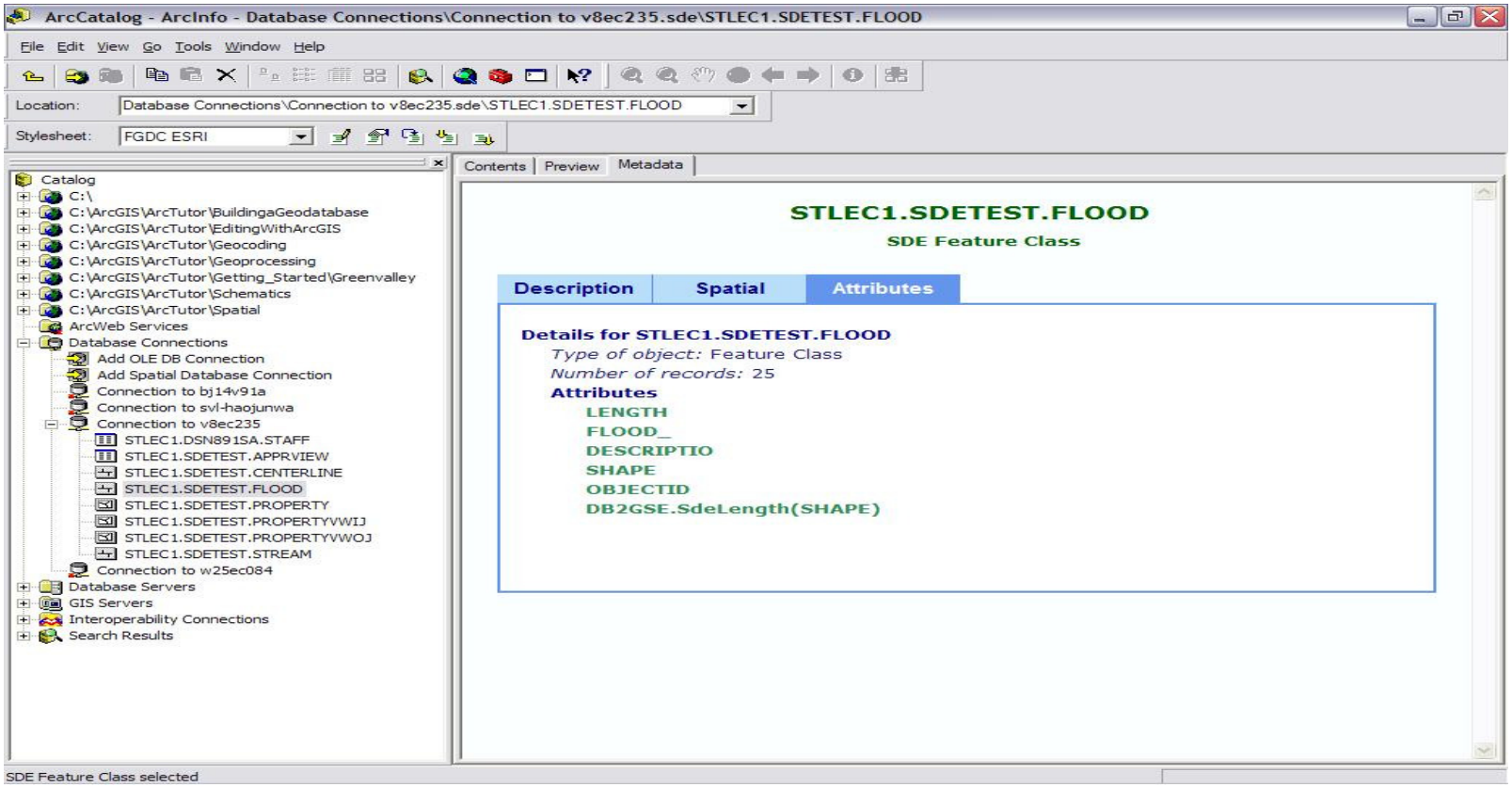
- A city government that maintains the data of the land properties of downtown Nashville needs to develop a GIS application with the following capabilities:
  - Display the maps of properties, rivers and road networks based on existing shape files.
  - Maintain the non-spatial data, such as property owners and property values on the backend database.
  - Provide easy ways to integrate non-spatial data with their spatial properties.
  - Allow users to customizes the display of maps for different purposes.
  - Allow users to submit complex spatial queries (within, intersect, contain, etc) without much knowledge of spatial SQL.

