Customer Experiences with Oracle Spatial and Graph

Jim Steiner
Vice President, Product Management
The following is intended to outline our general product direction. It is intended for information purposes only, and may not be incorporated into any contract. It is not a commitment to deliver any material, code, or functionality, and should not be relied upon in making purchasing decisions. The development, release, and timing of any features or functionality described for Oracle’s products remains at the sole discretion of Oracle.
Our Panelists

Tracy McLane, Bechtel Corporation
Koray Kaya, KKB (Turkish Credit Registry)
Scott Gooding, CSX Corporation
Marc Lieber, Trivadis at Novartis
Today’s Panelists

- **Tracy J. McLane**, Corporate GIS Manager, Bechtel Corporation
  - *Enterprise GIS for Engineering and Construction*

- **Koray Kaya**, EVP, Strategic Planning and Corporate Relations, KKB Kredi Kayıt Burosu AS (Turkish Credit Registry)
  - *OLTP and Data Warehousing in an Exadata Environment*

- **Scott Gooding**, Spatial Database Architect, CSX
  - *Network Data Model Graph for Nationwide Rail System*

- **Marc Lieber**, Principal Consultant, Trivadis AG
  - *RDF Semantic Graph for Pharmaceutical Knowledge Portal*
Oracle Spatial and Graph
In-Database Datatypes, Models and Analytics

Complete
Open
Integrated
Most Widely Used
Oracle’s Spatial Stack

Built-in Geospatial features

- Spatial analytics in Applications and tools
- Fusion Middleware MapViewer, Event Processing
- Oracle Spatial and Graph database
- Bundled and Cloud-based Map Content
- Designed for Exadata
Oracle Spatial and Graph
Mature, Proven Graph Database Capabilities

Graph Features

- Network Data Model graph
- W3C RDF Semantic graph
Network Data Model Graph

Use Cases

- Transportation, Road and Multimodal Networks
- Drive Time Polygon Analysis
- Trade Area Management
- Service Delivery Optimization
- Water, Gas, Electric Utility, Network Applications

Oracle Spatial and Graph
### RDF Semantic Graph

#### Use Cases

<table>
<thead>
<tr>
<th>Linked Data &amp; Public Clouds</th>
<th>Text Mining &amp; Entity Analytics</th>
<th>Social Media Analysis</th>
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<tbody>
<tr>
<td>• Unified content metadata model for public clouds</td>
<td>• Find related content &amp; relations by navigating connected entities</td>
<td>• Analyze content using integrated metadata</td>
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<tr>
<td>• Validate semantic and structural consistency</td>
<td>• “Reason” across entities</td>
<td>- Blogs, wikis, video</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Calendars, IM, voice</td>
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Oracle Spatial and Graph

12c Spatial Features

- Vector Performance Acceleration
- Parallel GeoRaster and Enhanced Raster Operations
- Parametric Curve Data Type
- Extended 3D and Point Cloud data type functionality
- Web Feature Server Console
Oracle Spatial and Graph

12c Graph Features

- Network Data Model graph
  - Real World Feature Modeling
  - Multimodal Routing, Temporal Modeling and Analysis
  - Large Scale Drive Time/Distance Analysis

- RDF Semantic Graph
  - RDF views on relational tables
  - SPARQL 1.1, GeoSPARQL, SPARQL Gateway
  - Enhanced Reasoning and Security
  - Named Graphs
## Spatial and Graph at OOW 2013 - Sessions

<table>
<thead>
<tr>
<th>Date/Time</th>
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<td>1:45 PM - 2:45 PM</td>
<td>Best Development Practices with Maps, Spatial, and Graph Analytics</td>
<td>Marriott Marquis - Golden Gate C2</td>
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<tr>
<td>3:15 PM - 4:15 PM</td>
<td>Latest Spatial Features in Oracle Database 12c</td>
<td>Moscone South - 303</td>
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<td>Fast Data with Oracle Event Processing</td>
<td>Moscone North - 130</td>
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## Spatial and Graph at OOW 2013 – Demos

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## Partners

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### Spatial and Graph at OOW 2013 – Hands On Lab

