Use of Oracle Spatial 10g for Land Management

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Overview

- Geospatial is ubiquitous and mission critical
- Oracle Spatial Technologies
- Case Examples
- Oracle10g New Features
Mission Critical Uses in Cadastres, Mapping Agencies, and Land Registration

- **IACS:**
  - Ireland Ministry of Agric.
  - Netherlands Min of Agric.
  - Poland Min of Agric.
  - Italian Min of Agric.

- **Cadastre:**
  - The Netherlands
  - Poland
  - Denmark
  - Czech Republic

- **Environment:**
  - UK Environment Agency
  - U.S. EPA

- **Mapping Agencies:**
  - UK Ordnance Survey
  - Ireland Ordnance Survey
  - N. Ireland Ordnance Survey
  - SOGEI (Italy)
  - NGA (USA)
  - USGS (USA)
  - Australia

- **Hydrographic Agencies**
  - Canada
  - Australia
  - US Navy …
Location is becoming mainstream

**Location Aware Utilities Infrastructure**
- Networks: Outage, Network Analysis, Distribution,
- Logistics: Real time supply chain management
- Asset Management: Fixed, mobile, planning

**eBusiness Applications**
- CRM, Sales, Marketing, HR, Supply Chain
- Web Portals: Google, Yahoo, AOL, Microsoft

**Location-enhanced Wireless Communications**
- Ubiquitous positioning capability
Amazon.com Example
Challenge of Integrating Spatial and Enterprise Applications

- Specialty GIS servers
  - Data isolation
  - High systems admin and management costs
  - Scalability problems
  - High training costs
  - Complex support problems

- Spatial data tightly coupled to specific application

- Information not aligned with Business Processes
Role of Spatial DBMS: Provides Security, Performance, Scalability

Oracle 10g Spatial

- Editing
- Geocoding
- Mapping
- Analysis/BI
- Workflows
- Business Logic

• Data Types
• Indexing
• Security
• Query
• Analysis
• Versioning
• Scalability

Engineering Applications → GIS → Asset Mgmt Applications

SQL SQL SQL
DBMS Supports all Information Types

- Relate associated information to spatial locations
  - Records
  - Images
  - Satellite imagery
  - 2D & 3D Vector data
  - Networks
  - Documents
  - Video
  - XML
Partners Supporting Oracle Spatial/Locator

autodesk
INTERGRAPH
PCI Geomatics
Leica Geosystems
Bentley
ESRI
Skyline
MapInfo
Navteq
Geodan
Byers Engineering Company
Exor
GIS Data Technology
GDT
Acquis
Safe Software
ObjectFX
Laser-Scan
Caris
Tele Atlas
Enterprise Customer Requirements

- Cost reduction, consolidation
- Eliminate stovepipes
- Decision making based on all available data
- Eliminate duplicate data
- Support multiple data types
- Simplified programming
- Use common IT platforms
- Support best of breed tools

- 1000’s of users
- 10’s Terabytes
- 24x7 systems
- Minimize of Isolated systems
- Support near real-time data and sensor inputs
- Database security
- Support SOA architecture
Oracle Spatial Capabilities

Spatial Data Types
All Spatial Data Stored in the Database

Spatial Indexing
Fast Access to Spatial Data

Spatial Access Through SQL

Query/Analysis
Select, join, buffer, within distance, nearest neighbor, intersection, union, convex hull, centroid, ...

