SPATIAL

May 2012
Oracle Spatial User Conference

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Oracle Spatial User Conference

May 23, 2012

Ronald Reagan Building and International Trade Center

Washington, DC USA

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Oracle Spatial

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Advanced Oracle Spatial

Program Agenda

- Introduction
- GeoRaster
- Network Data Model
- 3D and Point Cloud Data
- Discussion

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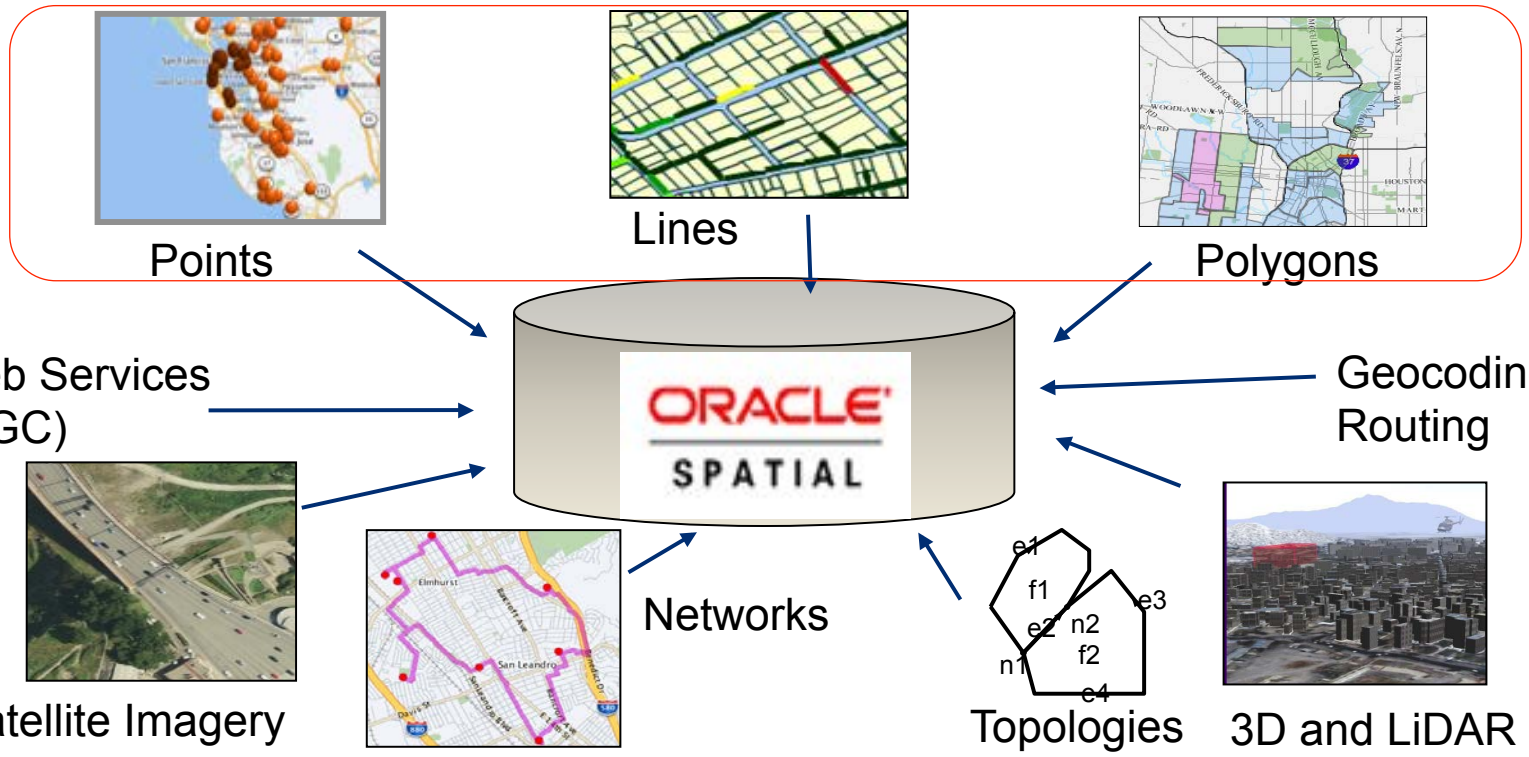
Natively manage all spatial content



