
ORACLE®

Oracle's Spatial Technologies

Oracle Locator

Oracle Spatial

Oracle Application Server MapViewer

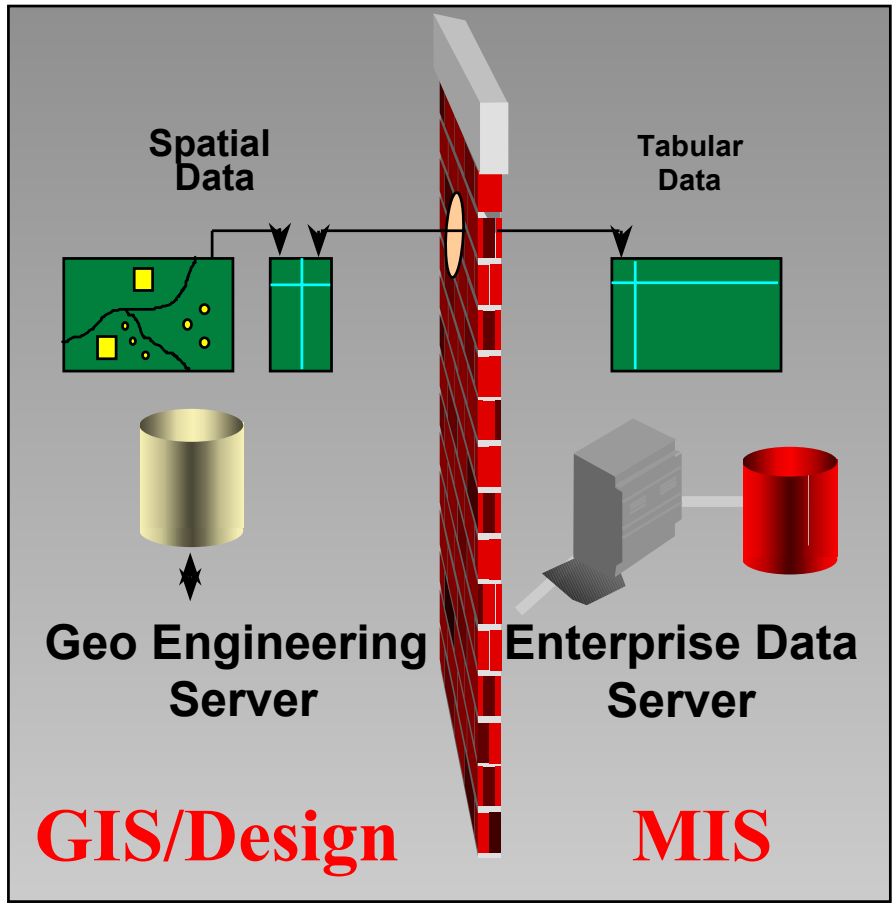
Agenda

- Geospatial Technology Trends
- Oracle Locator and Spatial
  - Oracle Geospatial Object Types and Indexing
  - SQL Operators and Functions
  - Oracle Locator and Spatial Usage & Feature Comparison
  - Oracle Spatial Technologies and Models
- Oracle Application Server MapViewer
- Oracle Locator, Spatial and MapViewer Technology Partners