Architecture Overview

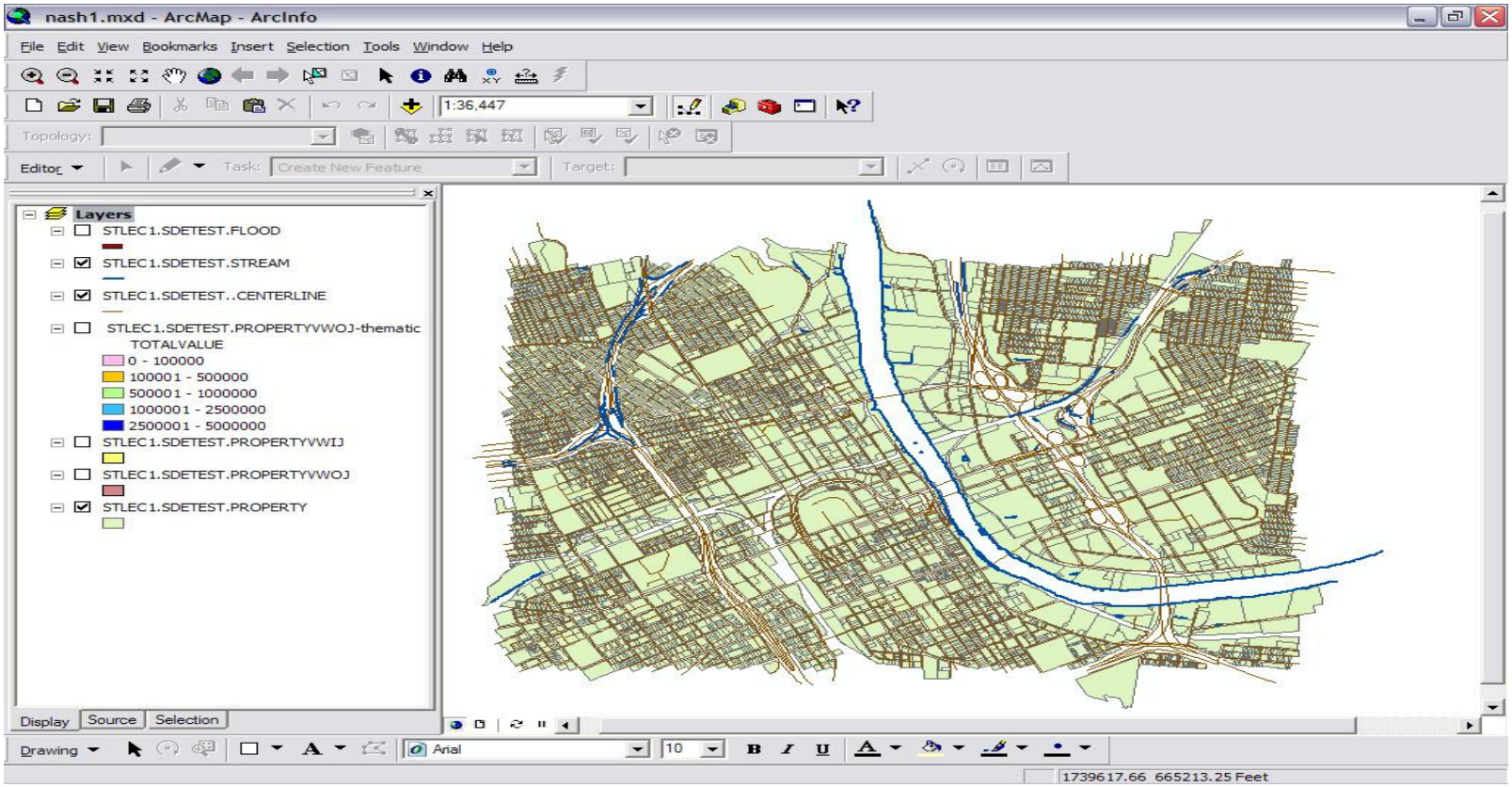