Oracle Spatial
Every Oracle10g Database is a Spatial DBMS

Oracle10g Locator Feature:

- SQL Spatial Type
- R-tree index
- Spatial Operators
- Spatial Reference System
- Geodetic (lat/long) Support
- Versioning/Long Transactions
- Parallel Index, Query, Load
- Partitioning
- GML Support
- Annotation Support
Spatial Query Via SQL

Find all building within 500 meters of building 902

SQL> SELECT a.building_id
2> FROM base_buildings a, base_buildings b
3> WHERE b.building_id = 902
4> AND MDSYS.SDO_WITHIN_DISTANCE( a.Location, b.Location,
5> ‘distance=500’) = ‘TRUE’;
Oracle Spatial Option

Includes Locator features plus:
- Geometry operations
- Spatial aggregates
- Linear referencing
- Coordinate system transformation
- User-defined coordinate systems
- Network Management
- Topology
- Raster integration
- Geocoder
- Spatial Data Mining

An option of Oracle Enterprise Edition

Large data volumes, high user population

Complex queries, Advanced manipulations.
DBMS Enables Geospatial Platforms

- Land Management
- Transportation
- Modeling/Analysis
- Homeland Security
- Logistics

Multiple Apps
Multiple Users
Ireland Dept. of Agriculture
UK Ordnance Survey

Data Collection
- Surveys
- GPS
- New Features
- Photogrammetry
- Online Updates
- Secure extraction

Production
- Parcel Updates
- Integration
- Long Transactions
- Versioning
- Topology Mgmt.
- Quality Control
- Security

Dissemination
- Compilation
- Media Production
- Web Delivery
- Online Query
- Online updates
- Personalization
- Billing
- Security
UK Ordnance Survey

- Store and maintain once, use many times
- Reduce deployment costs
- Reduce maintenance costs
- Improve data integration
- Improve systems integration
- Facilitate new product opportunities
- Increase business agility
- Standards and COTS based
Previous Environment

- Existing systems lack agility
- Difficult to integrate/interoperate
- Very costly to maintain
- Complex bespoke developments
## Sizing

<table>
<thead>
<tr>
<th>Type of Data</th>
<th>Size (GB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw Data</td>
<td>350</td>
</tr>
<tr>
<td>Spatial Indexes</td>
<td>70</td>
</tr>
<tr>
<td>Transient Tables required during Spatial Index Creation / Re-Build</td>
<td>40</td>
</tr>
<tr>
<td>History Non-Spatial Indexes</td>
<td>10</td>
</tr>
<tr>
<td>Database Structures (system, undo, etc.)</td>
<td>100</td>
</tr>
<tr>
<td>Contingency at 25%</td>
<td>200</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>995 GB</strong></td>
</tr>
</tbody>
</table>

450 million features
US Census Bureau 2010 TIGER

- World’s largest Topology Maintenance Project
- Census standardized on Oracle10g Spatial for 2010 Topology Modernization Project
- Using Oracle10g Topology
  - Data Maintenance
  - Referential Integrity
  - Persistent Topology
  - Open Solution
New York City

- Centralized GIS Utility based on Oracle Spatial
- Developed standardized digital basemap for all agencies
  - 6,000 miles of underground pipes
  - 1 million water/sewer connections
  - 32,000 sq. miles of Infrastructure Data
  - 7,500 digital photographs
- Multiple GIS applications: ESRI, Bentley, MapInfo, GE Smallworld
- Core component of city’s 311 application
Integrated NYC Spatial Architecture

GIS Specialist Systems

Environmental Management
Transportation
Crime Monitoring
DPW Services
Health & Social Services
Education

Spatially Enabled Business Applications

Logistics Management
Financial Management
Citizen Portal
Asset Maintenance
Criminal Justice
Health Planning

Spatial Data Hub

Topographic/Raster
Cadastre
Geo-coded Address
Street Center Lines
Assets
Environmental
Transport
Health/Social services
Education

NYC DoITT
the department of information technology and telecommunications
Oracle10g Value Proposition

**Integrated and Assured Information Sharing**

- Single source of truth
- Strong Security
- Real-time information updates
- Interoperable data and location aware processes
- Integrated spatial information from multiple sources
- Enhanced Business and Operational Intelligence
- Creation of a Network Centric, Spatially Enabled, Real Time Enterprise

![Diagram showing integration services connecting various departments]
To find out more...

http://otn.oracle.com/products/spatial

Examples, white papers, downloads, discussion forum, sample data....