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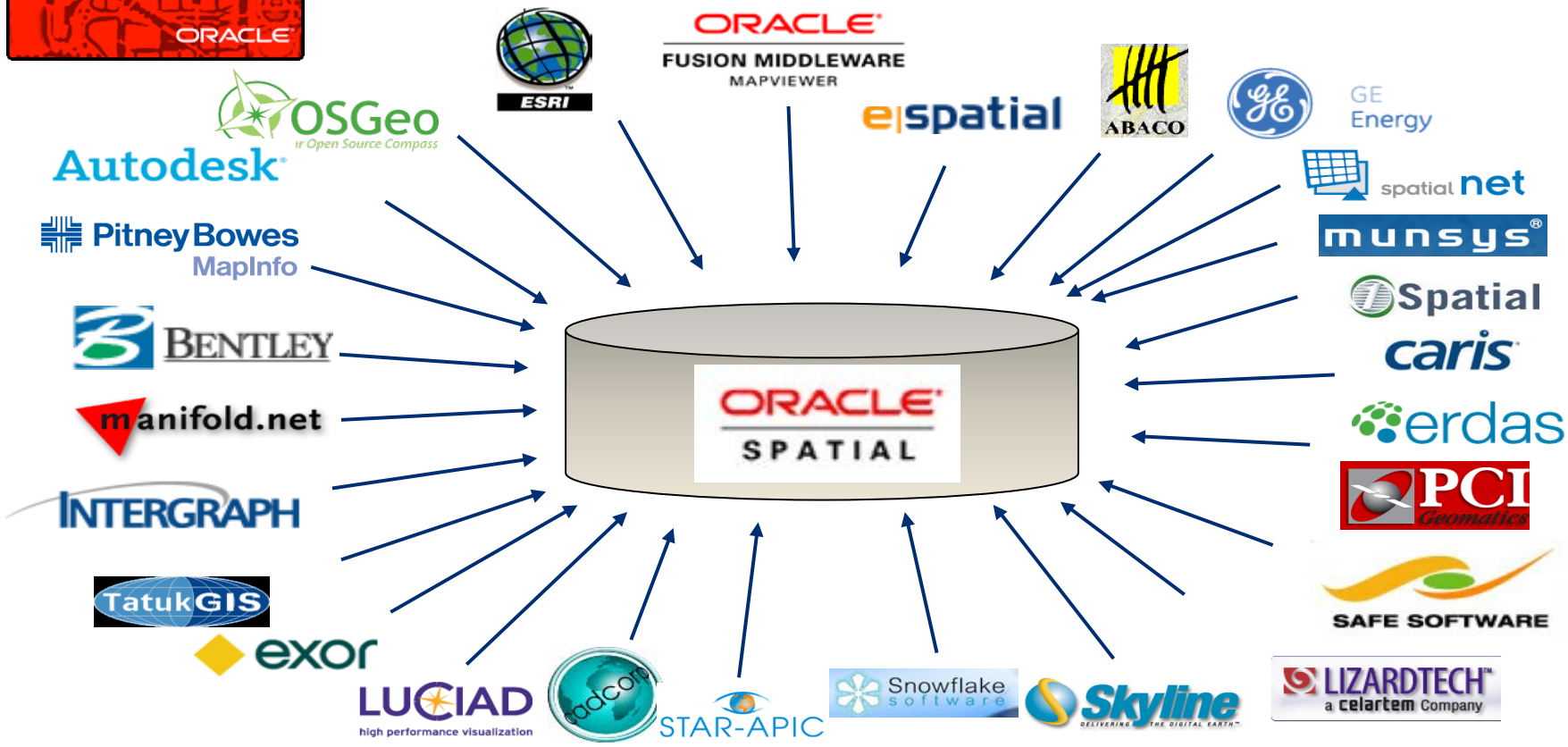
Open and Interoperable