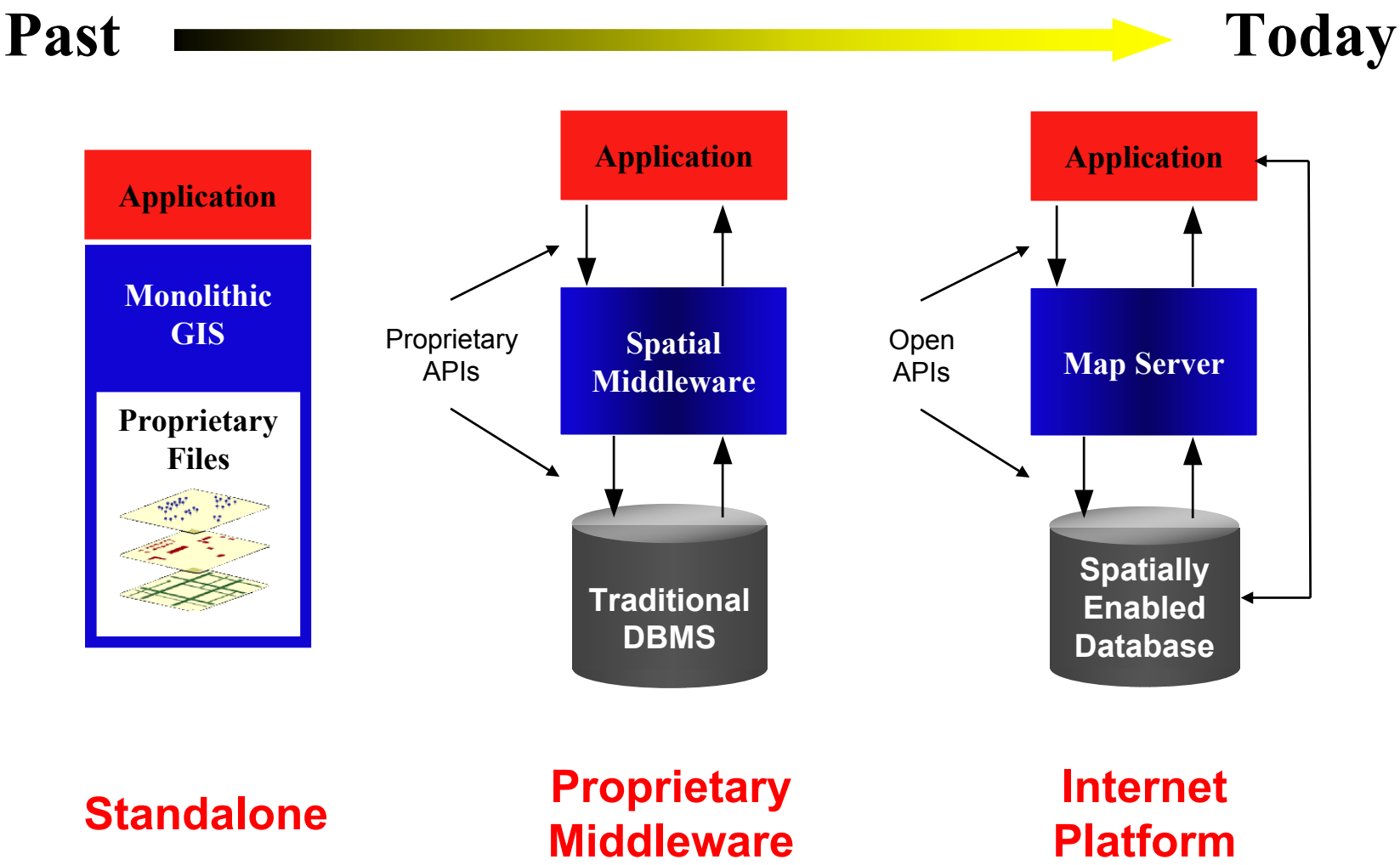
Geospatial Technology Trends

Challenge of Incorporating Location Based Information

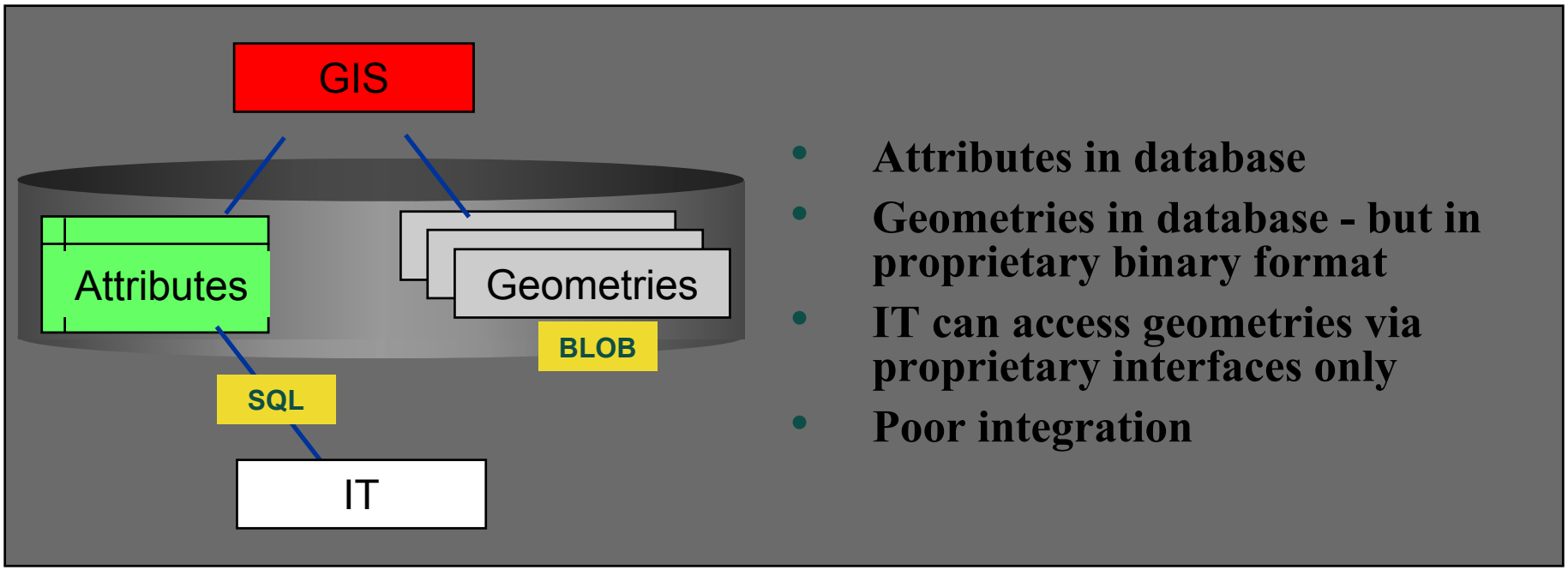
- Specialty GIS/RS servers
  - Data isolation
  - High systems admin and management costs
  - Scalability problems
  - High training costs
  - Complex support problems
- Information not aligned with Business Processes



Evolution of GIS

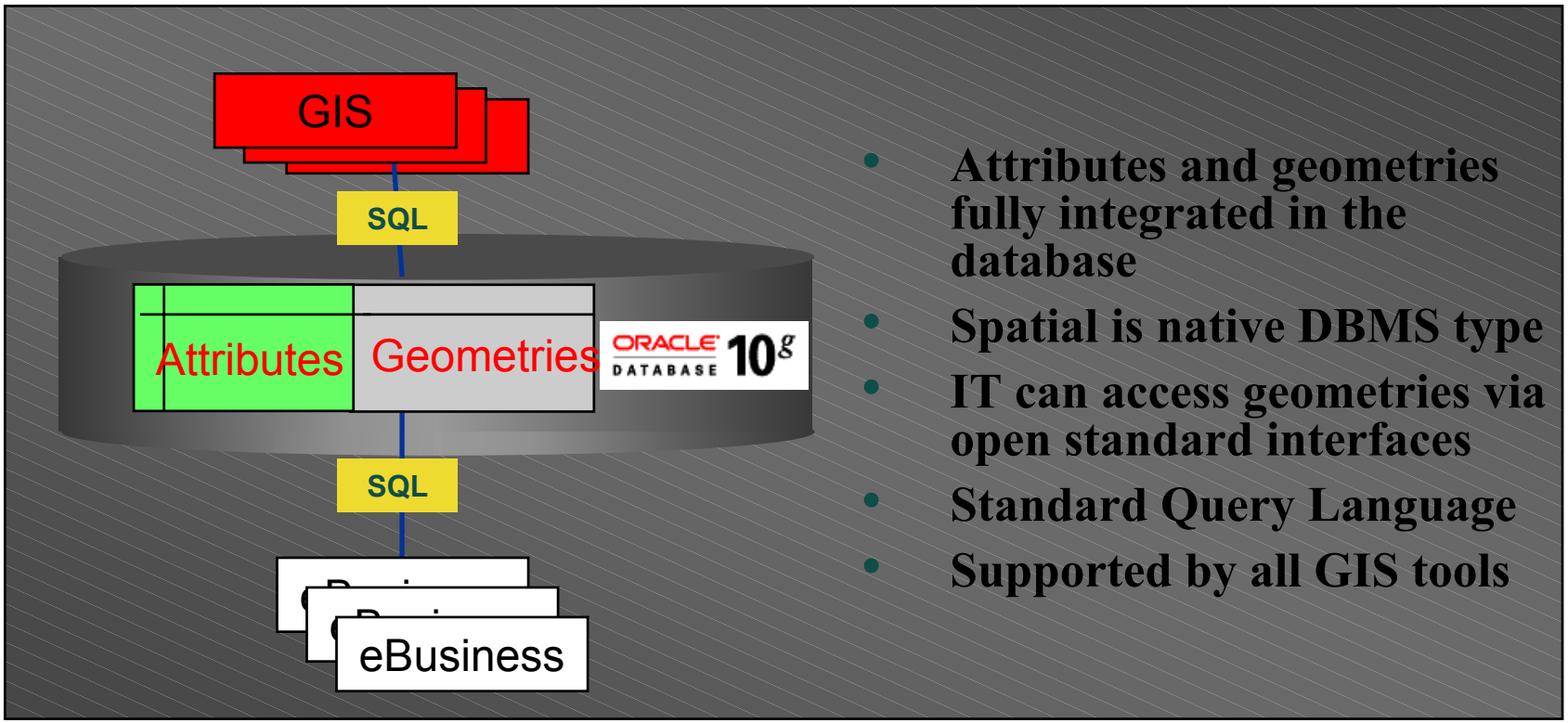


Early Spatial Systems: Hybrids



- Attributes in database
- Geometries in database - but in proprietary binary format
- IT can access geometries via proprietary interfaces only
- Poor integration

