



Spatially Enabling Enterprise Asset Management Using ArcGIS Server

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Agenda

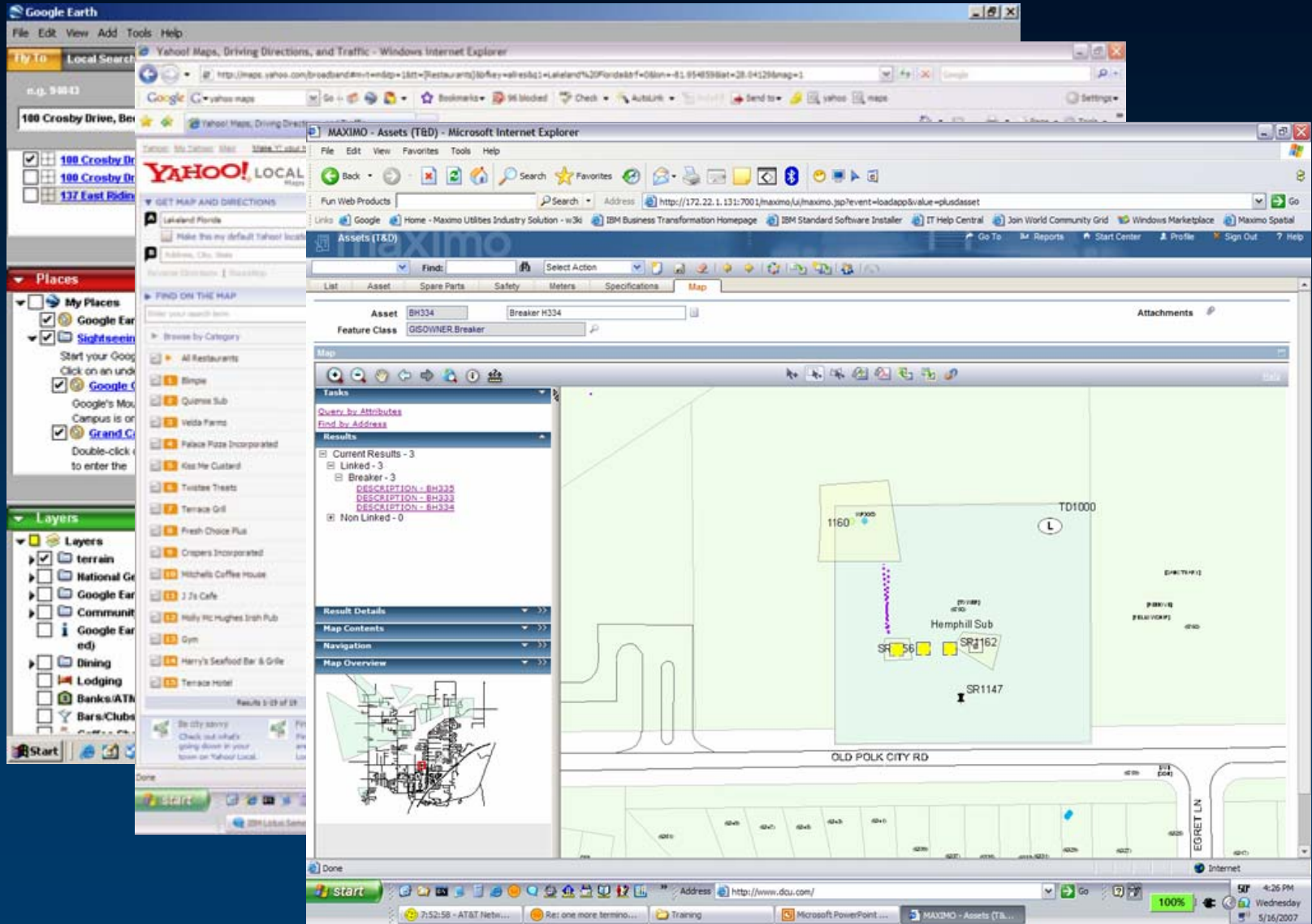
- **Enterprise Asset Management and GIS**
- **Value of Spatially enabling Enterprise Applications**
- **IBM – ESRI Relationship**
- **How ArcGIS Server supports Enterprise Applications**
- **Product Development**
- **Questions**

Why clients need comprehensive asset management

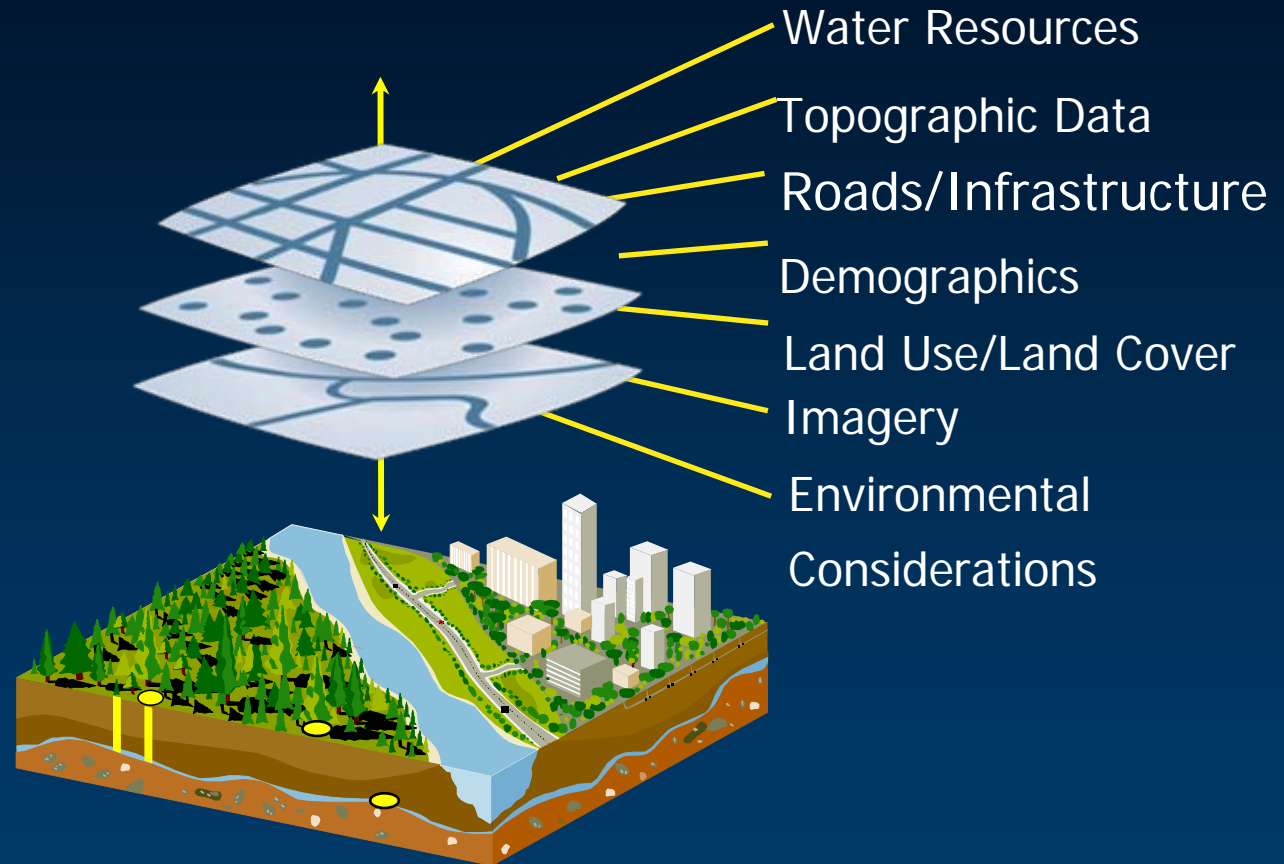


- **Drivers of comprehensive asset management:**
 - Cost inefficiencies and complexity associated with redundant asset management infrastructure
 - Need to measure and manage the availability and use of all strategic assets
 - Convergence of Operational Technology and Information Technology

Maps and Geo-coded Information is Pervasive



Geographic Information Systems (GIS) Integrates Data



- Geo-Referencing
- Map Overlay
- Spatial Analysis
- Visualization

... integrating measurements and disciplines



Evening View of Downtown Corpus Christi

City Wide Response: *Competition from Privatization*

City of Corpus Christi, Texas

Population	281,000
Metro census (2000)	380,000
Adopted expenditure budget FY 2006-07	\$566 M
Total full time City employees	2,000+
Utility accounts (approximate)	80,000

CITY UTILITIES

- 174 MGD Water production plant
- 6 Wastewater Treatment Plants
- 1500+ miles water mains
- 1250+ miles wastewater mains
- Gas distribution city owned/operated