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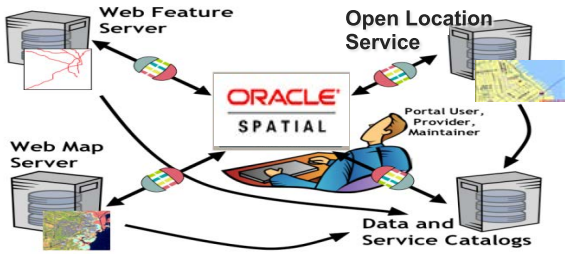
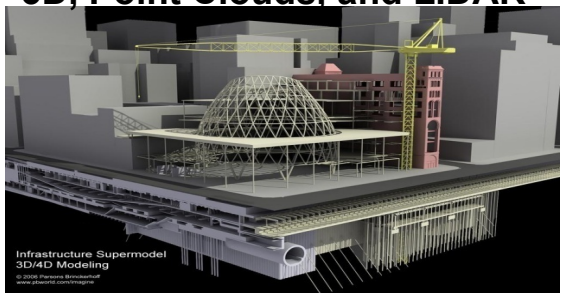
Oracle Spatial 11g Use cases

Scrollable, Interactive Maps

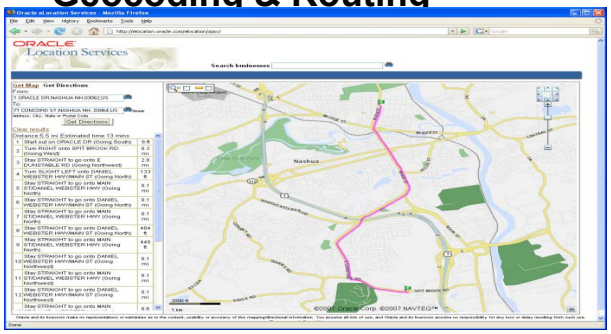
Spatial Web Services



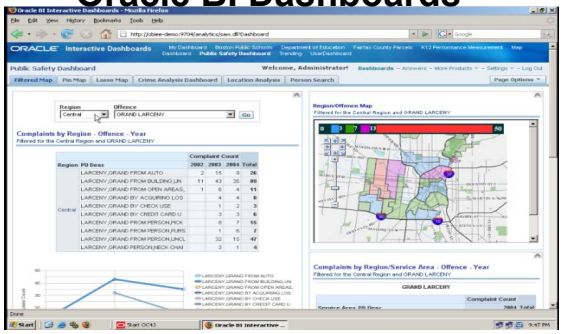
3D, Point Clouds, and LIDAR



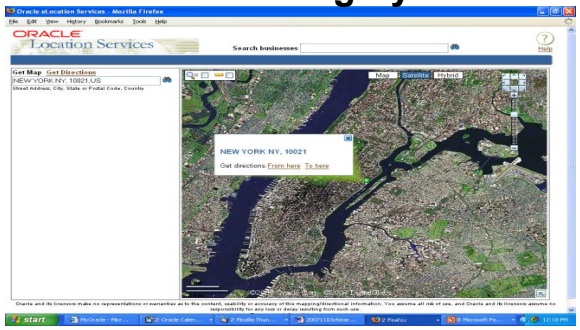
Geocoding & Routing



Oracle BI Dashboards



Raster Imagery



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GeoRaster

- A data type to store raster data
  - Satellite images, remote sensing data
  - Multi-band, multi-layer
  - An XML schema to store Metadata
  - Geo Referencing information
- Functionality
  - storage and indexing of raster data
  - Generate resolution pyramid
  - query and analysis
  - delivering to external consumers
    - Publish as JPEG, GIFF images