Open Spatial Databases

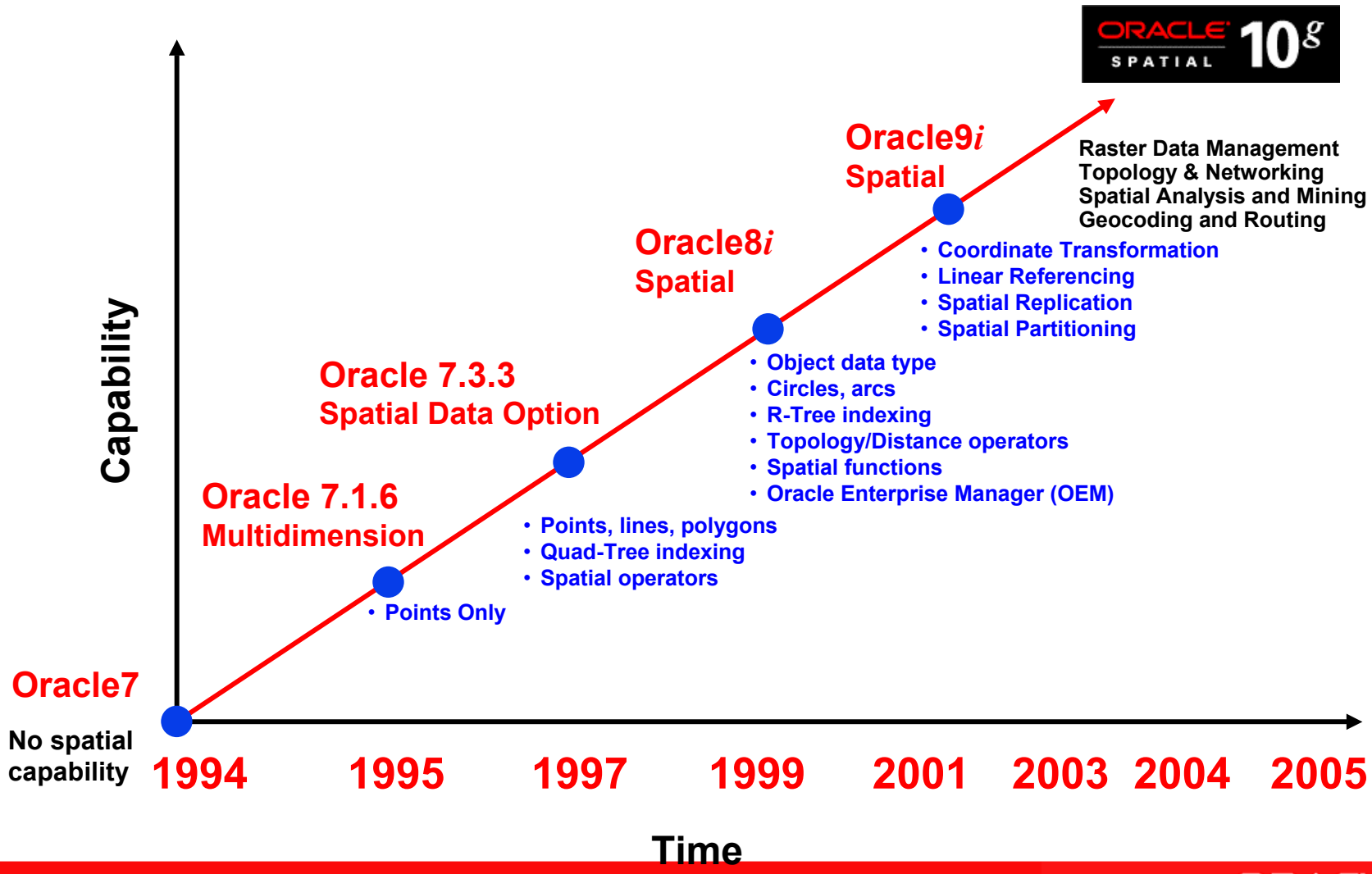


- Attributes and geometries fully integrated in the database
- Spatial is native DBMS type
- IT can access geometries via open standard interfaces
- Standard Query Language
- Supported by all GIS tools

Integrate All Information

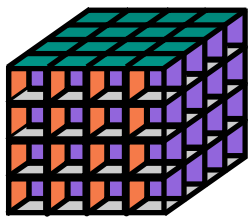
- Relate associated information to spatial locations
  - Land records and topologies
  - Road Networks
  - Property photographs
  - Satellite imagery
  - Image map data
  - Legal Documents

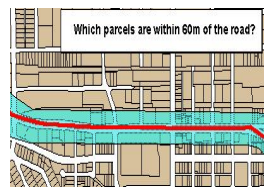
Oracle Spatial Development History



Value Propositions:

- Integrated enterprise data management for LARGE datasets and VLDBs
- Consolidated management of spatial operations
- Greater security and interoperability
- Enhanced decision support and business intelligence
- Reduced training requirements
- Spatially enabled applications





Oracle Locator and Spatial

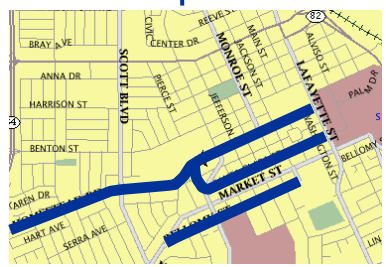
Relational and GIS Data in a Hybrid Setup
NO Data Integration

"How can I integrate all of my location (GIS) information with my ERP, CRM and multiple location technologies when my location information is 'owned' by my GIS?"