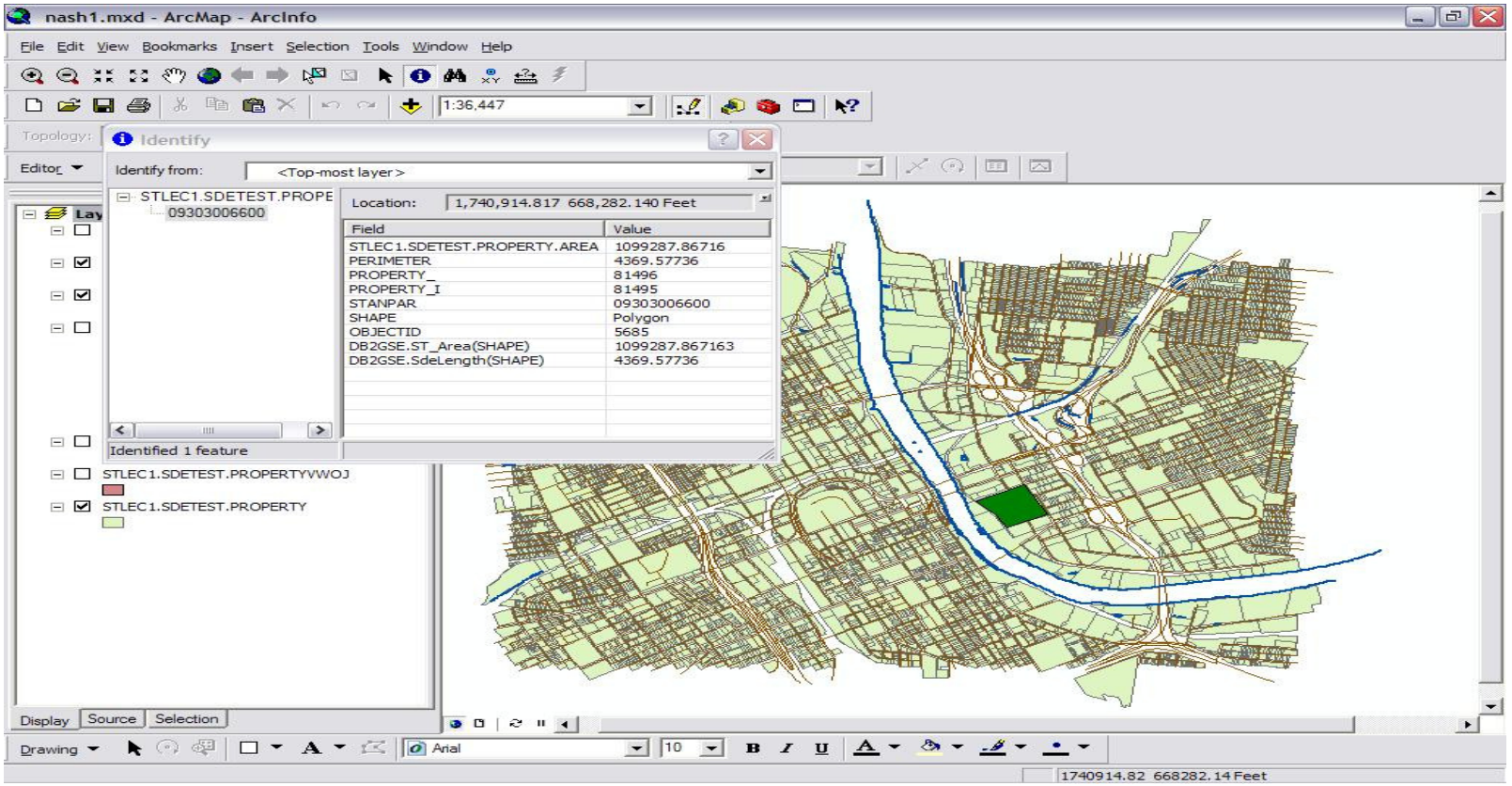
Screen 1 shows ArcCatalog with the preview of flood data set