City of Corpus Christi, Texas

Living View of Downtown Corpus Christi

Citizen



Report Event

Call Center



Create Work Order

View Existing WO on GIS Map

Field Operations



Locate Valves on Mobile GIS to Isolate Main

Submit Redline Sketch of Break Location

CIS Database

MAXIMO Database

ArcSDE Geodatabase

Integrated Corporate Databases

GIS Data Maintenance



Retrieve Redline

Post Break



City Wide Response:

Develop tool to spatially analyze work done or needed



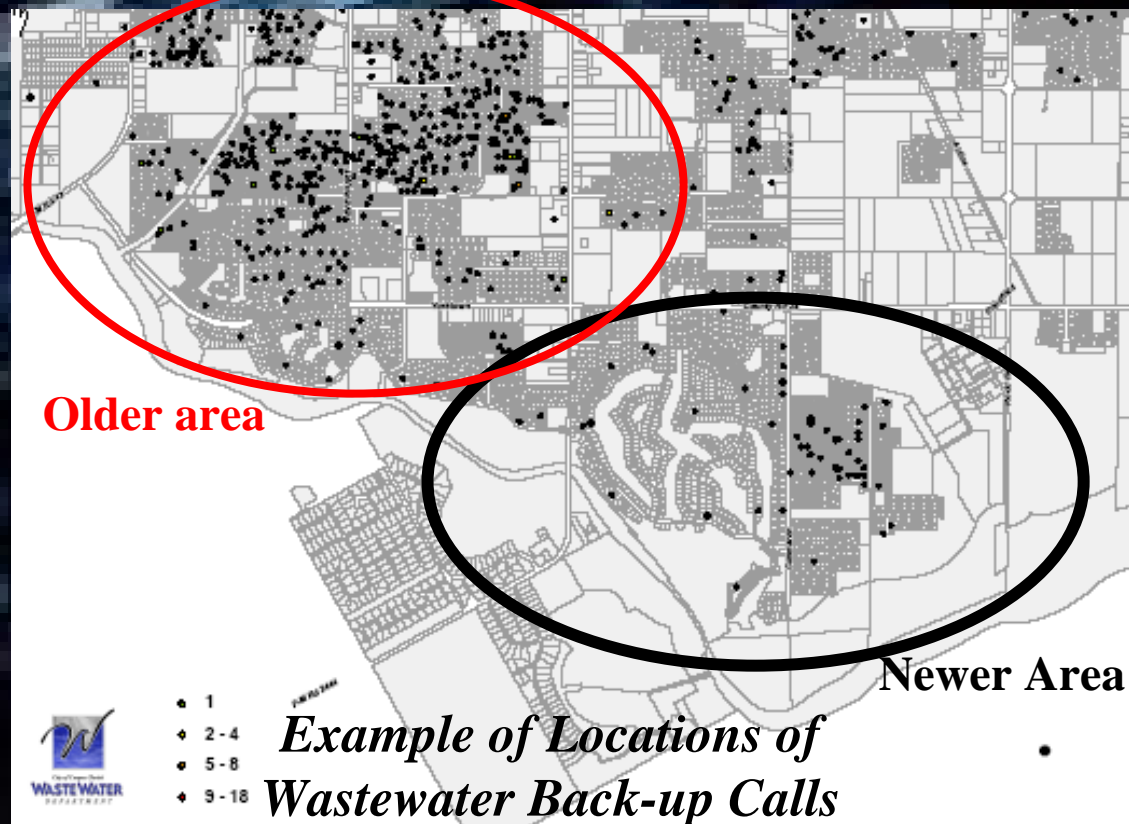
Each Customer's Work Order has a mappable location code enabling spatial analysis using our MAXIMO- GIS interface

■ Improved decision making based on visualization and thematic mapping.

– Internal Service departments understanding service level targets, monitoring trends & making needed tactical adjustments

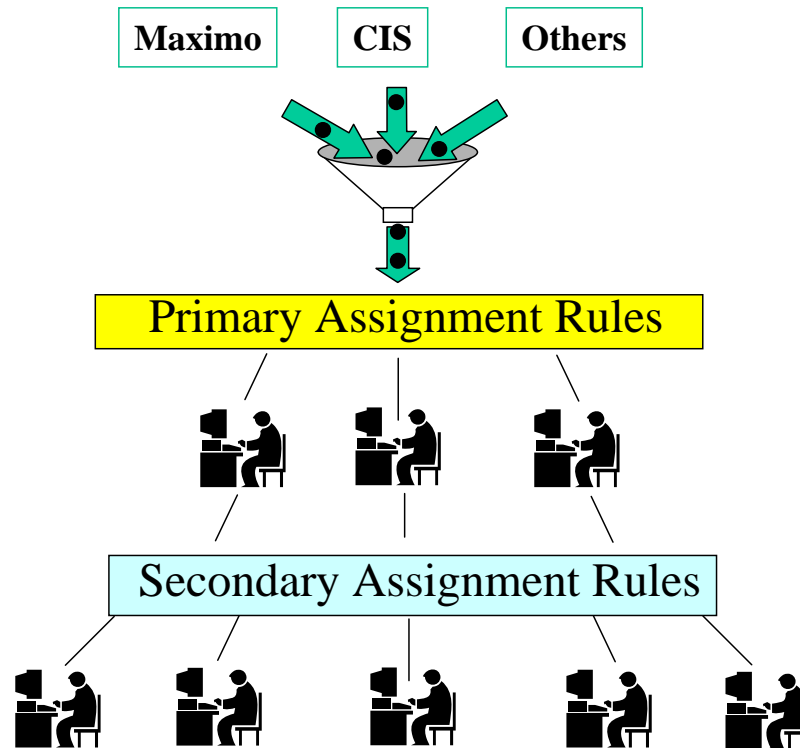
– Visualizing strategic implications of work & impact to others

– Fewer “work silos” and a “flatter” organization with a multi-skilled workforce

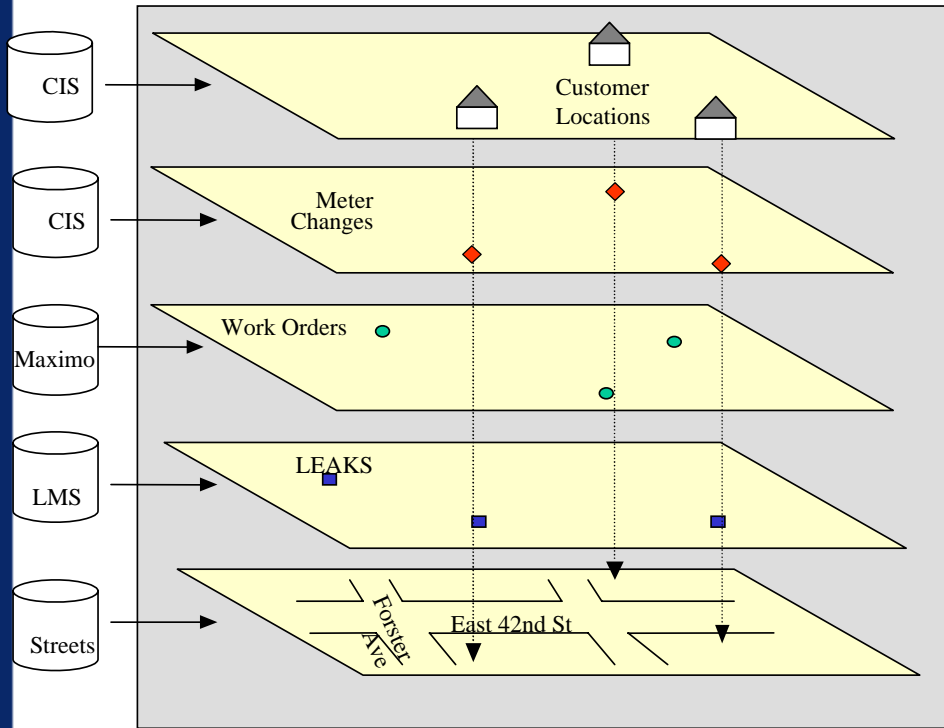


Common Work Queue

- Supervisors have clear ownership of work in a geographic area - while increasing their ability to transfer and receive work from others.