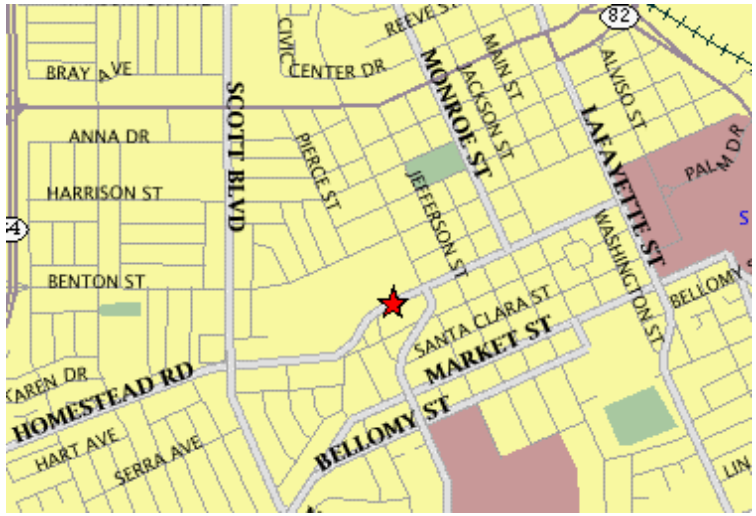
Road

ROAD_ID	NAME	SURFACE	LANES
1	Homestead	Asphalt	4
2	Bellomy	Asphalt	2
3	Santa Clara	Asphalt	2

GIS



Geospatial Data in Oracle Tables



Data Types and Models:

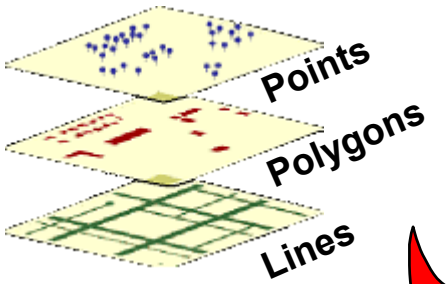
- Vector
  - SDO_GEOMETRY
  - SDO_TOPO_GEOMETRY
- Raster
  - SDO_GEORASTER

Road

ROAD_ID	NAME	SURFACE	LANES	LOCATION
1	Homestead	Asphalt	4	
2	Bellomy	Asphalt	2	
3	Santa Clara	Asphalt	2	

Locator and Spatial Capabilities

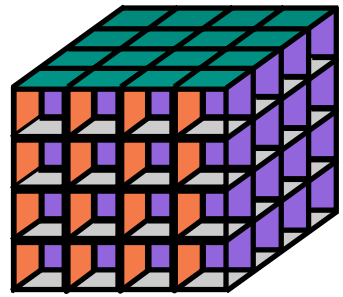
Spatial Data Types



All Spatial Data
Stored in the Database

Oracle
Spatial

Spatial Indexing



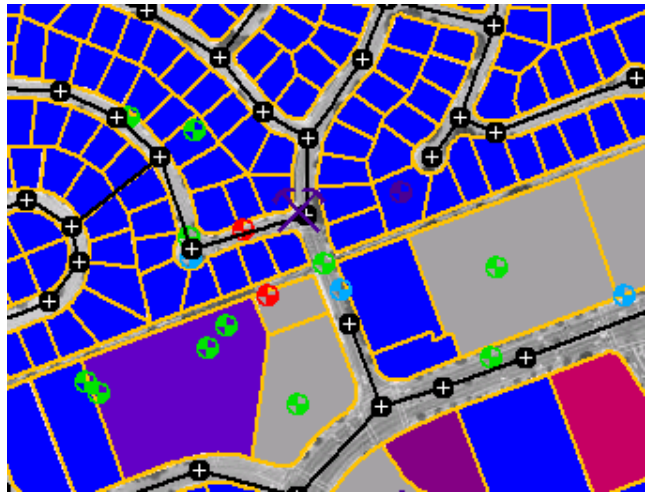
Fast Access to
Spatial Data

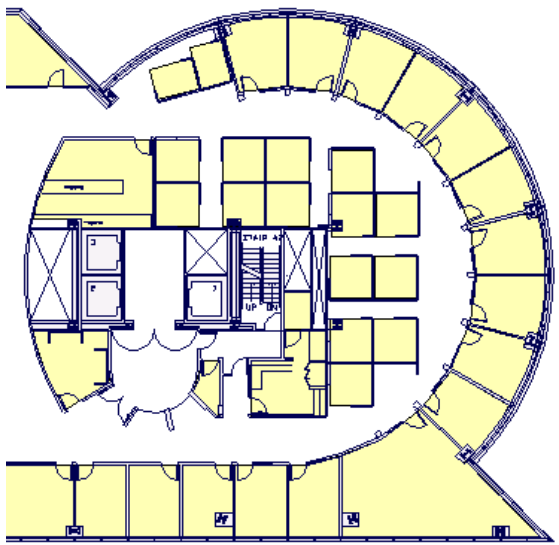
Spatial Access Through SQL

```
Select a.building_id
  from facility a, facility b
 where b.building_id = 902
   and sdo_within_distance( a.geom, b.geom
          'distance = 10 unit = mile') = 'TRUE';
```

Locator and Spatial Vector Data Types

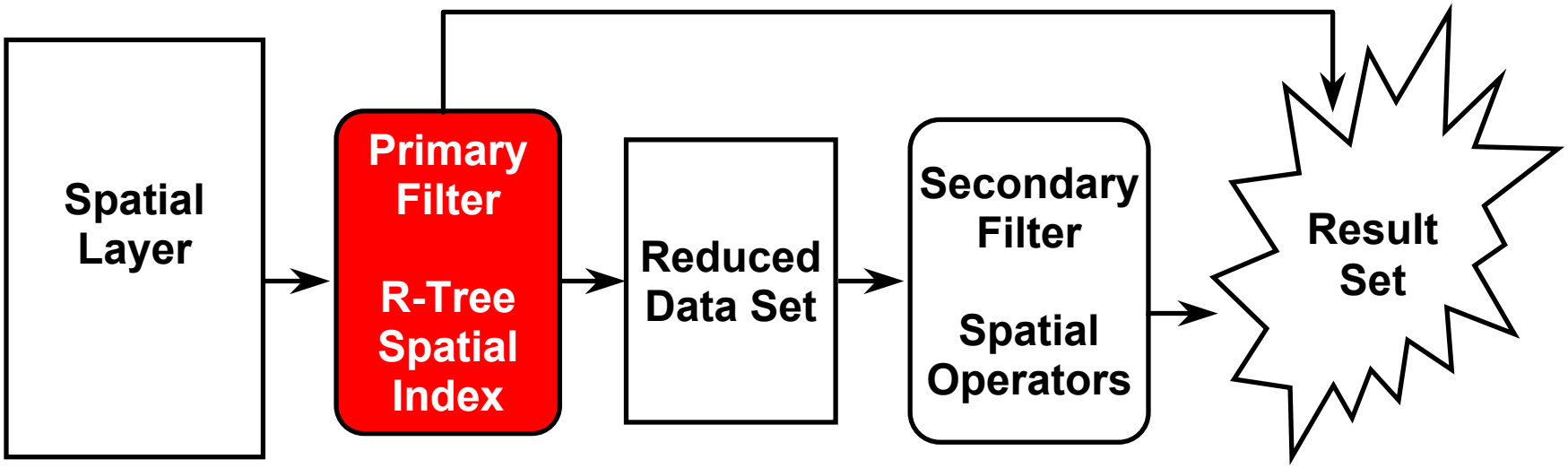
- Points
- Line Strings
- Polygons
- Polygons with holes
- Circles
- Arcs, arc strings
- Rectangles
- Compound elements