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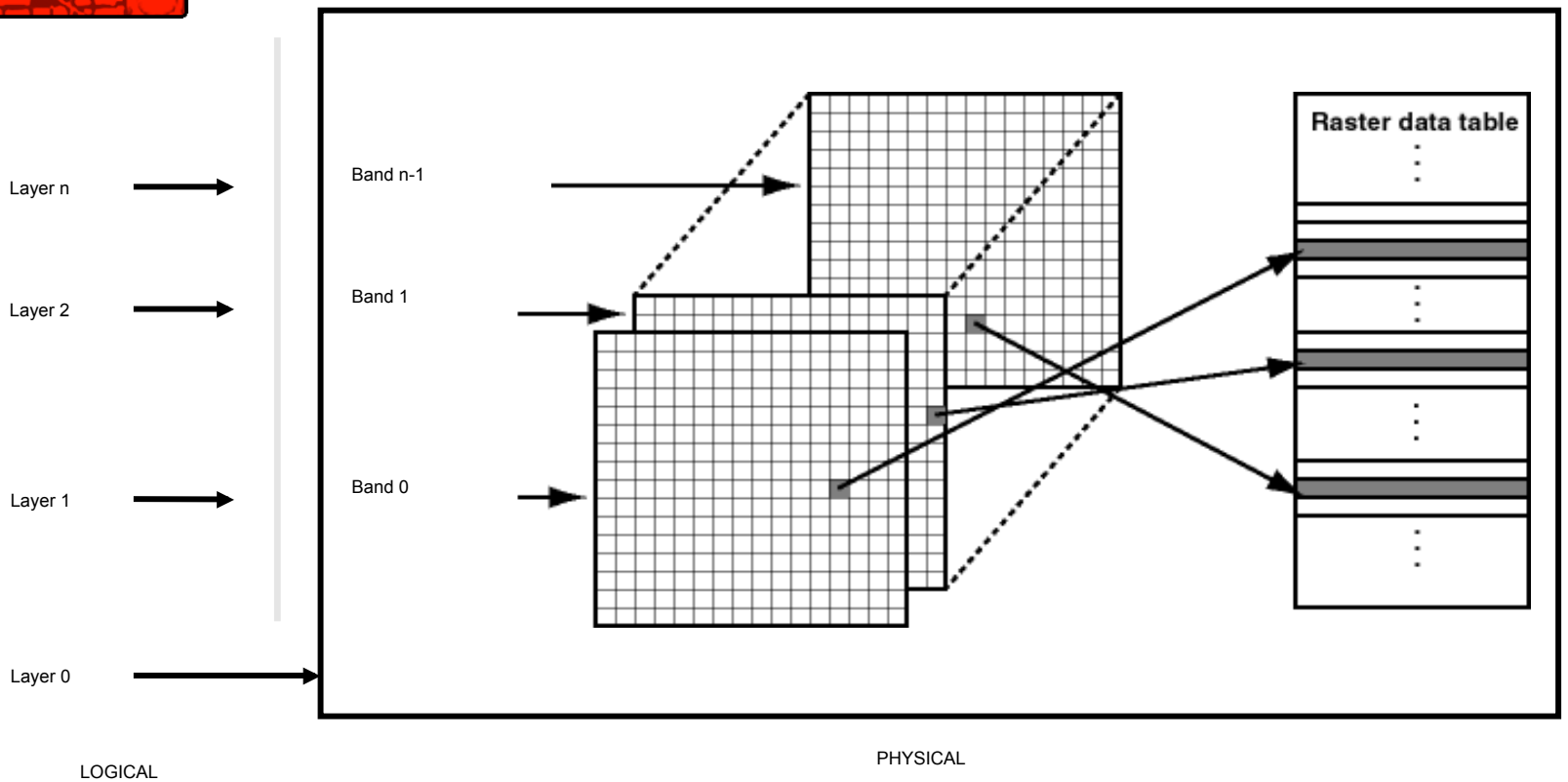
GeoRaster: Bands and Layers