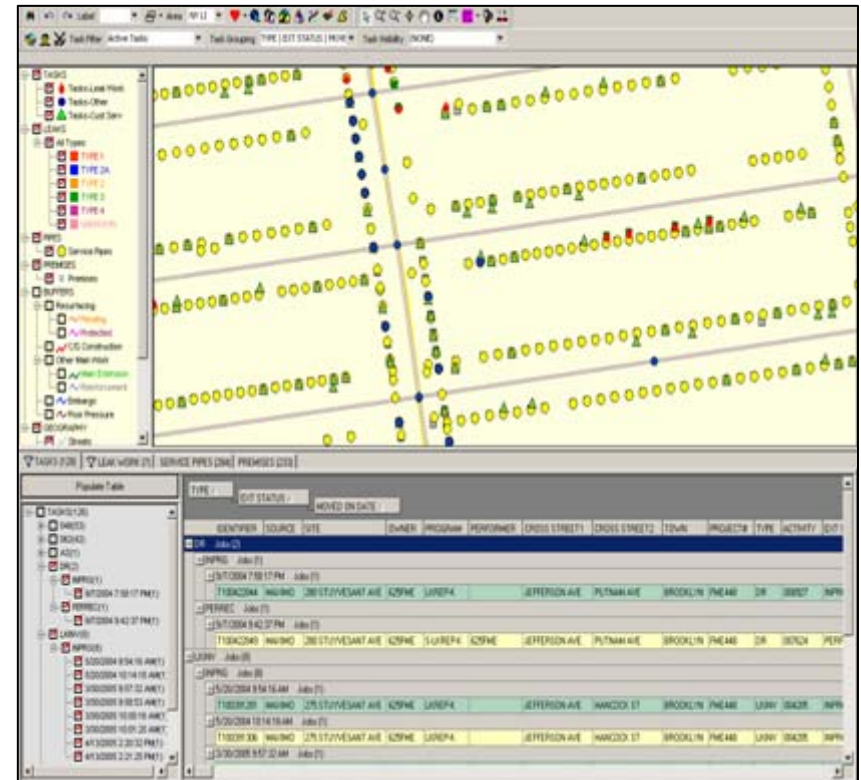


Consolidated View

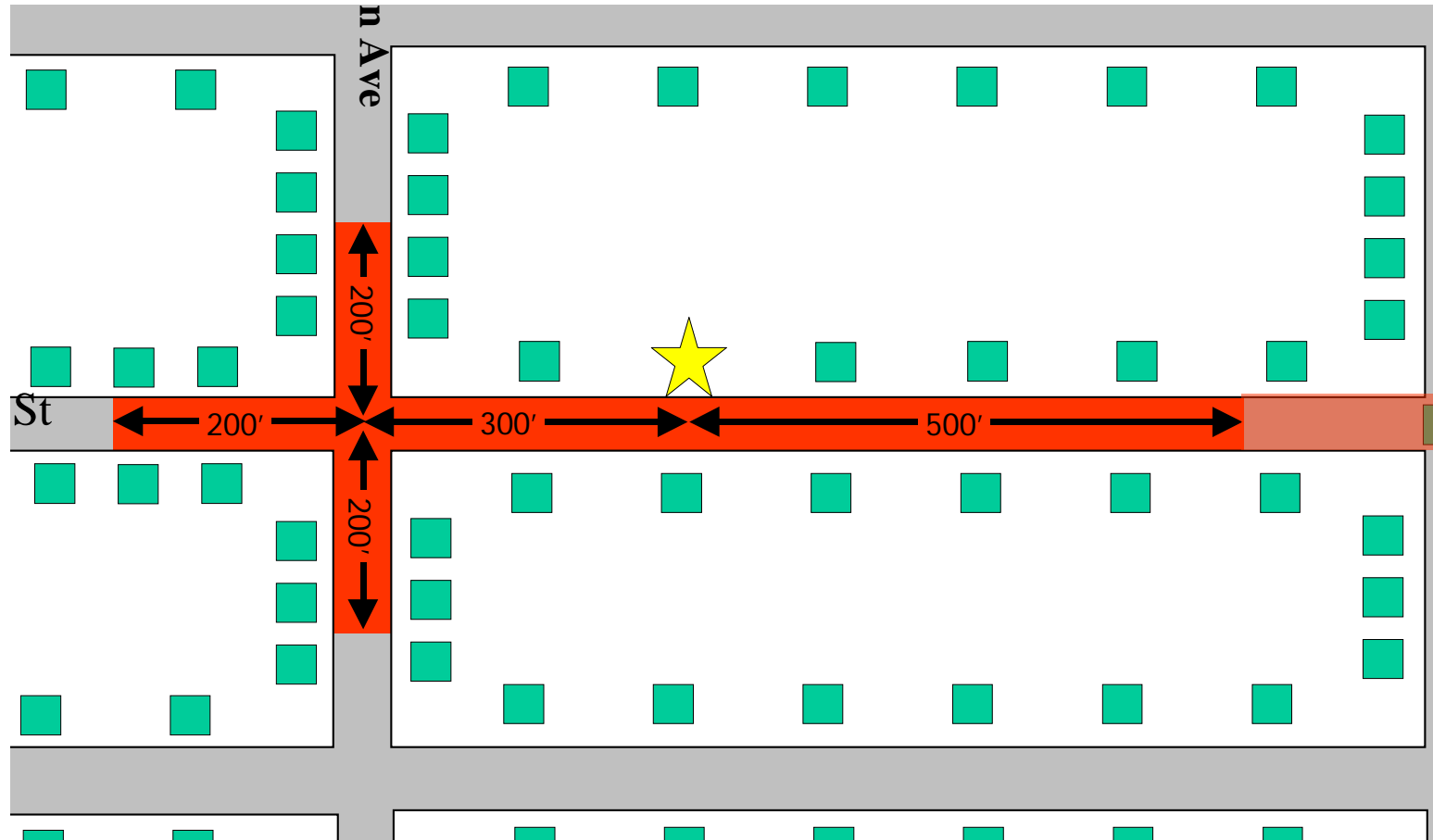


Multiple Data Sources

Graphical & Tabular Views



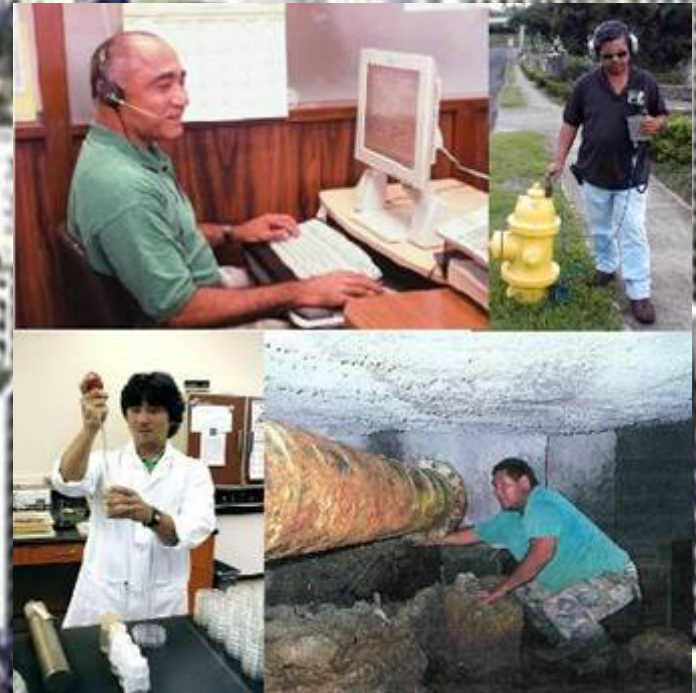
Tagalong Determination



Travel Distance - Within n feet in both directions from the primary job

Honolulu Board of Water Supply

- Serves One Million Customers On Oahu, & Provides Support Services To Kauai
 - *Among the 10 Largest Water Utilities in US*
 - *Primary Function is to Provide Municipal Water and Fire Protection for Oahu*
- **Treat 50 Billion Gallons of Water/ Year**
 - **110 Reservoirs and 170 Water Sources**
 - **1,900 Miles of Pipeline**
 - **155,000 Metered Connections**



Integration Accommodates Sharing Asset Data Across Multiple Enterprise Systems



Honolulu Board Water Supply

Clicking the
“Map It”
button brings
up the GIS
map with the
work
highlighted

The image displays two overlapping browser windows from the MAXIMO Work Order Tracking system. The top window shows the main work order details for work order 1004, titled "Generator Overhaul Test". The details include location BR230, equipment 11230 (Emergency Generator), and a status of INPRG. The bottom window shows a GIS map titled "GISMO Map" with the work order 1004 highlighted in yellow on a street map of Alamoana Blvd. The map includes street names such as Alamoana Blvd, Alapai St, and Kamae St. The interface includes various navigation and search tools.