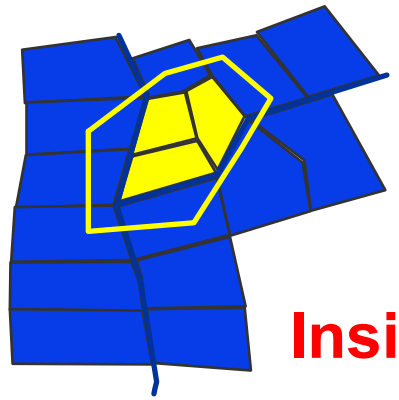
R-Tree Spatial Indexing

- Based on the Minimum Bounding Rectangle (MBR) of the spatial feature
- Used to index two, three and four dimensional data
- Acts as a primary filter on the data
- Provides extremely fast access to spatial data

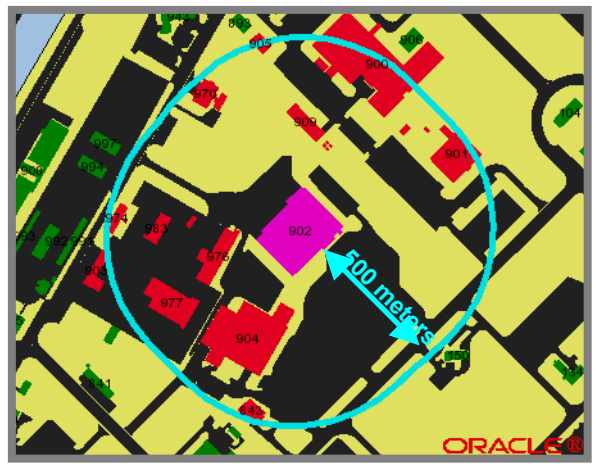


Locator and Spatial SQL Operators

- Full range of spatial operators
  - Implemented as functional extensions in SQL
  - Topological Operators
    - Inside Contains
    - Touch Disjoint
    - Covers Covered By
    - Equal Overlap Boundary
  - Distance Operators
    - Within Distance
    - Nearest Neighbor



Inside

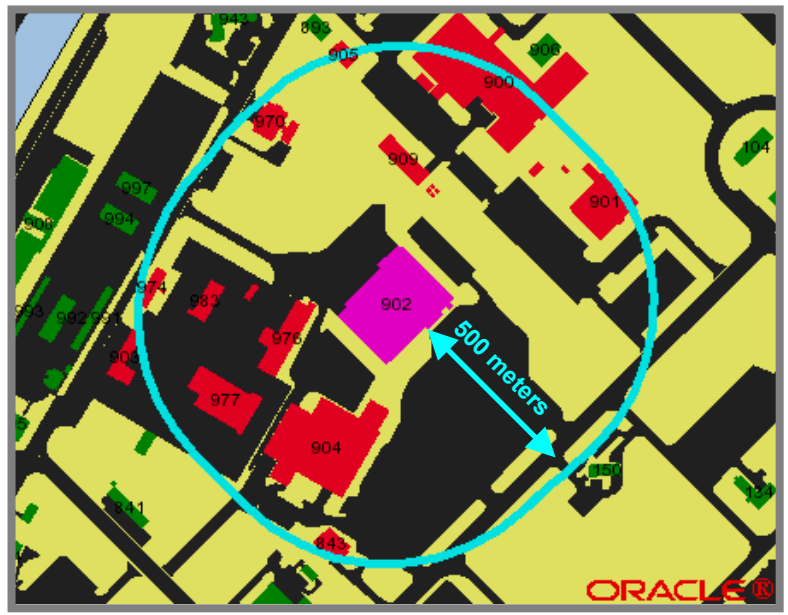


Within Distance

Locator and Spatial Query Via SQL

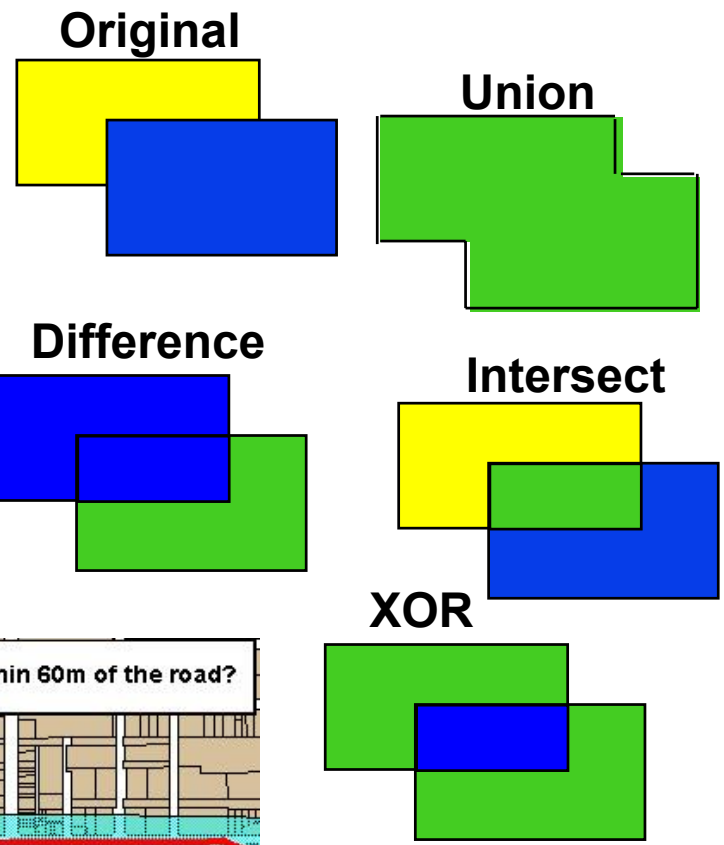
Find all buildings within 500 meters of building 902

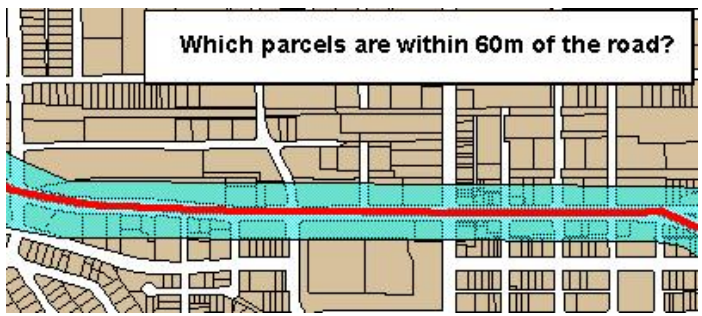
```
SQL> SELECT a.building_id
  2>   FROM base_buildings a,
  3>        base_buildings b
  4>  WHERE b.building_id = 902
  5>    AND MDSYS.SDO_WITHIN_DISTANCE(
  6>         a.Location, b.Location,
  7>         'distance=500 unit=meter')
  8>        = 'TRUE';
```