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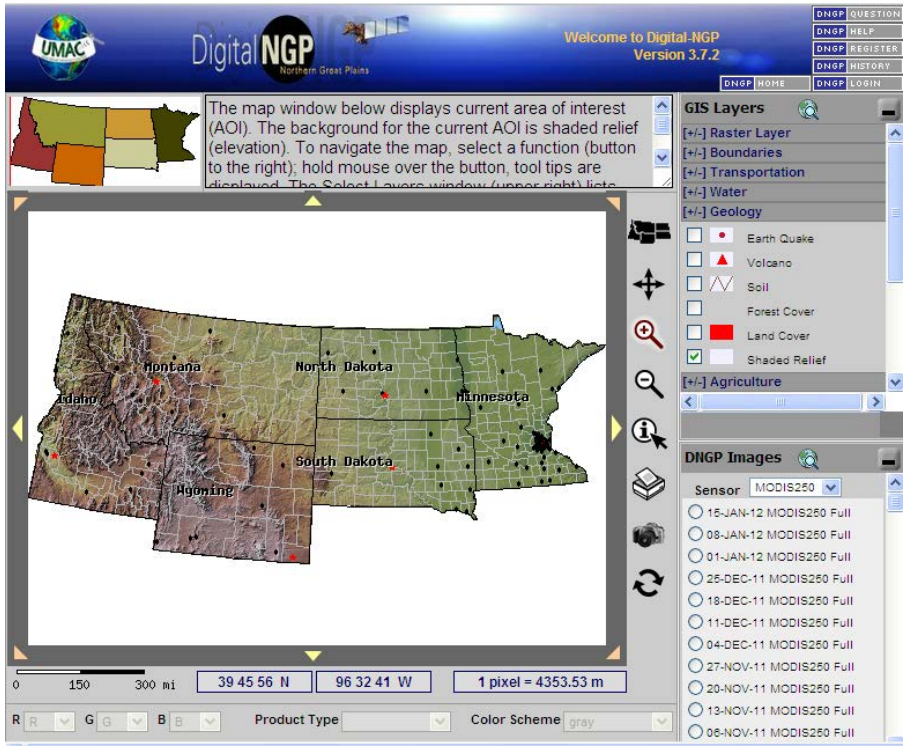
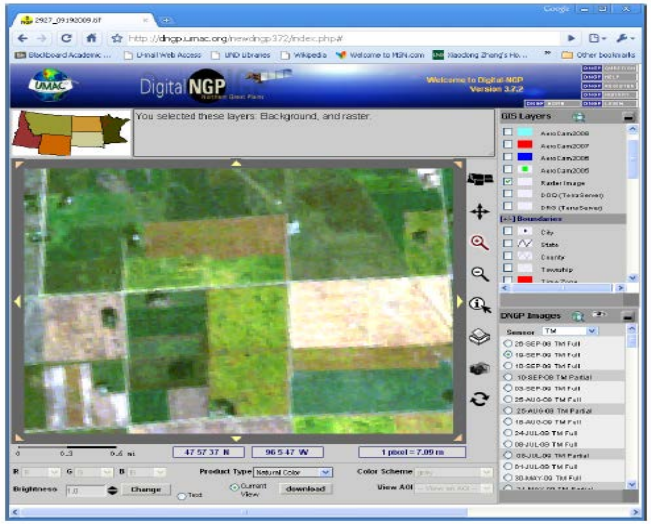
Customer use case: Raster Portal



OPEN PORTAL

Screen shots of Digital NGP system

Raster, Boundary, Transportation, Water, Geology, Agriculture, and Environment map layers plus near real time and archive imagery layers



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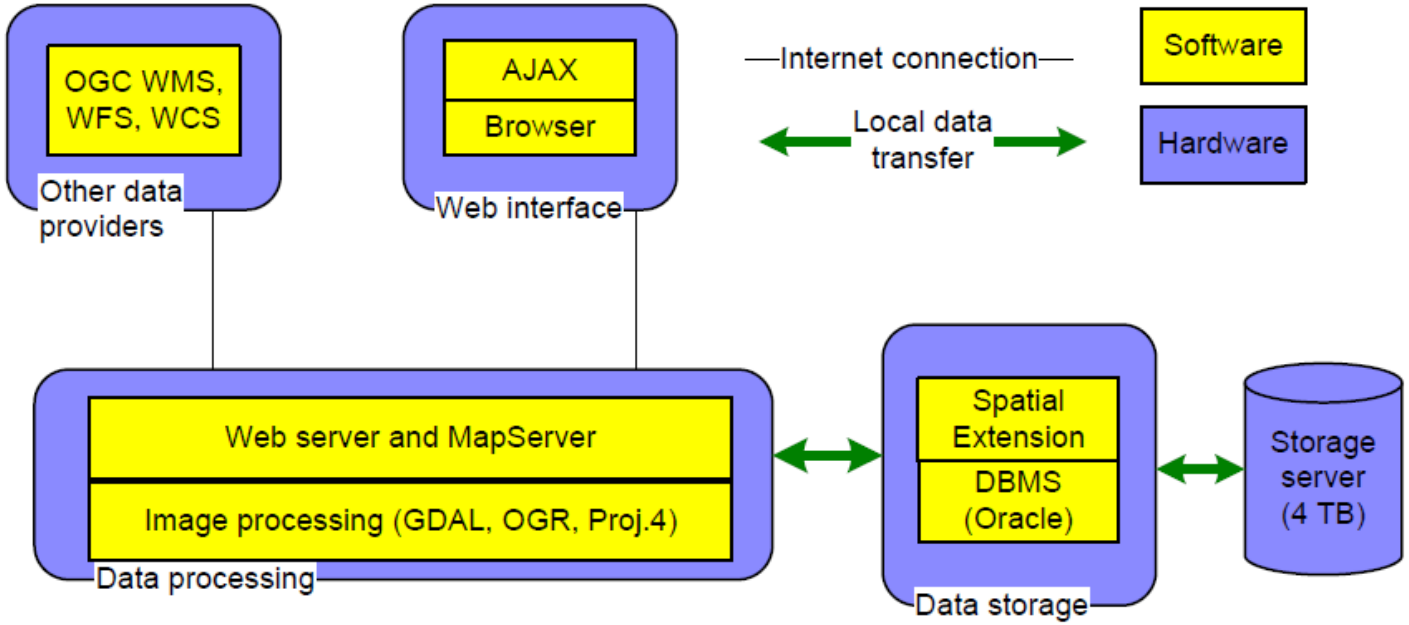
Digital Northern Great Plains