MAXIMO - Work Order Tracking - Work Order - Microsoft Internet Explorer

Address: http://stpmax2:7001/jsp/app/wotrack/main.jsp

Work Order Tracking Site: BEDFORD Start Center Go To Sign Out Help

Current Query: All Work Orders Select Action

Search Work Orders Plans Assignments Actuals Safety Plan Failure Reporting Attached Documents

Work Order: 1004 Generator Overhaul Test In Workflow? Work Type: OM

Location: BR230 Boiler Room Emergency Generator WO Priority: 1 GL Account: 6210-327-777

Equipment: 11230 Emergency Generator Loc Eq Priority: 5 Warranty: 5/25/99

Reported By: Dave Smith

Status: INPRG

Parent WO:

Job Details

Job Plan: JP11210

Safety Plan:

Schedule

Start

Target: 12/01/98 7:00 AM

Scheduled:

Actual: 2/6/99 1:16 PM

Estimated Duration: 7:00

Remaining Duration:

Done

MAXIMO GISMO Map

Map Find

1000 ALAMODANA BLVD
1001 ALAMODANA BLVD
215 WIKRO AVE

ALAMODANA BLVD

1118 ALAMODANA BLVD
1124 ALAMODANA BLVD
1122 ALAMODANA BLVD

1004
1140 ALAMODANA BLVD

ALAPAI ST

1000 ALAPAI ST

KAMAEE ST

308 KAMAEE ST
327 KAMAEE ST

1108 ALAPAI ST
318 KAMAEE ST

1116 ALAPAI ST
1142 ALAPAI ST

1100 ALAMODANA BLVD
1100 ALAMODANA BLVD

1100 ALAMODANA BLVD

1120 ALAMODANA BLVD

1201 ALAMODANA BLVD

OK

U:548890 Y:47200 (Feet)

Local Intranet

US Marine Corp and Naval Facilities

MAXIMO - GIS - Microsoft Internet Explorer

Address: <https://www.usmamax.net/jsp/app/wotack/gis.jsp>

GIS Viewer

maximo

Search Work Order Plans Actuals Assignment Safety Plan Failure Reporting Maps Linked Documents

INFADS Data

Facility Number: 250
Facility ID: NFA100000062807
Description: N/A
Primary Use Code: 21105
Associated Text: Maintenance Hangar - OH Space
FAC: 2111
FAC Text: Aircraft Maintenance Hangar
PRV: \$34,145,366.00
EE Date: 2001-12-06 00:00:00.0

Facility Dimensions

	English	Metric
Length:	484 Ft	147.52 M
Height:	73 Ft	22.25 M
Width:	282 Ft	85.95 M
Area:	174939 SF	53321.41 SM

Related Information

- Active Work Orders (481)
- Closed Work Orders (3468)
- Project Information (0)
- Equipment (136)
- CORRS Data (0)
- Photos and Images (0)
- Floorplans and CADD (0)

Facility Summary

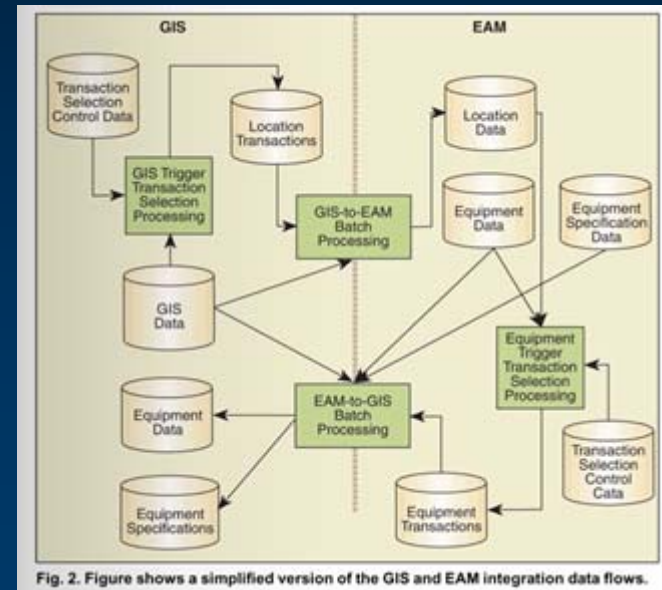
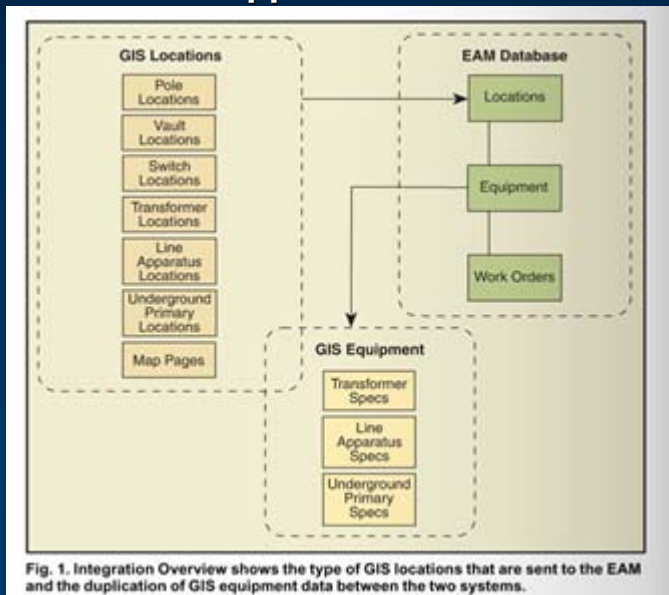
Work Order Summary

Active Map Tool: Nothing Selected

Chelan County Public Utility District

- MAXIMO
- Work Orders
- Inventory
- Detailed Equipment information
 - Distribution Transformers
 - Line Apparatus

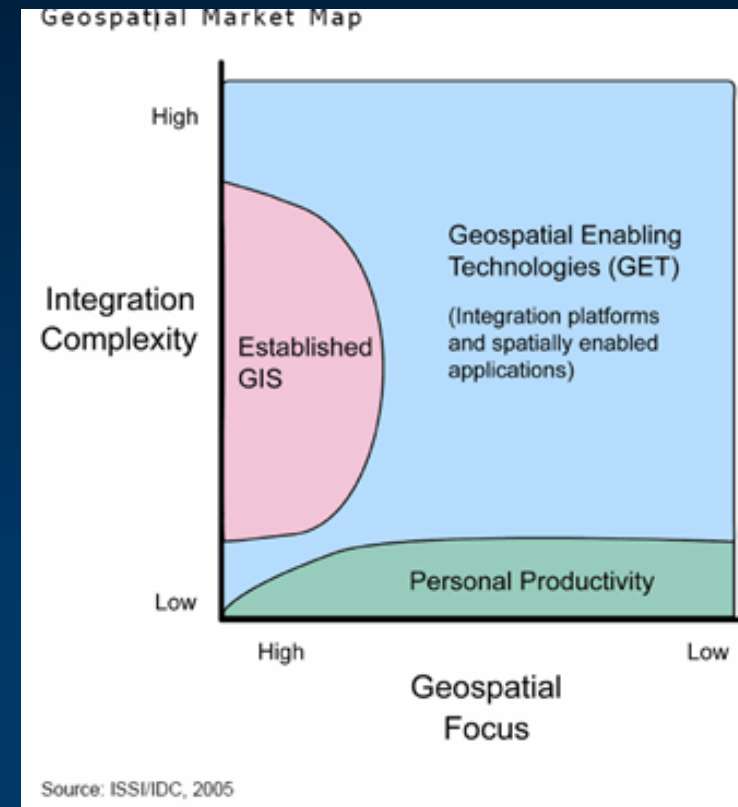
- ArcGIS
- Location data
- Two-way integration
- Improved planning & scheduling
- Failure analysis Maps



The biggest benefit of integrating the systems was in the work management arena. All work orders developed in the EAM systems were tagged with a GIS location, typically a map page and a location ID. This made it possible to better plan and schedule work by geographic area. It also allowed the district to produce maps for failure analysis and required maintenance work.