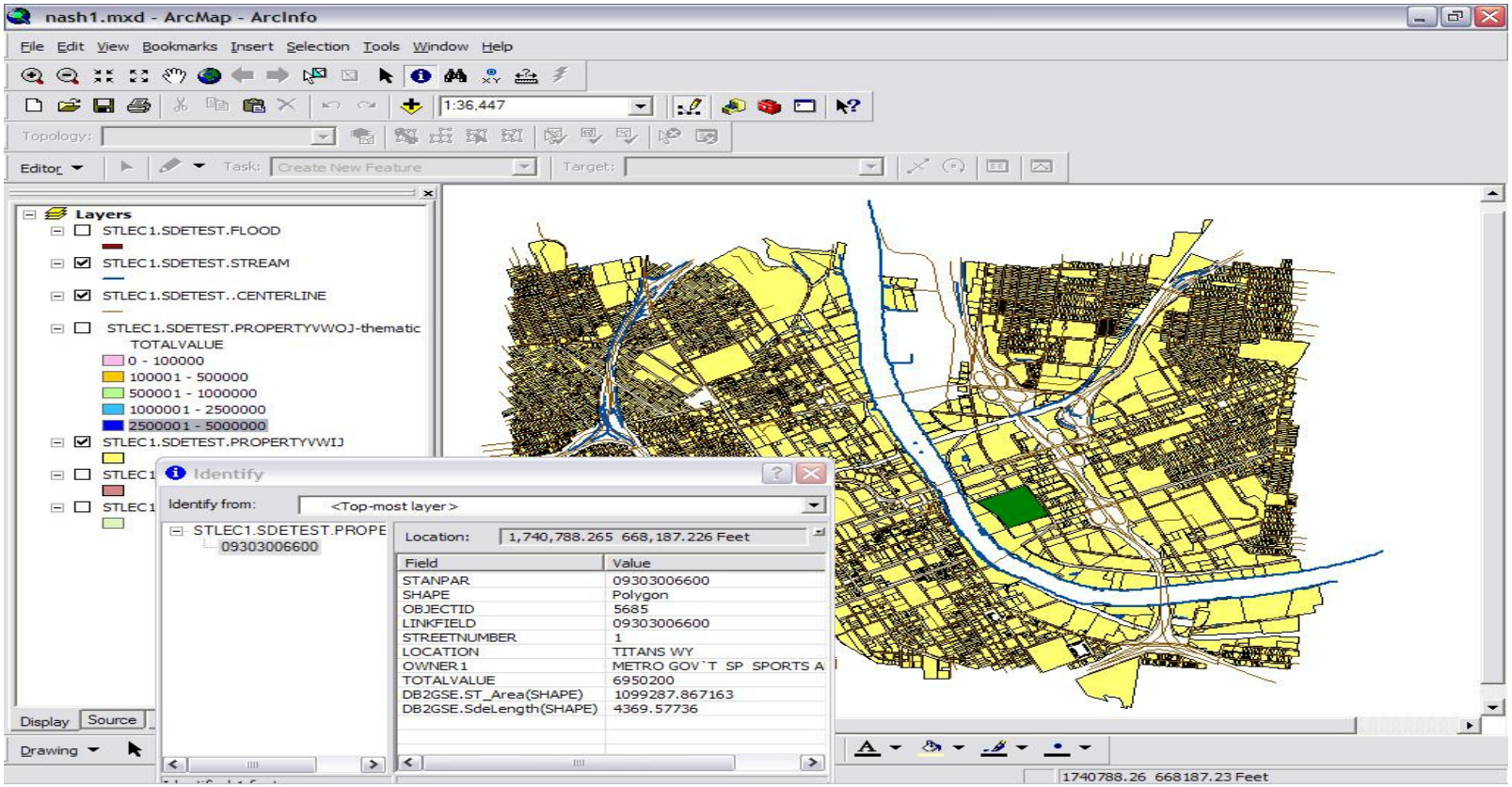
Screen 2 shows ArcCatalog with the metadata view of flood data set