Figure 1. Schematic diagram of DNPG system architecture.



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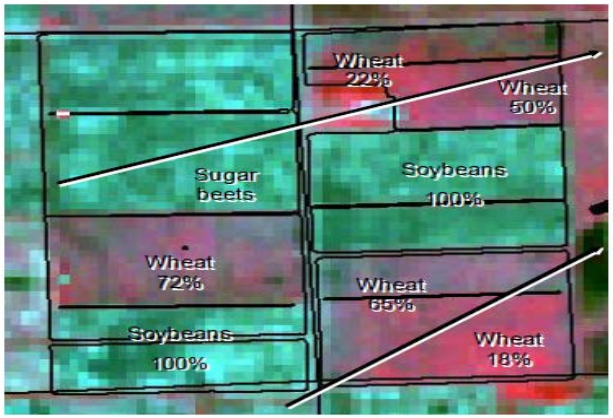
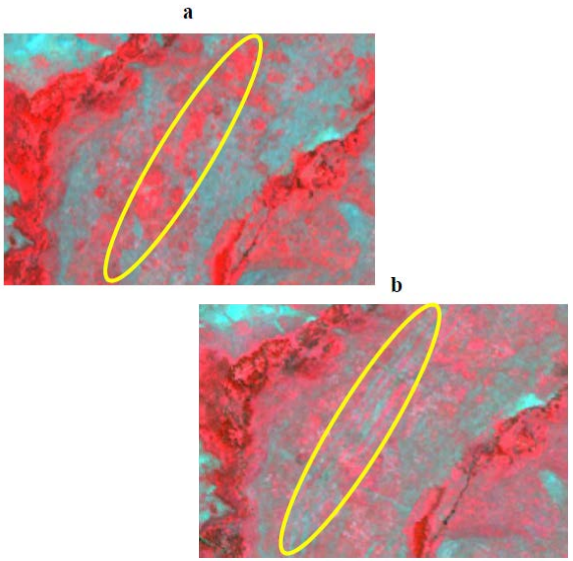
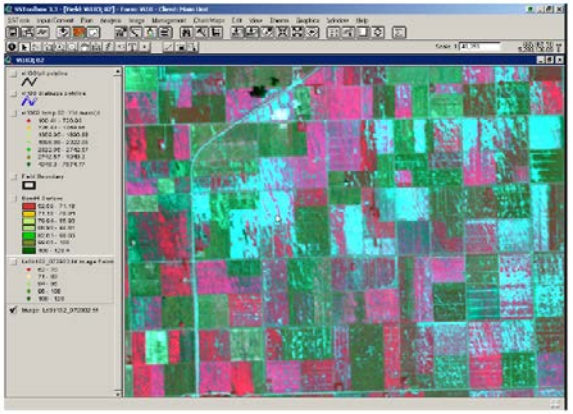
Hyper Spectral Images



HAIL DAMAGE
Percentage of crops damaged due to hail shown using enhanced Imagery from Landsat TM



WEED DETECTION
Ikonos imagery showing change in weed concentrations between 2001 and 2002