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### Meet-Ups

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<tr>
<td>Wednesday, Sept 25</td>
<td>Oracle Spatial and Graph Special Interest Group Meet-Up</td>
<td>OTN Lounge - Moscone South Lobby</td>
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<td>Oracle Spatial and Graph Special Interest Group Meet-Up</td>
<td>OTN Lounge - Moscone South Lobby</td>
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<tr>
<td>2:00 PM - 3:00 PM</td>
<td>RDF Graph User Meet-Up with Oracle Product Team</td>
<td>OTN Lounge - Moscone South Lobby</td>
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User Groups & Certification

- **Oracle Spatial & Graph Special Interest Group:**
  Connect and exchange knowledge with the user community
  - *Meet the SIG Board at OOW:* Wed 9/25, 2:00-3:00pm
    OTN Lounge, Moscone South Lobby
  - Join our groups: LinkedIn, Google+, IOUG SIG
  - Visit [OTN Spatial – Community](https://otn.oracle.com/)
    Search online for “Oracle Spatial and Graph Community”
  - Email [oraclespatialsig@gmail.com](mailto:oraclespatialsig@gmail.com)

- **Individual Certification, Partner Specialization**
  - Talk to Oracle team this week at OPN Lounge or
    Oracle Spatial & Graph demopod in Moscone South
Resources

- **Oracle Technology Network**
  Get software downloads, sample code, tech info, updates, documentation, partner resources
  - Oracle Spatial and Graph
  - Oracle Fusion Middleware MapViewer
Our Panelists

Tracy McLane, Bechtel Corporation
Koray Kaya, KKB (Turkish Credit Registry)
Scott Gooding, CSX Corporation
Marc Lieber, Trivadis at Novartis
The Use of Oracle Spatial and Graph in a Global Enterprise GIS Environment for Engineering and Construction

Presented by
Tracy J. McLane
Corporate GIS Manager, Bechtel Corporation

Oracle Open World 2013
September 22-26, 2013
San Francisco, California
An Introduction to Bechtel

- Top U.S. construction contractor by *Engineering News-Record (ENR)* for 15 straight years
- Revenue of $37.9 billion in 2012
- 52,700 employees worldwide
- Five Global Business Units (GBUs):
  - Civil Infrastructure
  - Mining & Metals
  - OGC (Oil, Gas & Chemicals)
  - Power
  - U.S. Government Services
- Signature Projects: Hoover Dam, English Channel Tunnel, Hong Kong International Airport, Ivanpah Solar Energy Site

Visit [www.bechtel.com](http://www.bechtel.com) for more information
Enterprise Spatial Data Deployment Strategy with Oracle Spatial

- GIS Data Configuration Management Processes and Content Sharing (Retrievability)
- Scalable, Multi-Tiered Data Security (System, Database, Feature)
- Return on Investment (ROI) on GIS Software and Spatial Data
- Prevent Duplicate Efforts on Data Purchase and Preparation between Data Stewards

GIS User-Specific Experience

Sources:
McLane, Tracy and Yongmin Yan. *Enterprise Spatial Data Deployment Strategies in a Global Engineering Environment – The Bechtel Experience*. The 17th International Conference on GeoInformatics 2009. Johnson Center, George Mason University, August 12th-14th, 2009 Fairfax, VA, USA

Examples of Spatial Attributes & Aggregation in Spatial Views:
- SDO_GEOM.SDO_LENGTH
- SDO_GEOM.SDO_AREA
- SDO_GEOM.SDO_INTERSECTION

McLane, Tracy. *The Use of Spatial Views for the Extension of Map Cube Operators in the Global Enterprise GIS Environment.*
April 14-18, 2010. Washington DC, USA.
Oracle Spatial Management of Survey Data & Alignment Geometry Creation via the Web

Bechtel survey managers and field engineers alike can manage thousands of Survey Work Requests (SWRs) through an advanced GIS web mapping application which allows them to create, search and manage their SWR information and to generate reports in both Adobe Acrobat (.PDF) or Excel format.

Surveyors have an expanded web form to record additional information on survey work execution and to calculate alignment geometry in the Cartesian coordinates of various coordinate systems and store them directly in the BecGIS Enterprise Database.

Field engineers, surveyors, and managers can conveniently use the mapping interface to browse survey locations and to discuss survey work before, during, and after a survey.