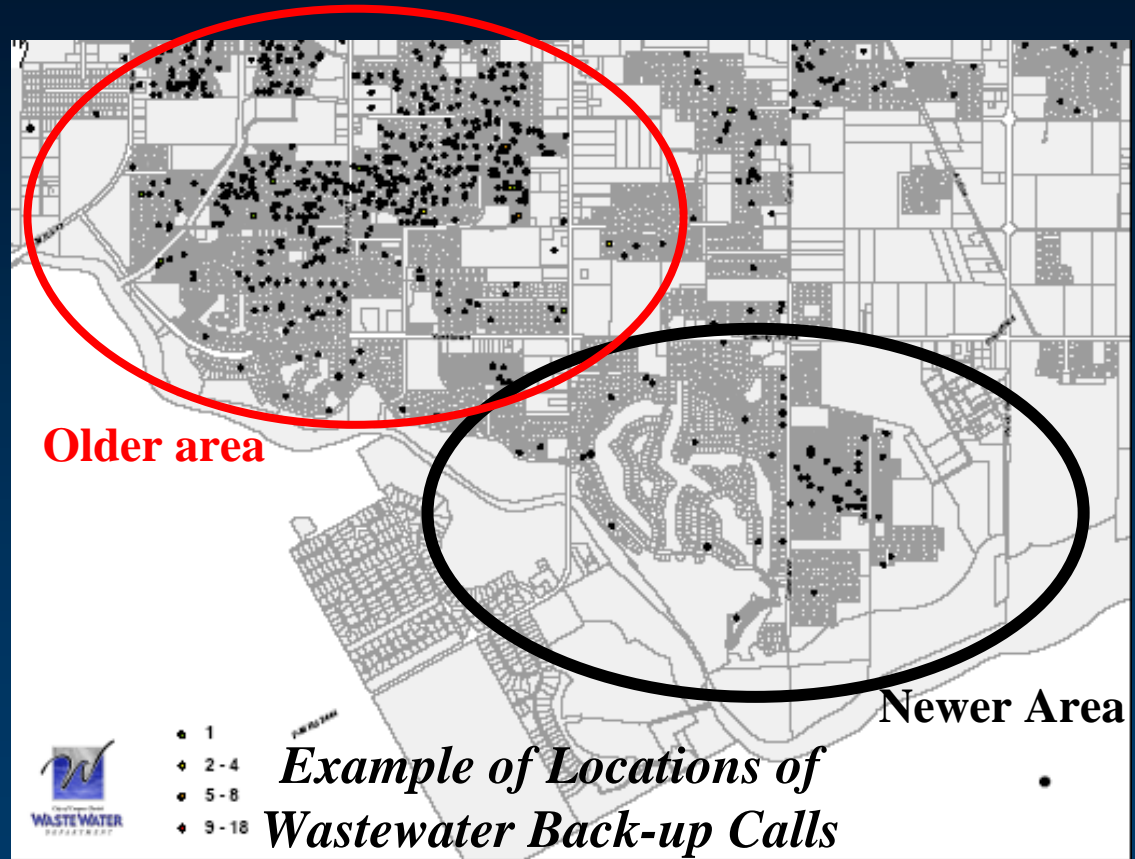
Market Trend From IDC

- **IDC – Extending GIS to Enterprise Application**
- **GET (Geospatial Enabling Technologies)**
 - **Spatial Context – location increases the value of data**
 - **Quantification/measurement – routing, network analysis**
 - **Modeling – look for trends, predict occurrence**
 - **Geographical analysis - proximity**
 - **Reference – relate data beyond the boundary of the enterprise**
 - **Visualization – Thematic mapping**



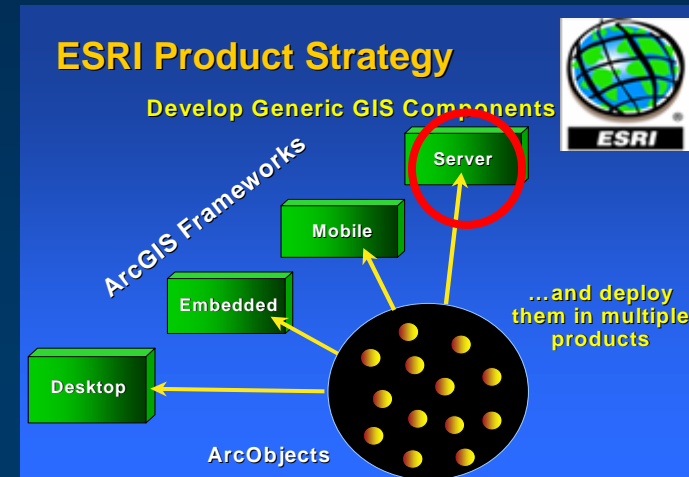
Value of Spatial Enabling EAM

- Visualization
 - assets, locations, wo's sr's supports visual business analysis
- Spatial Context
 - location provides contexts that makes information more meaningful
- Reference
 - group, cluster or categorize related information, reference related feature class details and infrastructure
- Quantification / Measurement
 - distance, physical relationship between objects, proximity measures, obstacles and available routes
- Modeling
 - trends, variation, patterns



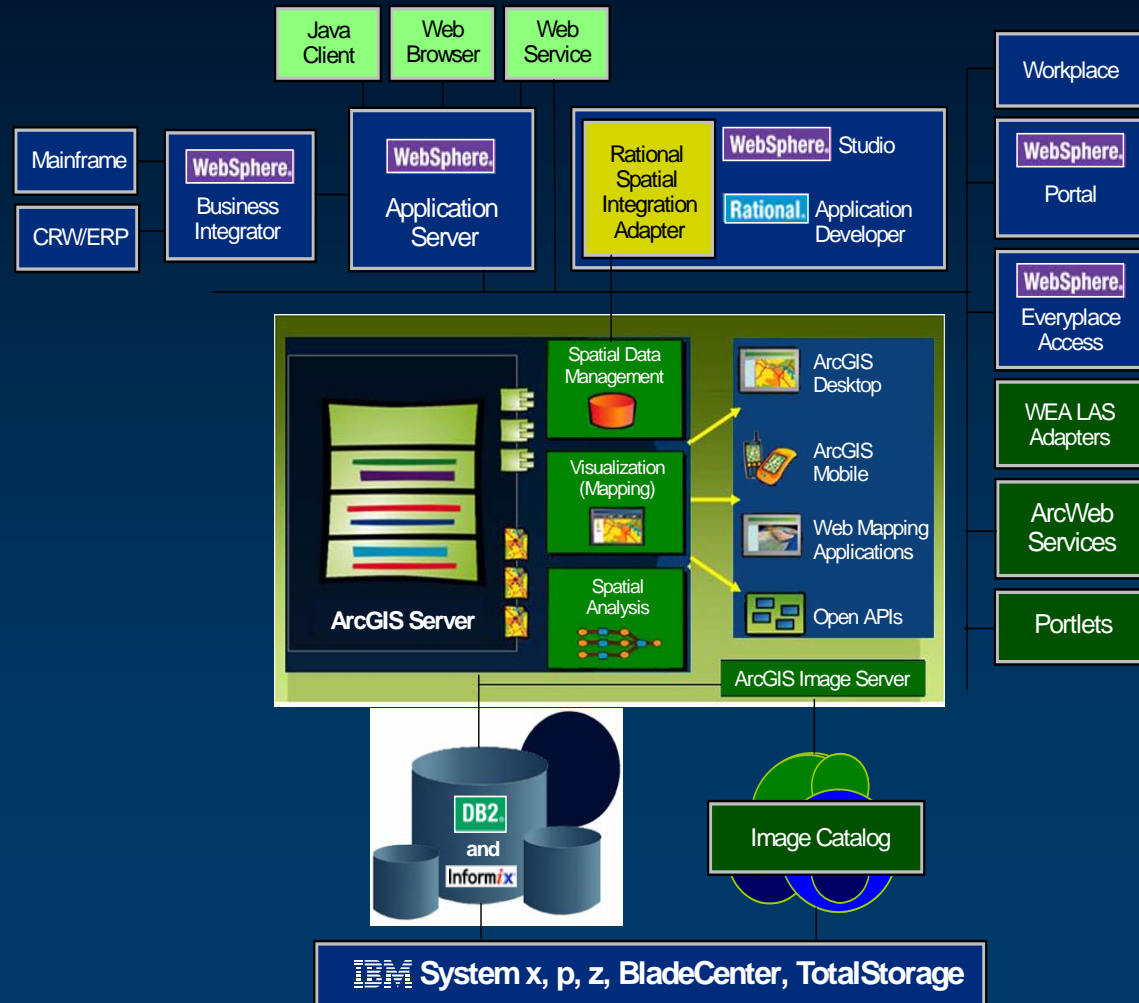
Why is IBM Working With ESRI?