Spatial SQL Functions

- Returns a geometry
  - Union
  - Difference
  - Intersect
  - XOR
  - Buffer
  - Centroid
  - ConvexHull
- Returns a number
  - Length
  - Area
  - Distance





Coordinate Systems

- **Support for geodetic, whole earth model (latitude/longitude)**
  - Great circle computations
  - Accurate distance and area calculations (unit support)
  - Support for geometries that span the poles and the 180 meridian
- **Support for EPSG coordinate systems**
  - Based on European Petroleum Survey Group (EPSG) data model and data set
  - Comes with Oracle Database 10g Release 2 (10.2) and higher
- **Support for U.S. National Grid**
  - Point coordinate representation using a single alphanumeric coordinate (for example, 18SUJ2348316806479498)
  - Convert from U.S. National Grid text format to SDO_GEOMETRY
- **Support for projected coordinate systems**
  - Cartesian computations
  - Many supported: UTM, State Plane, and many more…
  - Geometries fall off the edges of the projection
- **Support for non-Earth coordinates (e.g., floor plan)**

Oracle Locator and Spatial: A Comparison

Oracle Locator and Spatial: Typical Deployments

Locator Usage

- Most location-based business applications
- Simple GIS applications
- Partner-supported GIS

Spatial Usage

- Business applications requiring geocoder, routing engine in database
- Complex GIS applications
- Intensive database-driven geoprocessing
- Network modeling
- Raster data management

Oracle Locator & Spatial Features

Oracle Locator

- All Vector Data Types
- Spatial Operators
  - Topological
  - Distance
- Distance Function
- Coordinate Transformations
- GML 2.0 and 3.0
- Java Class Library (API)
- Long Transactions
- Table Partitioning*
- Object Replication*
- Oracle Label Security

Bundled Feature
Standard & Enterprise Edition

Oracle Spatial 10*g*

- All Locator features
- GeoRaster Data Type
- Topology Data Model
- Network Data Model
- Geocoding
- Routing
- eLocation Quick Start (New in 10*g* Release 2)
- Linear Referencing
- Spatial functions
  - aggregates
  - buffer, centroid, union,etc

Licensed Option
Enterprise Edition Only

*may require Enterprise Edition, additional options

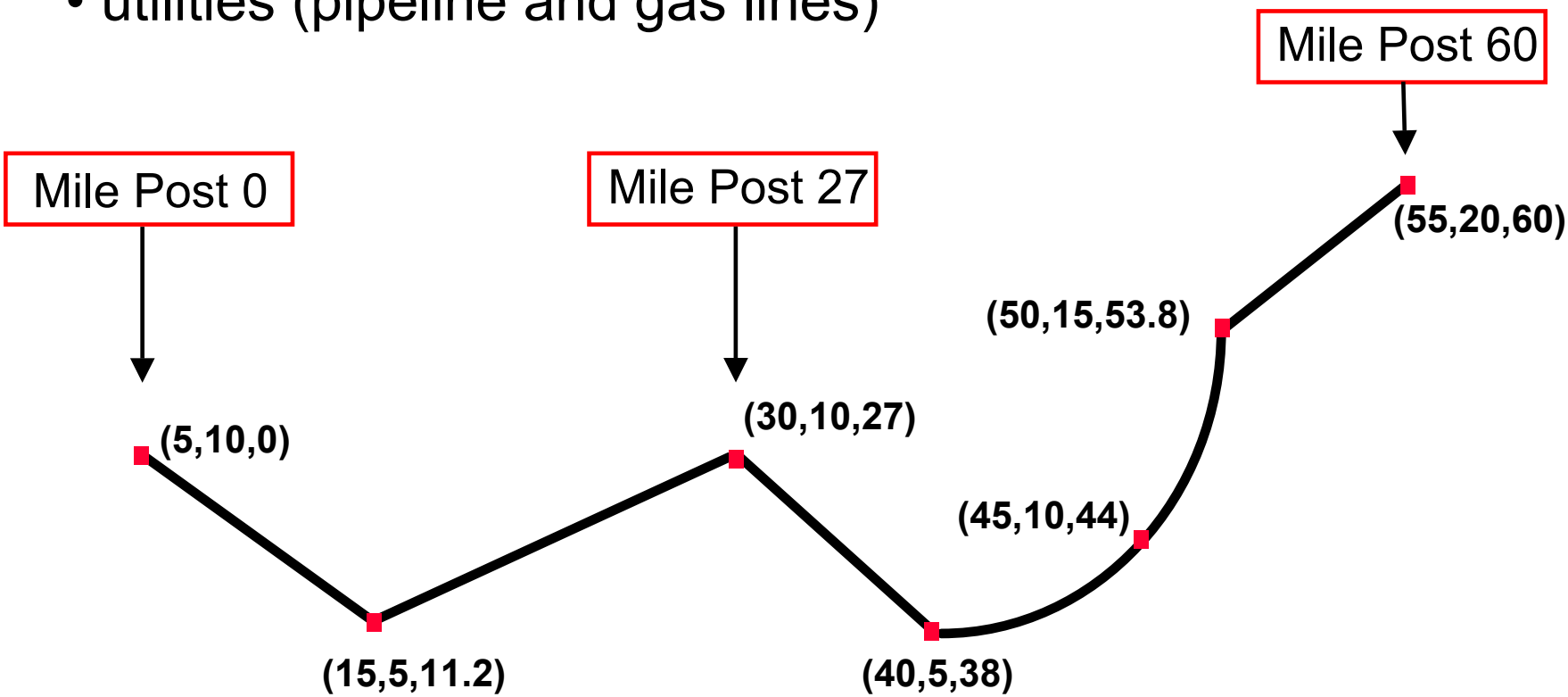
Oracle Spatial Technologies and Models

Oracle Spatial
Linear Referencing System (LRS)