FLOOD DAMAGE
Waterlogged fields (light blue) shown using enhanced Landsat TM

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Thematic Raster Maps

Zoning Fields and Nitrogen Credits for Precision Farming

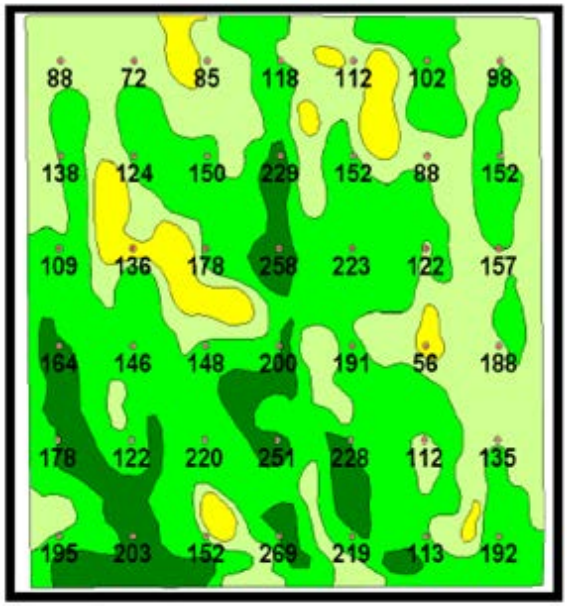

Table 1. Application rates of N fertilizer for the field shown in Figure 5.

Zone	Area (acre)	Application rate (lbs/acre)
Yellow	9.03	130
Yellow green	53.8	110
Green	73.5	80
Dark green	15.34	60

NITROGEN CREDITS

Normalized Difference in Vegetation Index map (from Landsat TM image) of sugar beet canopy. Shows nitrogen credits from available biomass (least to most: yellow to dark green). Result was reduction of 60 pounds per acre of Nitrogen fertilizer.

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What Is the Oracle Spatial Network Data Model?

- An open data model to store and analyze network data
- Connectivity is determined using nodes and links
  - Each link has a start node and an end node.
  - Links and/or nodes can have costs
  - Links can be one way or bi-directed

What Is the Oracle Spatial Network Data Model?

- Analysis is based on connectivity and optional cost information
- Network analyses includes
  - Shortest path analysis
  - Nearest neighbor analysis
  - Within cost analysis
  - Minimum cost spanning tree
  - Traveling salesman problem
  - Reachable/Reaching nodes
  - K-shortest paths analysis

Oracle Spatial Network Data Model API's

- A PL/SQL API to manage the network
  - Creating network structures, creating the metadata
  - Validation
- A Java API to perform network analyses
  - Shortest path
  - within cost,
  - nearest neighbor
  - k-shortest paths
  - Traveling salesman problem
  - minimum cost spanning tree
  - Reaching/reachable nodes and others

NDM Application: Closest Store To a Customer

- Given a set of Stores/Warehouses
  - Find the closest store for each address in a city
  - 119537 customers in the San Francisco area
  - 5000 stores to service these customers
- This is used to find the optimal warehouse for delivery to every address in a city or trading zone
- How can Oracle Spatial help solve the problem
  - Network data model (and routing)
  - Geocoding

Use Network Buffer

- Given a starting location (ie, a store location like Krogers), a network buffer generates all the paths/subpaths reachable within a cost (ie. within 30 miles or within 30 minutes)
- A reverse network buffer is similar, but finds all the paths/subpaths that can reach a location (ie. a store location like Krogers) constrained by a cost (ie. within 30 miles or within 30 minutes)
- Each link associated with a path/subpath of a network buffer can be persisted in an Oracle table
- Each link stores it's unique id, along with the cost at it's start point and end point for the path/subpath it participates in

Use Network Buffer

- Generate the following tables
  - A **distance_buffers** table, with reverse buffer results (about 90000 links per buffer), each with a 50 km constraint
  - A **time_buffers** table, with reverse buffer results, each with a 30 minute constraint
- Each reverse buffer takes about 3.5 seconds to generate and persist results in the distance_buffers (or time_buffers) table
- 5000 store reverse buffers would take
  - (3.5 seconds * 5000) = 17500 seconds = 4.86 hours
- Simple SQL to find the min distance from each customer to their nearest store