- Market share leader
 - Embraces standards-based technology allowing embedded components in enterprise applications
-
- Geographic Information System (GIS) Software And Services
 - 37 Years In Business, Privately Held
 - 300,000 Client Organizations, > 1M Users
 - > 84% U.S. Public Sector Market
 - > 50% Of U.S. Utility Market
 - Measurable Footprint In 50 Industry Sectors
 - Multi-channel Sales Organization
 - Largest Annual Event; User Conference, 15,000+ Attendees
 - Synergy With IBM In Technology, Business Outlook, Values



IBM & ESRI Strategic Alliance

- Global Strategic Alliance
- Serves growing market for enterprise Geographic Information System (GIS) solutions
- ESRI provides GIS software technology enabled on IBM infrastructure products
- Premier PW Member
- IBM Maximo team is engaged with IBM ESRI alliance team



History: ESRI & MRO Software

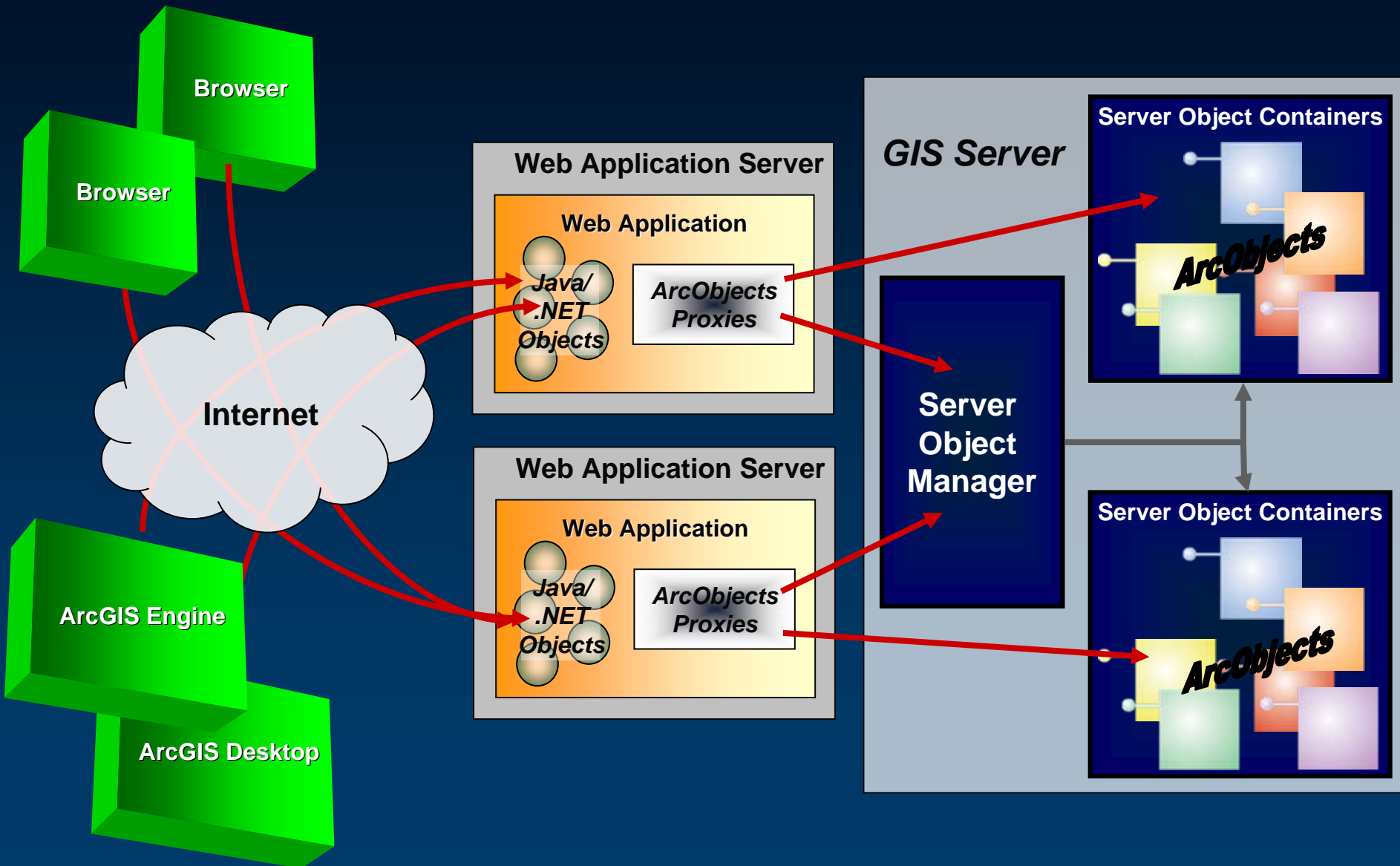
- MRO Software and ESRI formalized alliance in 2005
- Spatial enablement of Maximo stems joint effort to develop and market spatially enabled asset and service management solutions.
- Engaged at all levels of ESRI
 - **CEO support / engagement**
 - **Development / Services supporting IBM Maximo Spatial and current active research projects**
 - **Working with marketing / sales / industry marketing on go to market activities**
- Working with latest ESRI technology
- Awards
 - **New Business Partner of the Year 2007**



Development Perspective

*Gary Cooper Product Development
IBM Software Group
Tivoli Maximo*

GIS Server – What is the right architecture



Does it support the right functionality?



... Connects Disciplines, Departments, Organizations

Does it support diversity in data sources



Managing Complexity . . .

. . . And Making It All Accessible

What are we doing with GIS?

Spatially enabling Work Management

- Embedding ArcGIS Server 9.2 technology stack in the UI
- Powerful Java ArcObjects provide capabilities formerly found on only the desktop
- Dynamic – not static
- Visualization of data – a map as a report
- Geocoding, tracing networks, routing, simple editing
- Elimination of data duplication
- Leverage both technologies

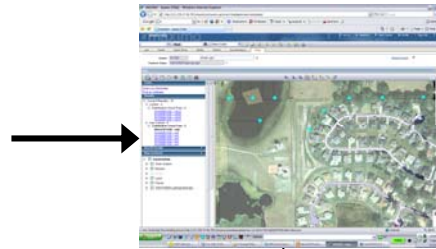
Spatially enabled Work Management should allow users to visualize all assets and work in their geospatial context to optimize resources and decisions

Why Is This Innovative?

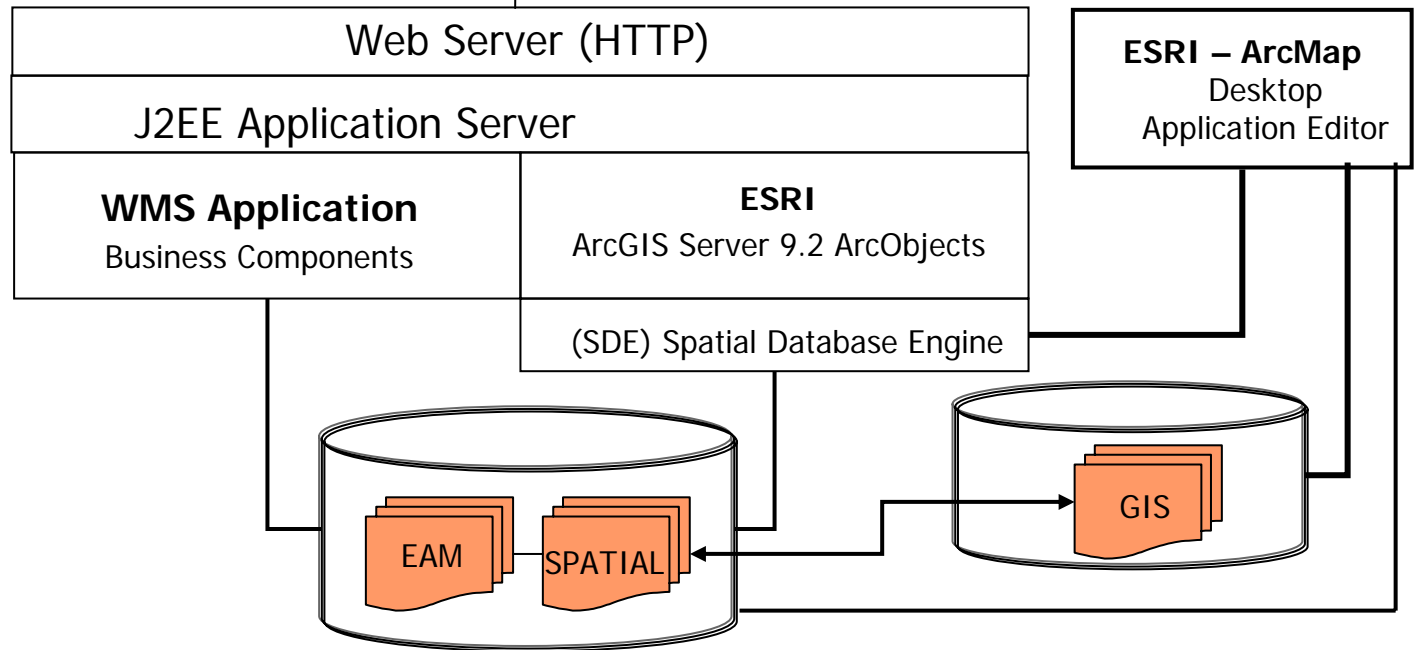
- Full strength of GIS spatial analyses can be exposed
 - Spatially-enabled executive-level cost/benefit analyses
 - Right access to data drives efficient processes throughout org
 - Model both outside plant and inside plant in single system
- Any entity can be spatially-enabled, not just assets.
 - Service Request, Locations, Crews, People, Work Orders, Tools, Materials, Labor
- All asset types can be spatially-enabled, not just points.
 - Points: Pole, Hydrant, Meter, Sign, Transformer, House, Computer
 - Linear: Roads, Rail, Pipelines, Powerlines, Communication networks
 - Area: Rights-of-way, Buildings, Roofs, Service Areas, Campus, Office
- Leveraging the latest ESRI technology
 - Early adopter of server-based GIS
 - No other asset management vendors are using this approach
 - Others use static ArcIMS published data