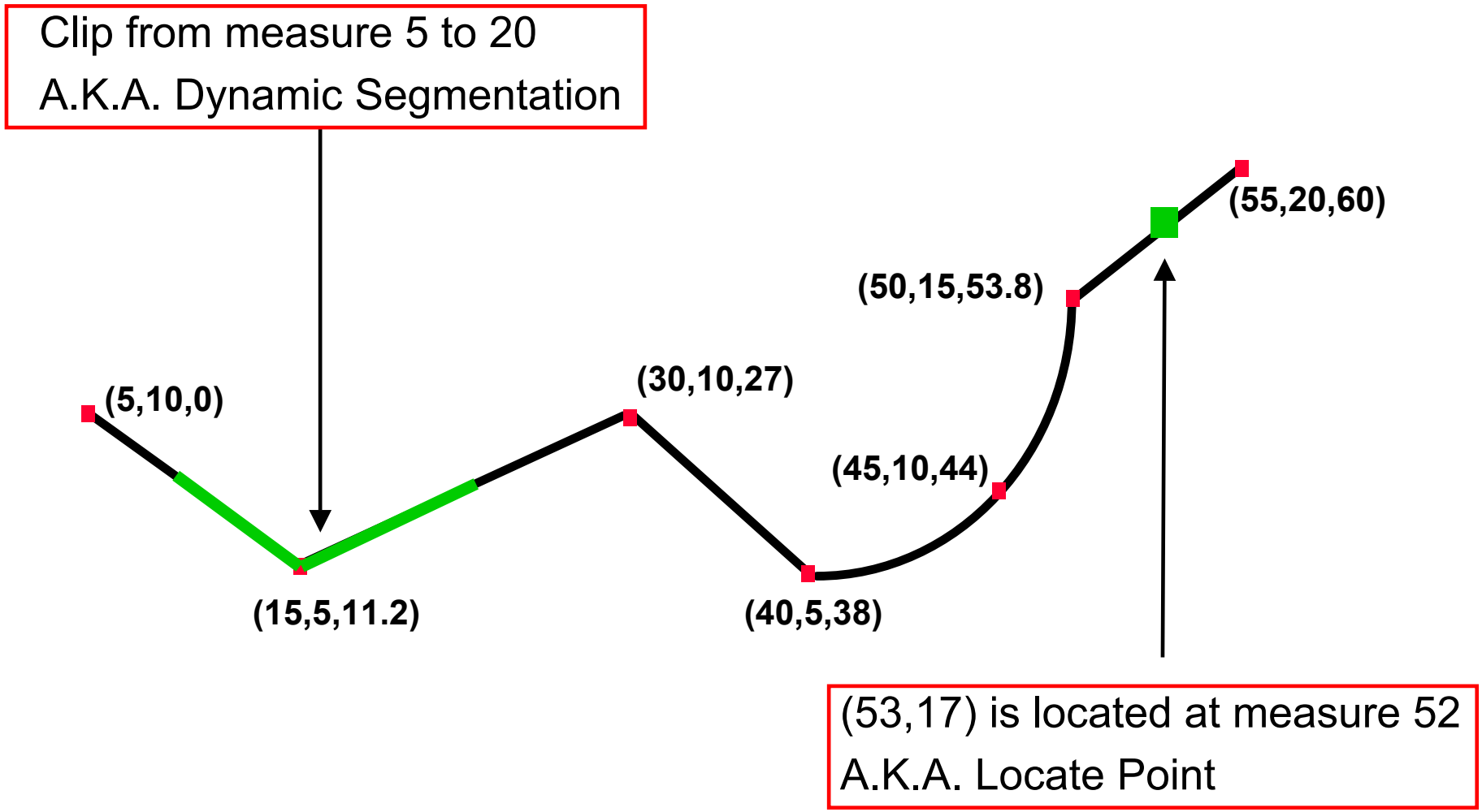
What Is Linear Referencing (LRS)?

Commonly used in many GIS applications such as:

- transportation (road network)
- utilities (pipeline and gas lines)

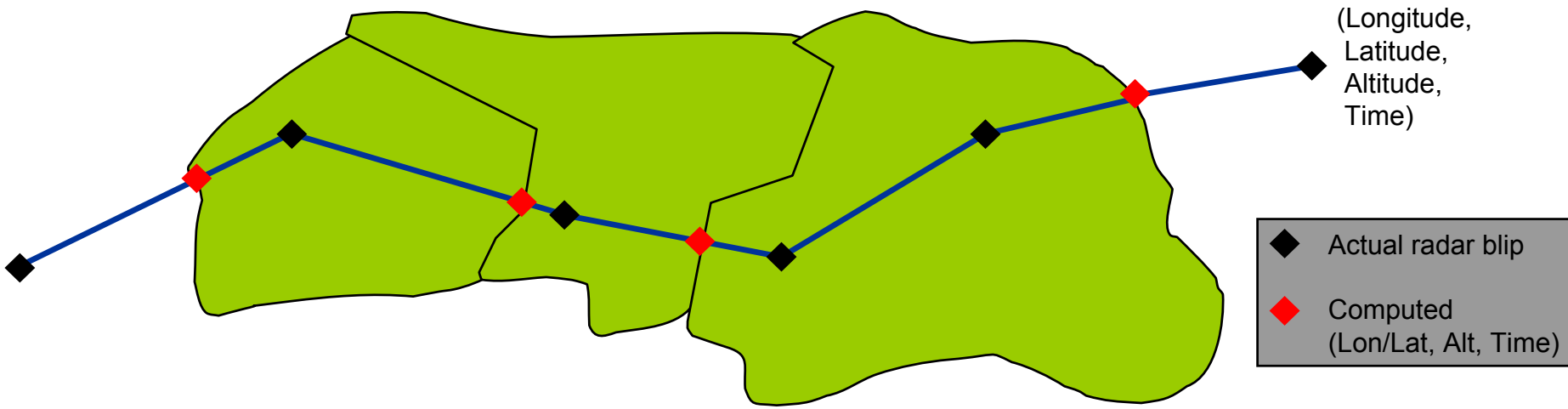


LRS Concepts



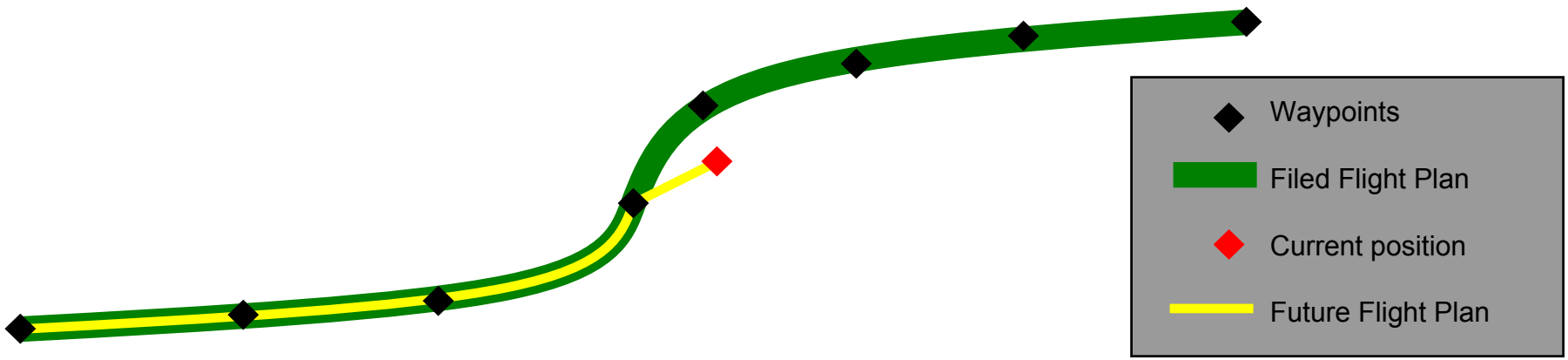
LRS Application Example – Oracle Spatial

- US Airspace Boundary Crossing Application
  - Oracle Spatial functions to calculate intersection of flight paths and US airspaces.
  - Linear Referencing to interpolate the time and altitude for entry/exit points of US airspace.
  - Accurately charge foreign carriers for the amount of time in US airspace.