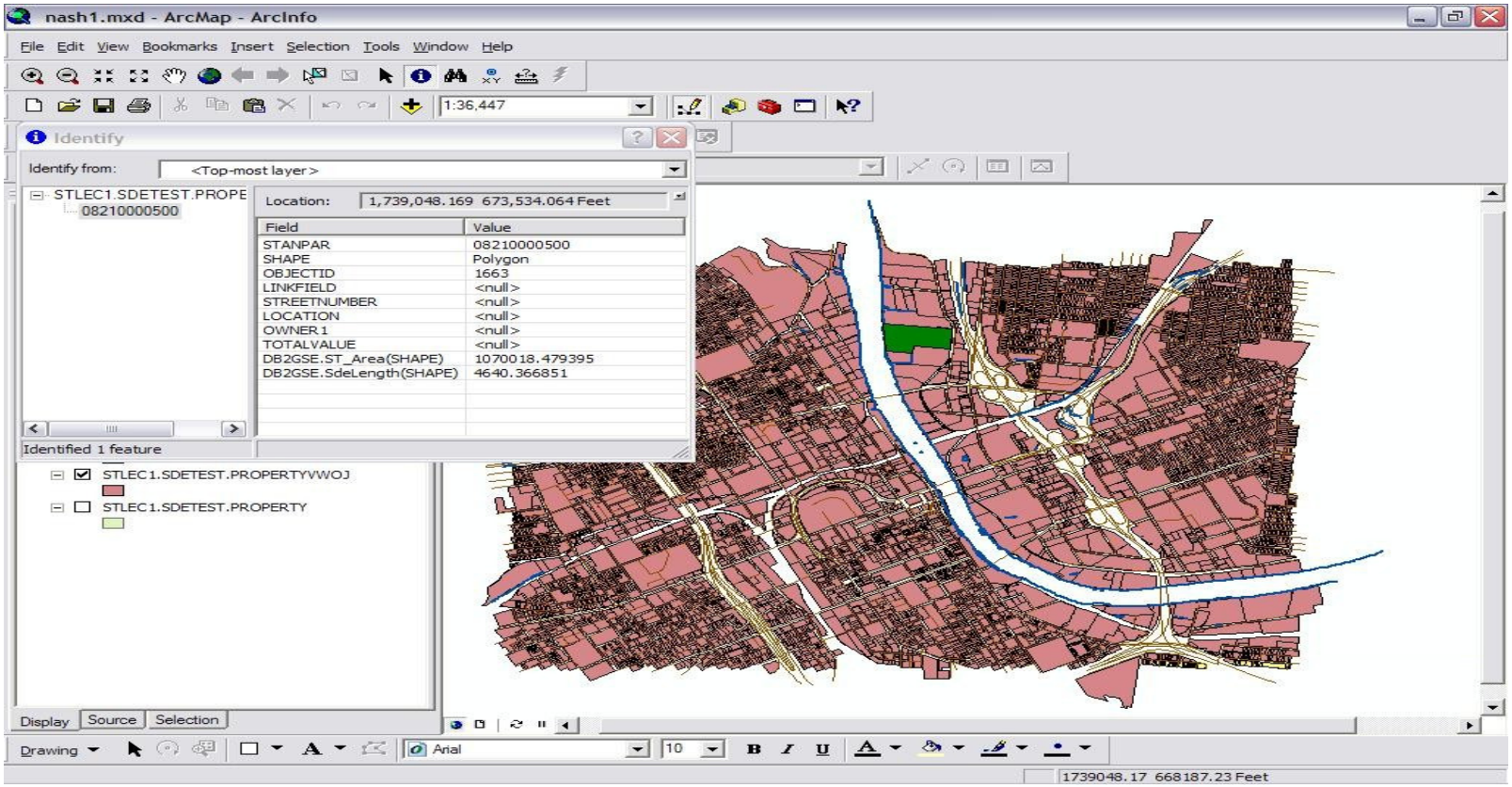
Screen 3 shows ArcMap with the layers of "stream, centerline, and property".