Combined Architecture – GIS and Work Management

Web Controls
Tables, Fields, Tabs



Java ADF Web Controls
Map, TOC, Toolbar, Task



Extend Schema & Linkage

- Keep it simple

ASSETS

ROADS – GIS Feature Class Business Table

SHAPE	OBJECTID	NAME	CREATEINMAXIMO	MXASSETUID	...
133	4321	Main St.	YES	12345678	

ASSET – MXES

ASSETNUM	LOCATION	DESCRIPTION	FEATURECLASSNAME	MXASSETUID	...
1001		Main St.	ROADS	12345678	

PARK – GIS Feature Class Business Table

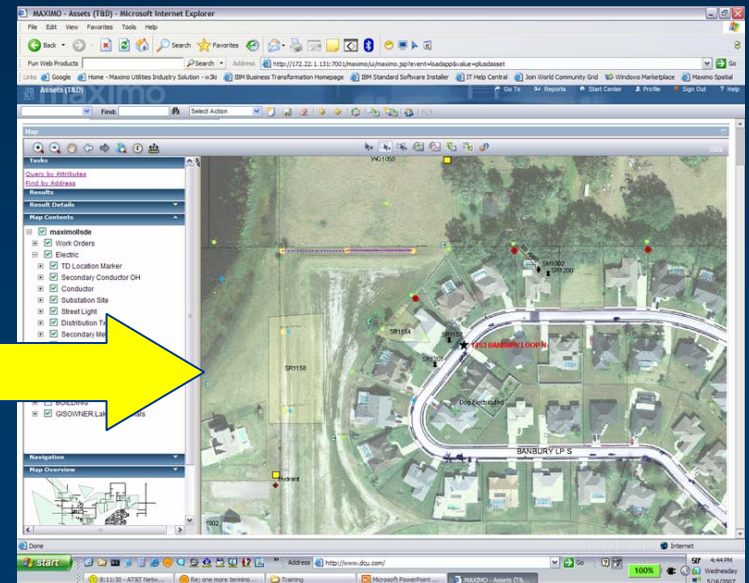
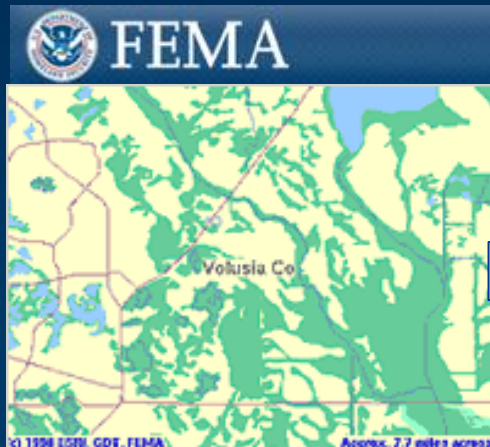
SHAPE	OBJECTID	NAME	CREATEINMAXIMO	MXLOCATIONSID	...
245	1234	Playground	YES	09922334456	

LOCATION - MXES

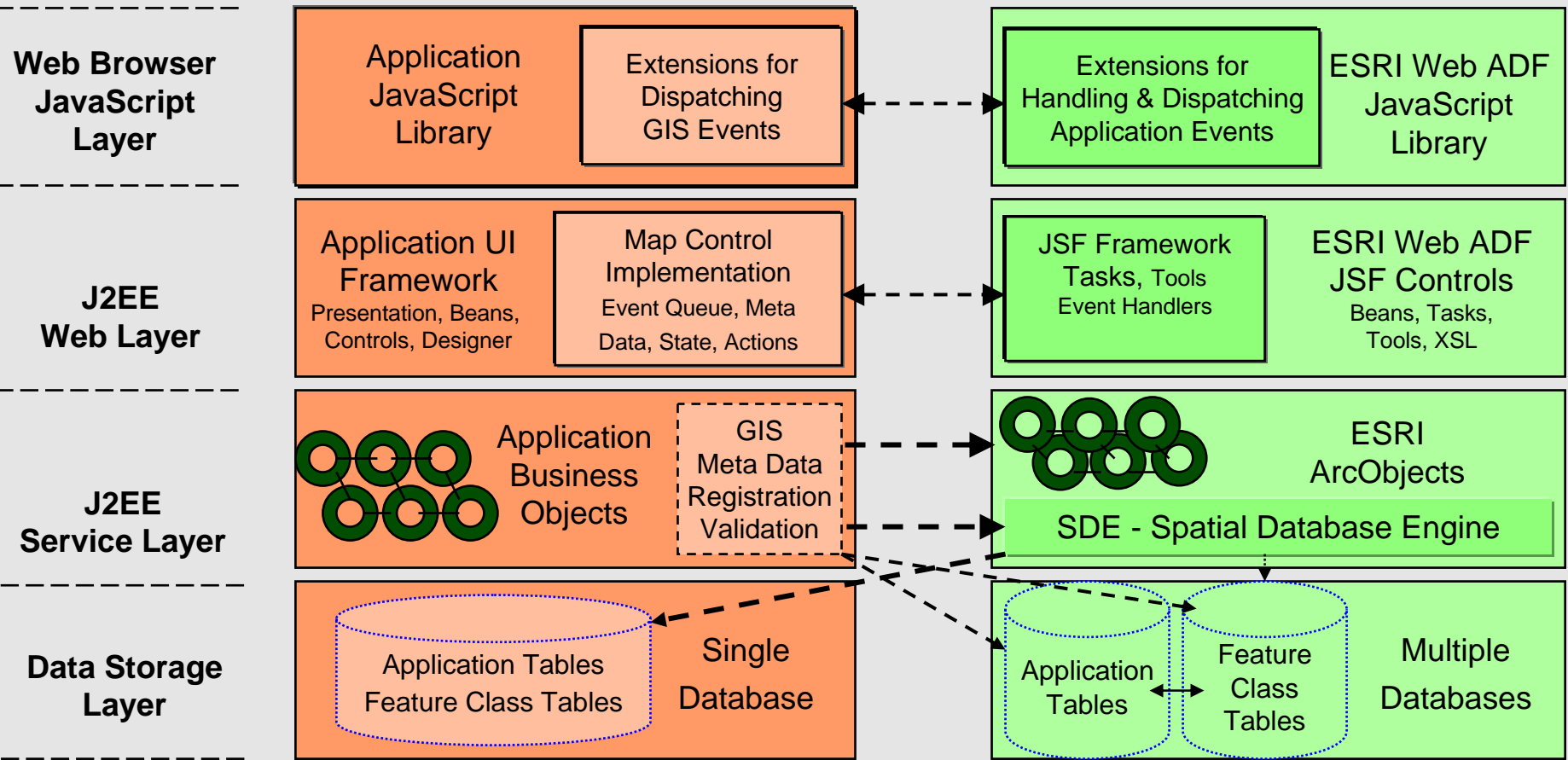
LOCNUM	DESCRIPTION	FEATURECLASSNAME	MXLOCATIONSID	...
L2003	Playground	PARK	09922334456	

ArcGIS Server Innovation

- **Innovative User of External Data Sources**
 - Remote Spatial Databases – connect in ArcCatalog
 - External data sources can provide themes that overlay the production layers
 - GPS(AVL) feeds from provider to track resources, assets, tools.
 - Any spatial data not maintained internally is a potential source.
 - FEMA flood planes, evacuation routes, census data
 - Easily integrated to map document simply by creating a connection.
 - Any web services compatible with ESRI data formats



Architecture Design Tiers



What will it look like?

Display Assets on a Map – Breakers at the SubStation

The screenshot shows the MAXIMO Assets (T&D) web application interface. At the top, the browser window title is "MAXIMO - Assets (T&D) - Microsoft Internet Explorer". The address bar shows the URL: <http://172.22.1.131:7001/maximo/ui/maximo.jsp?event=loadapp&value=plusdasset>. The application header includes a search bar with "Find:" and a "Select Action" dropdown. Below the header, the "Asset" field contains "BH334" and "Breaker H334", and the "Feature Class" is "GISOWNER.Breaker".

The main map area displays a geographical view of the Hemphill Substation. A yellow box highlights a specific area on the map, and a purple dashed line indicates a connection between a point labeled "1160" and a breaker labeled "SR56". Other breakers shown include "SR162" and "SR1147". The map also shows a transformer labeled "TD1000" and a road labeled "OLD POLK CITY RD".

On the left side of the map, there is a "Tasks" panel with options for "Query by Attributes" and "Find by Address". Below this is a "Results" section showing a tree view of search results: "Current Results - 3", "Linked - 3", "Breaker - 3" (with sub-items "DESCRIPTION - BH334", "DESCRIPTION - BH333", and "DESCRIPTION - BH334"), and "Non Linked - 0". Below the results is a "Result Details" section with expandable sections for "Map Contents", "Navigation", and "Map Overview".