All of these functionalities have significantly improved the efficiency of survey work, and are ensuring that construction activities go smoothly and on schedule.

For large renewable energy project sites, the need to collect and configuration manage spatial data from GPS/GNSS data collection is critical to ensuring the quality and accuracy requirements of the location-based information. Enterprise Geographic Information Systems (GIS) data management practices in Oracle Spatial and Graph were used for solar pylon drilling and insertion data at a large solar energy project site. The ability to effectively manage the GPS/GNSS coordinate data, as well as the related observation variables of Dilution of Precision (DOP) and other space weather (such as kP Indices), are important for quality assurance and visualization of construction progress for renewable energy infrastructure.
Oracle Spatial and Graph database provides key component to scalable Enterprise GIS architecture

Use of SDO_GEOMETRY storage formats provide GIS specialists a means to better interoperate spatial data to a variety of software clients

Integration of Oracle Spatial and Graph functions make spatial data handling more efficient for analysis and aggregation for users

Example: Use of SDO_GEOM.SDO_INTERSECTION function was used to produce a report on wetlands and other environmental quantities by work area. This report was generated in minutes, when previously it had taken hours to process the same analysis results using GIS desktop software, given the large size of the input datasets.

Bechtel procedures, data model standards and use of feature-level metadata are key to the configuration management of spatial data within Bechtel’s GIS Oracle Spatial environment
Using Location Information in OLTP and Data Warehouse Applications

September 2013
Using Location Information in OLTP and Data Warehouse Applications

Agenda

- KKB Introduction
- GeoMIS Reporting System
KKB Introduction
KKB Stake Holders

Member Organizations

- Banks: 39
- Consumer Finance: 13
- Leasing: 16
- Factoring: 74
- Credit Insurance: 2
- Other: 1
- Total: 145
Using Location Information in OLTP and Data Warehouse Applications

Some Figures

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<td>1 hr 35 mn</td>
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About GeoMIS Project

• Geocoding and Address Clean-up for entire countries credit transactions
  – More than **580,000,000** Records

• Map based statistical data display
  – Including micro regions

• Accessible to all member banks

• Map based reporting for
  – Standard reports
  – Trend Reports
  – Benchmark Reports
The Challenge

- High transactional requirements
  - 700,000,000 credit accounts needed to be processed
  - Current system resources allowed only 1,000,000 transactions per day
- Consolidation
  - Geomis: Spatial analysis and reporting
  - Datawarehouse
  - OLTP
  - BI
- Complex reporting: text and map based
- Integration with many data sources
- High availability and easy manageability
Using Location Information in OLTP and Data Warehouse Applications

Solution: Architecture – Consolidation of three projects

- Oracle EXADATA Database Machine
- Oracle WebLogic Cluster
- LocationBox
- Oracle BI Reports
Solution: GeoMIS architecture

Using Location Information in OLTP and Data Warehouse Applications

Maps and Geographic Content

Geocoding

Map Options

25X

Bank 1
Bank 2
Bank 39

Credit transactions
Using Location Information in OLTP and Data Warehouse Applications
Using Location Information in OLTP and Data Warehouse Applications
Business Benefits

Marketing & Sales Departments
Credit Allocation Departments
Credit Monitoring Departments
Credit Collections Departments
CRM Departments
Using Location Information in OLTP and Data Warehouse Applications

What is Next?

Commercial Credits Universe
Collections Universe
Household Aggregation Universe
Credits Cards Expenses Universe
Credit Card Merchants Monitoring
ATM/Branch Location Analysis
Scott Gooding
Spatial Database Architect
CSX, based in Jacksonville, Fla., is one of the nation’s leading transportation companies

- Provides rail, intermodal and rail-to-truck transload services.
- Rail network spans approximately 21,000 miles
  - Service to 23 eastern states, the District of Columbia and two Canadian provinces.
  - CSX’s network connects more than 240 short line and regional railroads and more than 70 ocean, river, and lake ports
- Over 3500 locomotives, 30k employees
**Business challenges**