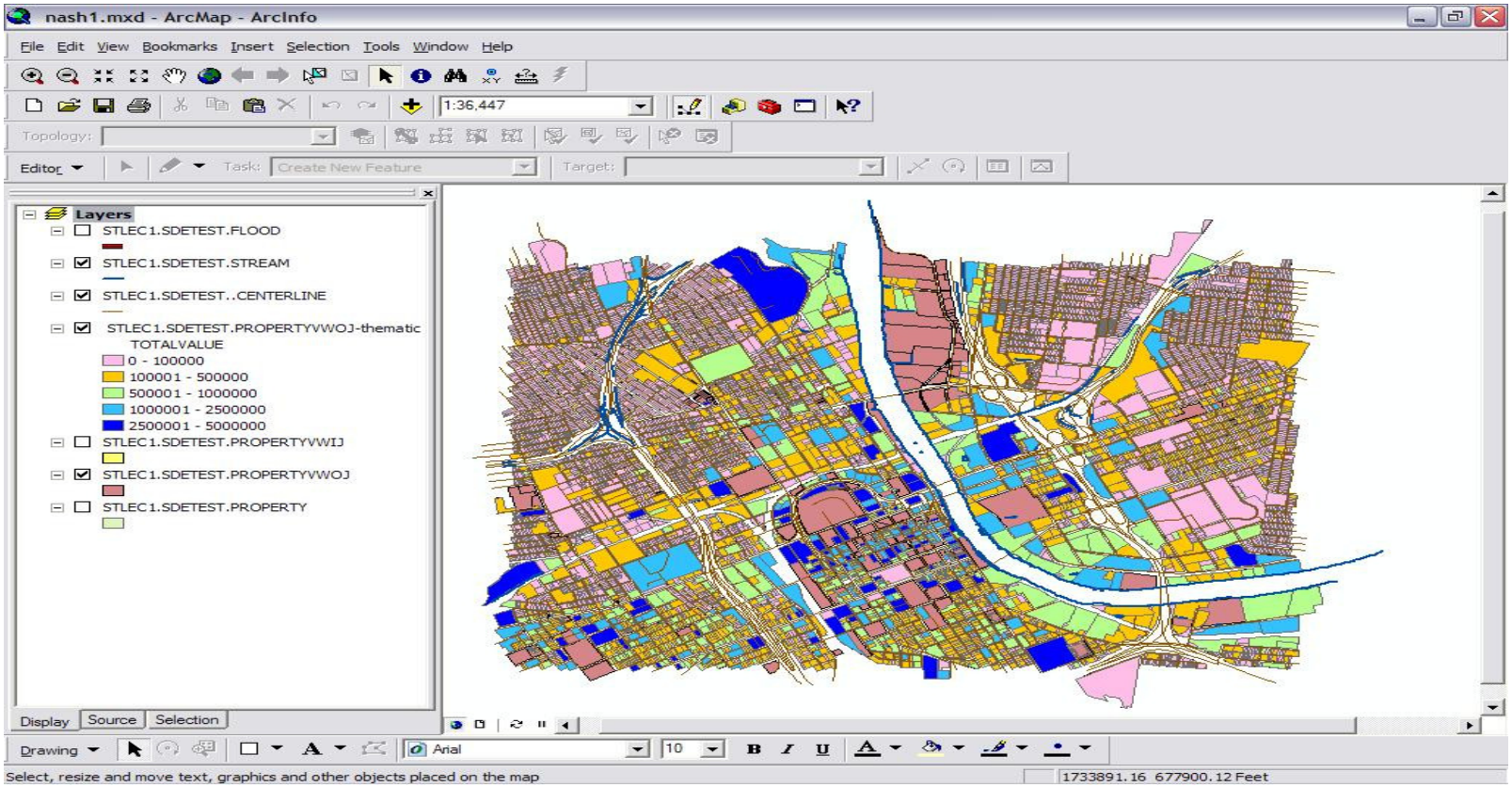
Screen 4 shows ArcMap with an identified property view