At the bottom of the browser window, the Windows taskbar is visible, showing the Start button, several open applications (including "Training" and "Microsoft PowerPoint"), and the system tray with the date and time: "Wednesday 5/16/2007 4:26 PM".

Views presenting geographical diversity of assets

The screenshot displays the MAXIMO Assets (T&D) web application interface. The browser window title is "MAXIMO - Assets (T&D) - Microsoft Internet Explorer". The address bar shows the URL: <http://172.22.1.131:7001/maximo/asset/maximo.jsp?event=loadapp&value=plusasset>. The application header includes navigation links for "Go To", "Reports", "Start Center", "Profile", and "Sign Out".

The main content area is titled "Assets (T&D)" and features a search bar with "Find:" and "Select Action" dropdowns. Below this, the "Asset" field is set to "BH334" (Breaker H334) and the "Feature Class" is "GISOWNER.Breaker". An "Attachments" link is visible on the right.

The central focus is the "Map" view, which shows a detailed street map of a residential neighborhood. A yellow circle highlights a specific location on "OLD POLK CITY RD". The map includes various street names such as JANET LN, BRYSON LP, OONGORD LN, LAMP POST LN, CEDAR KNOLL DR N, CEDAR KNOLL DR S, ODONIEL DR, ODONIEL LP W, GRADY MOCK RD, MARLYN DR, DUSHAM DR, CRAWWELL RD, HIDDEN DR, OSPREY WY, WALT WILLIAMS RD, MAGPIE DR, PENGUIN PL, VINEYARD DR, PADGETT PL N, PADGETT PL S, VILLAGE VIEW LN, EAGLE RUN, SANDERS DR, BAKER RUN, REA COOK RUN, GRANE DR, and LT LOOP RD. A small inset map on the left provides a broader geographical context.

The bottom of the screen shows the Windows taskbar with the "start" button, system tray icons, and the system clock displaying "4:28 PM" on "Wednesday 5/16/2007". The taskbar also shows several open applications, including "MAXIMO - Assets (T&D)".

Address Search for Map Navigation

The screenshot displays the MAXIMO Assets (T&D) web application interface within a Microsoft Internet Explorer browser window. The browser's address bar shows the URL: `http://172.22.1.131:7001/maximo.jspx?event=loadapp&value=plusasset`. The application's main menu includes options like "List", "Asset", "Spare Parts", "Safety", "Meters", "Specifications", and "Map".

The "Map" view is active, showing a detailed map of a utility network. A search results panel on the left lists "1453 BANBURY LOOP N" with "Current Results - 2". A "Find by Address" dialog box is open over the map, with the search input field containing "1453 Banbury Lp N" and buttons for "Find", "Locate", and "Clear Locations". The map shows various assets such as "SR1154", "SR1157", "SR1201", "SR1200", and "SM1002". A specific location is highlighted with a star and labeled "1453 BANBURY LOOP N". Other map features include "WO1060", "SR1150", and "BANBURY LP S".

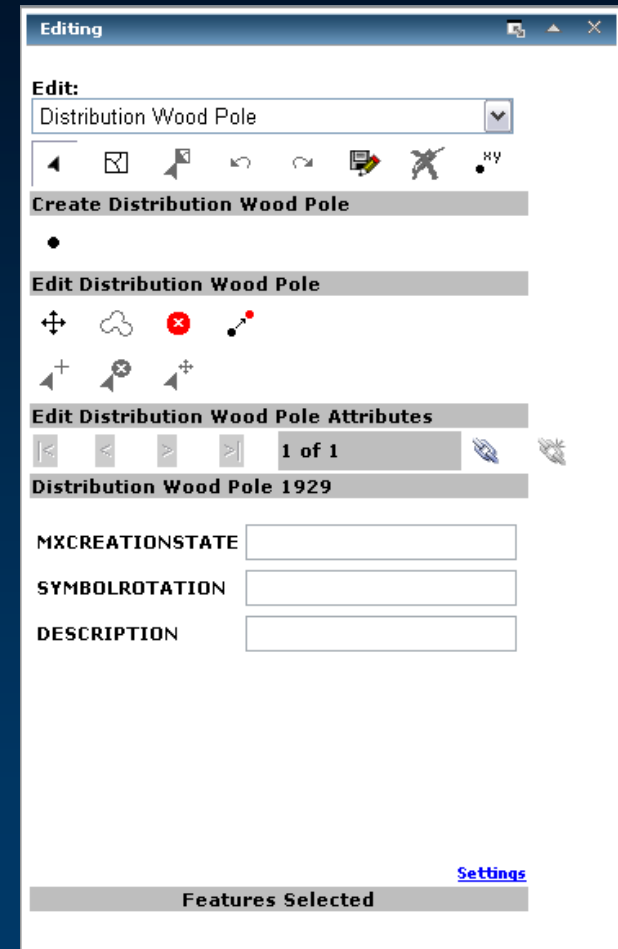
The Windows taskbar at the bottom shows the system clock as 4:38 PM on Wednesday, 5/16/2007, and the taskbar includes icons for "Training", "Microsoft PowerPoint", and "MAXIMO - Assets (T&D)".

Access Image data (internal or external)

The screenshot displays the MAXIMO Assets (T&D) web application running in Microsoft Internet Explorer. The browser window title is "MAXIMO - Assets (T&D) - Microsoft Internet Explorer". The address bar shows the URL: `http://172.22.1.131:7001/maximo/jsr?event=loadapp&value=plusdasset`. The application interface includes a navigation sidebar on the left with sections for "Tasks", "Query by Attributes", "Find by Address", "Results", "Result Details", and "Map Contents". The "Map Contents" section is expanded, showing a list of assets with checkboxes, including "maximofsde", "Work Orders", "Electric", "TD Location Marker", "Secondary Conductor OH", "Conductor", "Substation Site", "Street Light", "Distribution Tx UG", "Secondary Meter", "Poles", "Water", "Land", "Parcel", "Servers", "BUILDING", and "GISOWNER LakelandAerials". The main map area shows an aerial view of a residential neighborhood with utility assets overlaid. A street is labeled "BANBURY LP S" and a specific location is marked "1453 BANBURY LOOP N". Other assets are labeled with IDs such as "SR1154", "SR1157", "SR1201", "SR1158", "SM1002", and "SR1200". The Windows taskbar at the bottom shows the Start button, several open applications, and the system tray with the date "Wednesday, 5/16/2007" and time "4:44 PM".

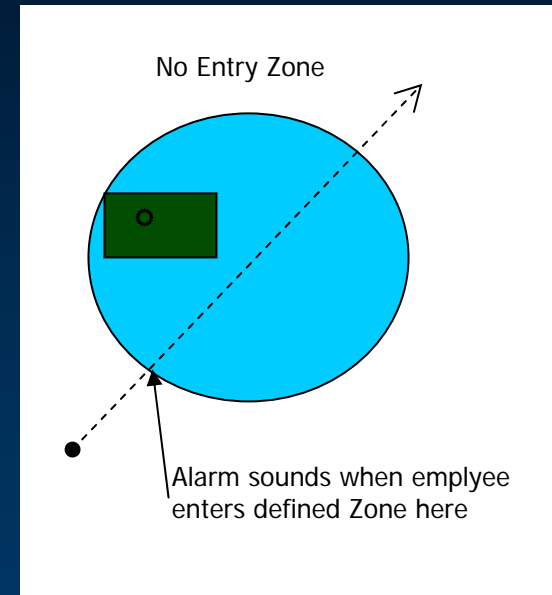
Editing GIS Data

- **Create, Modify, Link GIS features**
 - **Should work management users edit GIS data?**
 - Maybe?
 - Sometimes?
 - Never?
 - **What about work orders?**
 - Feature is owned by work management
 - All GIS consumers should see work orders immediately. (GIS users, CSR's, Public)
 - Expose defined work to the Enterprise and Public



Visualize Proximity NEZ (No Entry Zones)

- GIS works anywhere
 - Define No Entry Zones and monitor zone boundary
 - Supports safety and regulatory compliance at any work location
 - RF (Wi-Fi, Broadband cellular) and RFID make this possible
 - Work Assignment by proximity
 - Right resource at the right place at the right time.



Summary

- As Google brought maps, directions, and other location based services to the consumer, we have brought the full power of geospatial technology to the global enterprise.
- As many of our industry leading customers have directed us, GIS functionality within an Enterprise Application is core to the business and essential in optimizing operations.
- Now IT staffs and system integrators can focus on creating the business processes and solutions for the company instead of resources being spent on the nuts and bolts of integration.



Questions...