CHALLENGES / OPPORTUNITIES

• Improve locomotive usage through more accurate routing
• Spatial integration of disparate systems
• Replacing legacy systems
• Improving operating efficiency through effective use of spatial technologies
Two primary uses of Network Data Model Graph and Geocoding/Routing engines of Oracle Spatial and Graph

- Locomotive Tonnage
  - Uses the NDM graph
- Oracle Spatial and Graph Enterprise Geocoding & Routing
  - Deployed as web services
  - Used throughout the CSX enterprise
Network Data Model Graph and Locomotive Tonnage

- Locomotive Tonnage
  - Uses Network Data Model Graph of Oracle Spatial and Graph
  - Performance
    - Considerably faster than other platforms available to CSX
      - 100 route calculations in 6 seconds (through a web service)
    - NDM Load on Demand API
      - Efficient and tunable
  - Standard platform
    - Oracle database servers are the corporate standard
    - Java is the standard development language
    - Oracle Spatial and Graph already used in several production locomotive systems
    - Oracle Spatial and Graph Routing Engine is in use also
  - Customizable
    - API / data model is flexible
Routing Engine and Geocoder

- Deployed as turnkey Webservices
  - Uses purchased TomTom data
  - Ubiquitous in the CSX enterprise
    - Parallel batch reverse geocoding of train locations
      - Up to 54 reverse geocodes per second
    - Geocoding of employee addresses
    - Routing of maintenance crews
    - Routing union employees to jobsites
Business Benefits

- Replaced an unsupported system with a well documented supported system
- Met modernization goals
- Standard, shared network data model provides consistent and trusted information
- Excellent geocoding and routing performance
  - 54 reverse geocodes per second using parallel processing
  - 100 train routes in 6 seconds through a web service – 64 times faster than a traditional GIS
  - 1.2 second average route driving route generation
- Improved support
- Improved train routing saves fuel
- Improved on time placement of trains (increased operating efficiency)
- SOA- Build once and deploy service
Semantic Web

Using Oracle Spatial & Graph in a scientific knowledge portal for the pharmaceutical industry

Author: Marc Lieber
Novartis Institutes for BioMedical Research (NIBR) Project Metastore

- **NIBR is the global pharmaceutical organization for Novartis committed to discovering innovative medicines to treat diseases with high unmet medical need**
  - 6000+ scientists, physicians, business professionals worldwide

- **METASTORE is a Scientific knowledge portal used by many application to Search over Ontology oriented data**
  - Organized around scientific **concept types**: Genes, Proteins, Indications, Anatomy, diseases, taxonomy etc…;
    - Can be hierarchically organized and classified
    - Builds a semantic network of scientific concepts
Solution implemented: Oracle Spatial & Graph

1. Accessible through dedicated service layer and reusable widgets
   - Integrated application to visualize all Metastore content.
Project overview

Metastore III

1. Previous version of Metastore had all data stored in relational tables
   - Lack of flexibility
   - Changes in the data model not easy to implement

2. What are the new needs for Metastore?
   - Data capture: increasing complexity of the data extracted from mostly non-structured data: more inter-concept relations and concept properties
   - Data curation
   - Semantic data federation, text mining
   - Connection to other data sources
     - Linked Open Data, SPARQL end points
   - Contextual navigation
   - Detect new relation through inferencing
Why Oracle Spatial & Graph in Metastore?

- The advantage of using the Oracle Triple store are multiple
  - SPARQL and SQL interaction with relationally stored data
  - Use of SQL Hints, indexes and caching to increase performances
  - Standard DB Administration: Backup/recovery/replication, etc…
  - PL/SQL or Java programming
  - Supports large volumes of data (100’s of billions)
  - Good integration with standard RDF client tools such as Jena and Sesame
BUSINESS BENEFITS REALIZED BY ORACLE SOLUTION

• **Performance**: met design goals for comparable performance to legacy application with enhanced usability

• **Better Analysis**: enables discovery of unknown relationships based on the meaning (the semantics) of the data

• **Flexible Data Modeling**: supports discovery and allows easy changes to incorporate new kinds of data and relationships

• **Data Integration**: allows semantic and relational data assets to be interrogated together for first time for greater discovery

• **New set of services**: the Semantic Web technology extends accessibility and usability of the Metastore content
Q & A
Hardware and Software
Engineered to Work Together