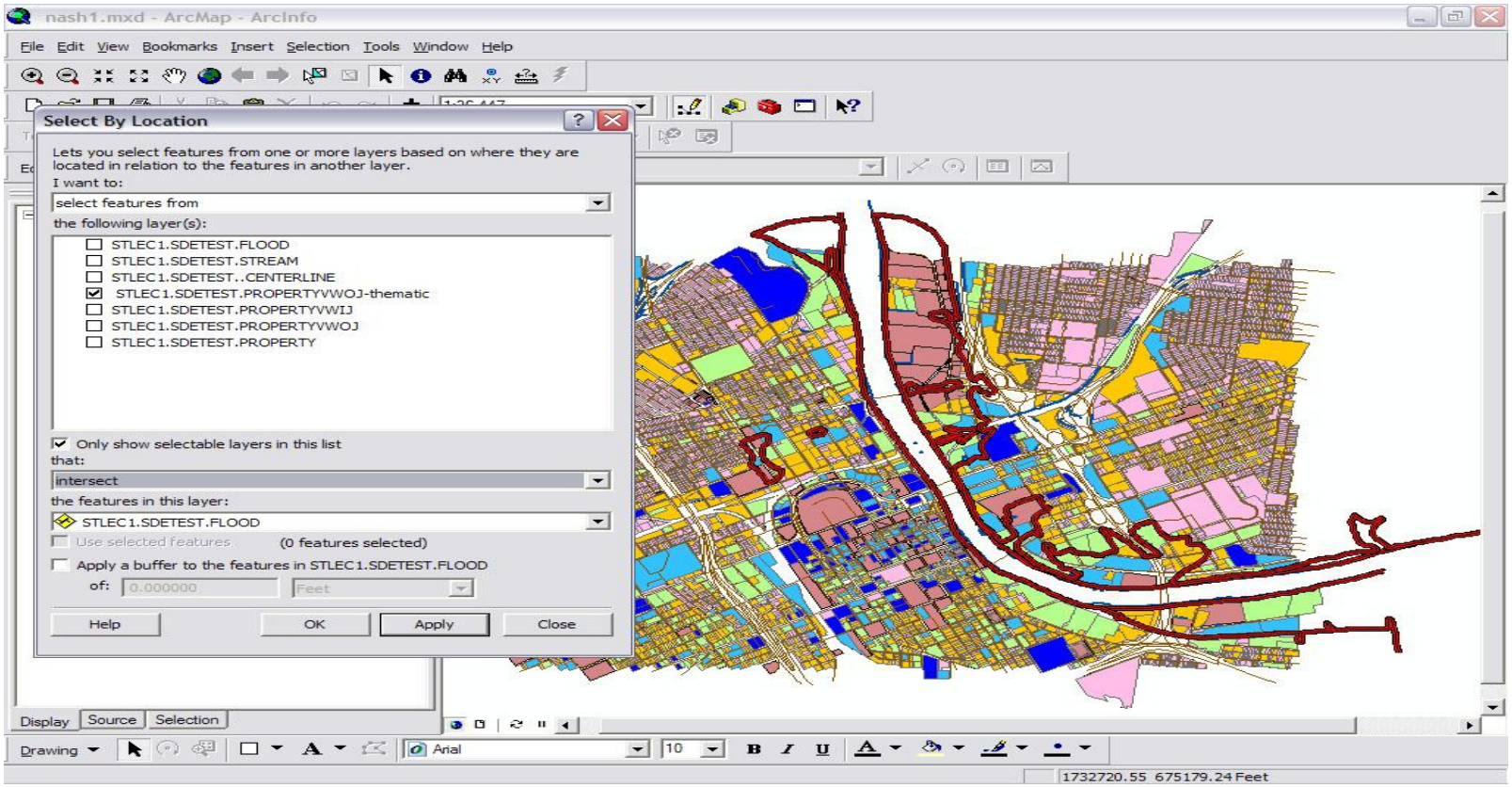
Screen 5 shows ArcMap with an identified inner join view



