Spatially Enabling Enterprise Asset Management
Using ArcGIS Server

Ron Wallace – Industry Marketing
Gary Cooper Product Development
IBM Software Group
Tivoli Maximo
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

<table>
<thead>
<tr>
<th>Traditional Asset Classes</th>
<th>Asset Lifecycle</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Real Estate and Facilities</strong></td>
<td><img src="image" alt="Land, Offices, Warehouses, Retail Space, Schools, Hospitals, Airports" /></td>
</tr>
<tr>
<td><strong>Plant and Production</strong></td>
<td><img src="image" alt="Mining, Textile, Chemical, Petroleum, Electronics, Food, Life Sciences, Power Gen" /></td>
</tr>
<tr>
<td><strong>Transportation and Fleet</strong></td>
<td><img src="image" alt="Military, Airlines, Trucking, Shipping, Railroad, Public Transportation" /></td>
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<tr>
<td><strong>Infrastructure</strong></td>
<td><img src="image" alt="Railways, Electric / Gas Distribution, Highways, Telecom, Water" /></td>
</tr>
<tr>
<td><strong>IT Equipment and Network</strong></td>
<td><img src="image" alt="PCs, Networks, Routers, Applications, Auto Discovery, Service Desk" /></td>
</tr>
</tbody>
</table>
Maps and Geo-coded Information is Pervasive
Geographic Information Systems (GIS) Integrates Data

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

... integrating measurements and disciplines
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
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 themematic 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

Example of Locations of Wastewater Back-up Calls
Common Work Queue

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

- Supervisors can prioritize their work more effectively
  - Grouping work by due date
  - Grouping leaks by grade
  - Filtering tasks to see mandated work

- Construction & Maintain can communicate through buffers of various types
  - C/S Construction - Cost avoidance of maintenance work
  - Identifying mandated maintenance work on pending street resurfacing projects.
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

SCADA
- Runtime
- Pressure
- Levels
- Speed

Maximo
- Condition
- Repair History
- Maintenance
- Crews

GIS
- Location

CIS
- Customer Billing
- Meter Reading
- Rates
Honolulu Board Water Supply

Clicking the “Map It” button brings up the GIS map with the work highlighted.
US Marine Corp and Naval Facilities

[Image of a GIS application showing facility summary and work order summary]

- **Facility Summary**
- **Work Order Summary**
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

Example of Locations of Wastewater Back-up Calls
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

Browser

Internet

ArcGIS Engine

ArcGIS Desktop

Web Application Server

Web Application

Java/.NET Objects

ArcObjects Proxies

Server Object Manager

GIS Server

Server Object Containers

ArcObjects

Browser

ArcGIS Engine

ArcGIS Desktop

Web Application Server

Web Application

Java/.NET Objects

ArcObjects Proxies

Server Object Containers

ArcObjects
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-enable 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

Web Server (HTTP)

J2EE Application Server

WMS Application
- Business Components

ESRI
- ArcGIS Server 9.2 ArcObjects
- (SDE) Spatial Database Engine

ESRI - ArcMap
- Desktop Application Editor

EAM

SPATIAL

GIS
Extend Schema & Linkage

- Keep it simple

### ASSETS

#### ROADS - GIS Feature Class Business Table

<table>
<thead>
<tr>
<th>SHAPE</th>
<th>OBJECTID</th>
<th>NAME</th>
<th>CREATEINMAXIMO</th>
<th>MXASSETUID</th>
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<tbody>
<tr>
<td>133</td>
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#### ASSET - MXES

<table>
<thead>
<tr>
<th>ASSETNUM</th>
<th>LOCATION</th>
<th>DESCRIPTION</th>
<th>FEATURECLASSNAME</th>
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#### PARK - GIS Feature Class Business Table

<table>
<thead>
<tr>
<th>SHAPE</th>
<th>OBJECTID</th>
<th>NAME</th>
<th>CREATEINMAXIMO</th>
<th>MXLOCATIONSID</th>
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<tr>
<td>245</td>
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<td>09922334456</td>
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#### LOCATION - MXES

<table>
<thead>
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<td>L2003</td>
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<td>PARK</td>
<td>09922334456</td>
</tr>
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</table>
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

**Web Browser JavaScript Layer**
- Application JavaScript Library
- Extensions for Dispatching GIS Events
- Web Browser
- JavaScript
- Layer

**J2EE Web Layer**
- Application UI Framework
  - Presentation, Beans, Controls, Designer
- Map Control Implementation
  - Event Queue, Meta Data, State, Actions
- J2EE
- Web Layer

**J2EE Service Layer**
- Application Business Objects
- GIS Meta Data Registration Validation
- J2EE
- Service Layer

**Data Storage Layer**
- Application Tables
  - Feature Class Tables
- Single Database
- Data Storage
- Layer

**Extensions for Handling & Dispatching Application Events**
- ESRI Web ADF JavaScript Library

**ESRI Web ADF JSF Controls**
- Beans, Tasks, Tools, XSL

**JSF Framework**
- Tasks, Tools
  - Event Handlers

**ESRI Web ADF**
- SDE - Spatial Database Engine

**ESRI ArcObjects**
- Multiple Databases
What will it look like?
Display Assets on a Map – Breakers at the SubStation
Views presenting geographical diversity of assets
Address Search for Map Navigation
Access Image data (internal or external)
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...