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3D Technology

- LIDAR based 3D Data acquisition
  - Terabytes of data per day collected using sensors
  - Point Clouds of data generated from these sensors
  - Each Point Cloud describes objects within a few square miles
- 3D Features are extracted by analyzing the point clouds
- Spatial now support Point Cloud data type to handle this large volume of data
- Data model also extended to handle a variety of 3D Objects
  - Landmarks, buildings, bridges, point clouds
- 3D based Location based search and Analysis
  - Nearest, Within-Distance

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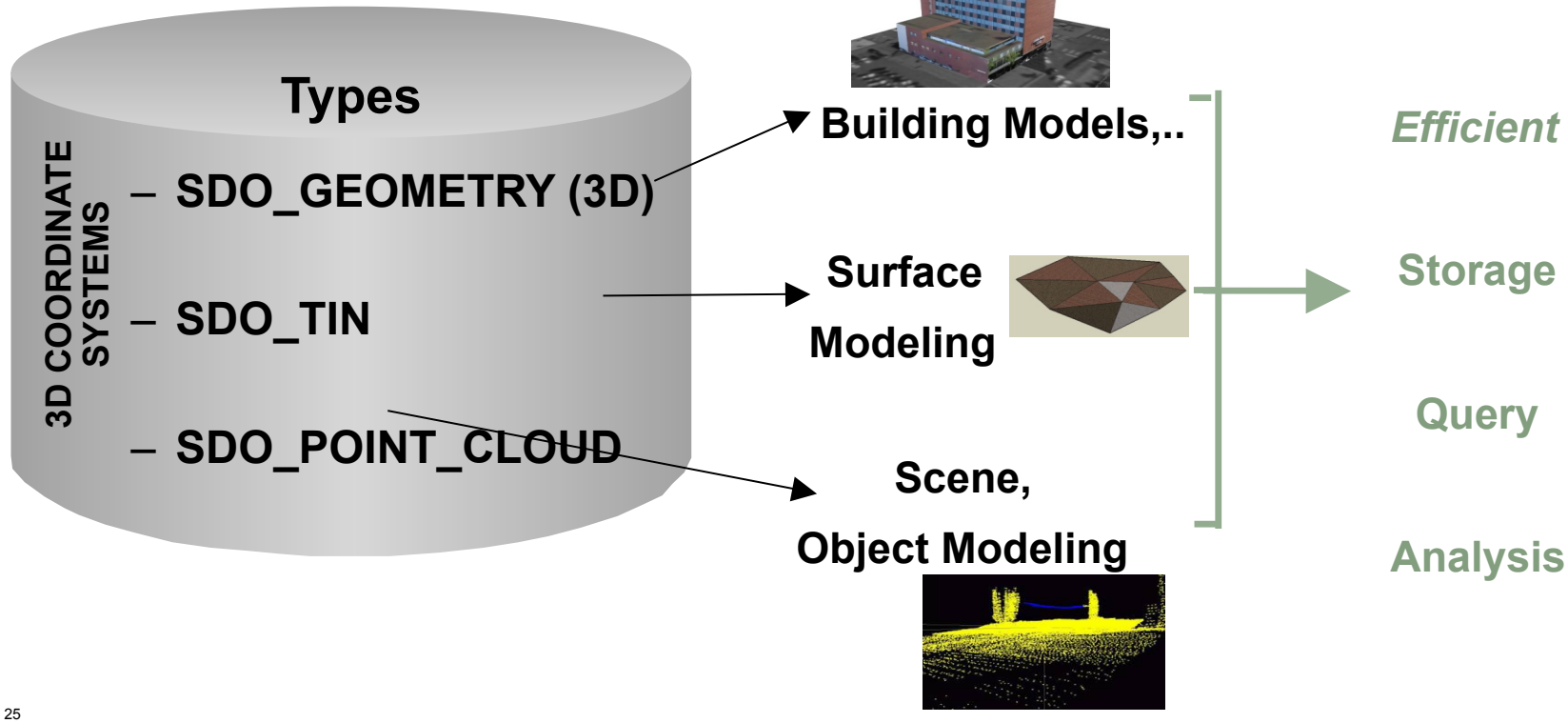
3D in Spatial 11g



Q&A