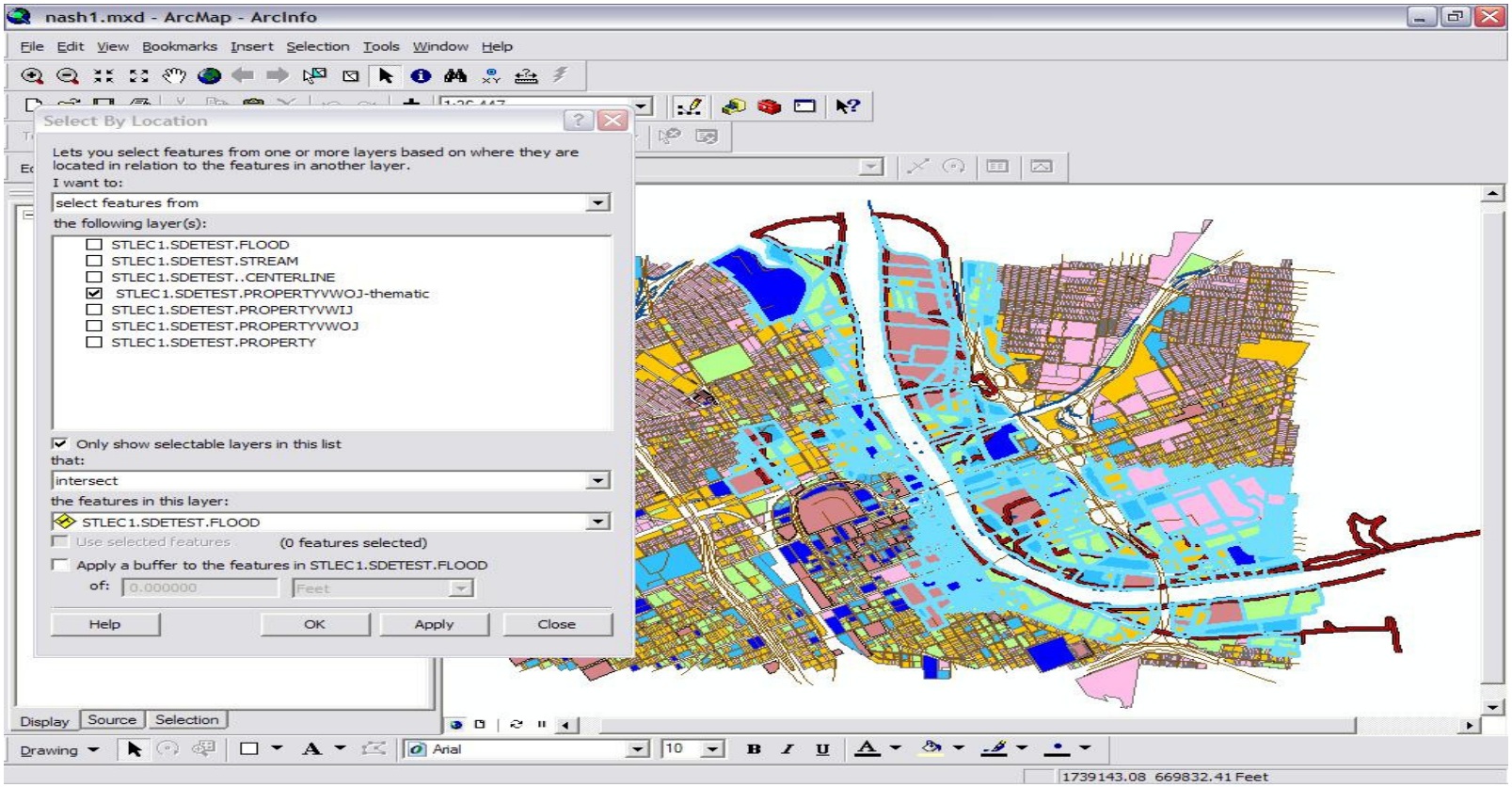
Screen 6 shows ArcMap with an identified outer join view



Screen 7 shows ArcMap with an categorized property view



Screen 8 shows ArcMap with the "select by location" query wizard



Screen 9 shows the query result for " categorized properties intersect flood".

Implementation Summary #2

- Can quickly design and deploy a scalable and customizable enterprise GIS solution using ESRI's ArcGIS 9.3 on DB2 for z/OS
- Loose coupling relationship between DB2 for z/OS spatial database server and ArcGIS application servers + clients
- ArcGIS server can support both intranet and internet web clients
- Unlimited usage scenarios for many industries

Resources for further information

- DB2 9 for z/OS Spatial Support User's Guide and Reference

  http://www-306.ibm.com/software/data/db2/zos/v9books.html
- ESRI

  http://www.esri.com
- *DB2 9 for z/OS Information; Download the full recorded version of the insurance demo and the city government demo*

  http://www.ibm.com/software/data/db2/zos-new/
- Open Geospatial Consortium, Inc.

  http://www.opengeospatial.org

Agenda

- Why DB2 for z/OS
- Enterprise Spatial Data Solutions with ESRI
  - Location Information
  - Case Studies & Examples
- Spatial Support in DB2 9 for z/OS
  - Features
  - Usage Scenarios
- Q & A

Questions ??

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