OracleAS MapViewer and Oracle Spatial LRS

- MapViewer application for flight plan visualization
- Spatial analysis to project current flight position to next waypoint of original flight plan.
- Another example of LRS functionality

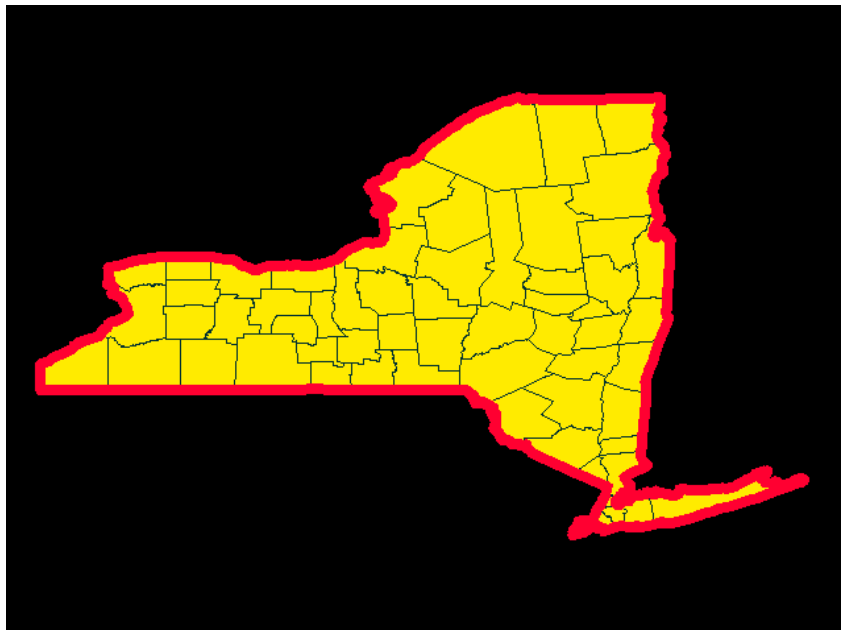


Oracle Spatial
Spatial Aggregate Functions

Spatial Aggregate Functions - Example

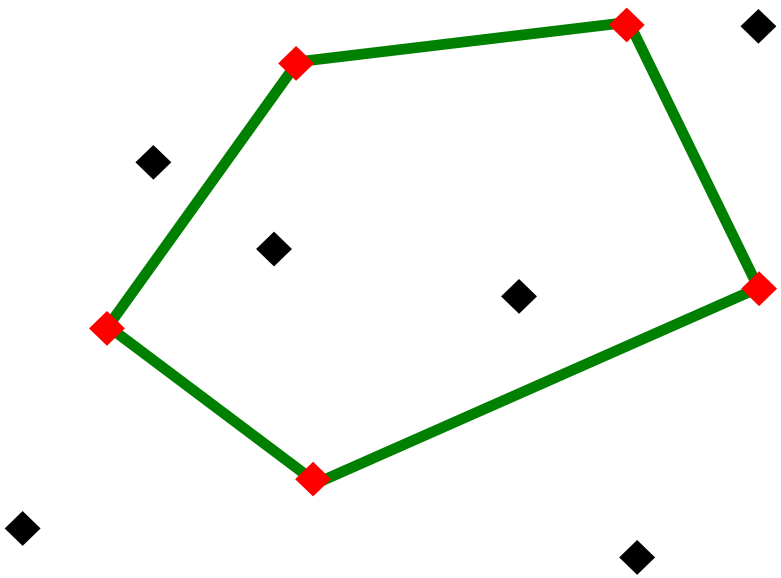
Generate New York state boundary by aggregating counties

```
SELECT SDO_AGGR_UNION(sdo_aggr_type(a.geometry, 0.5)
FROM counties
WHERE state = 'New York';
```



SDO_AGGR_CONVEXHULL

- Snap a rubber band around contaminated wells
- Dynamically generate new region
- Further analysis with new region, e.g.
  - Search for chemical plants within 5 miles of new region



Non-contaminated well

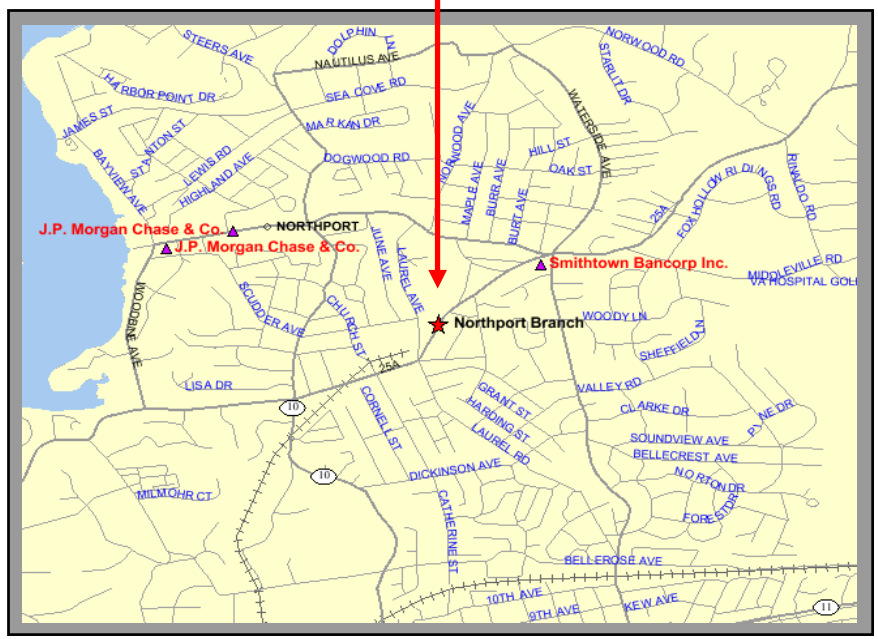
Contaminated well

Oracle Spatial 10*g*
Geocoding

Oracle Spatial 10*g* Geocoder

- **Geocoding Engine within Oracle Database**
  - Geocode: Generates latitude/longitude (points) from address
  - Reverse Geocode: Generates address from latitude/longitude (points)
  - Supports international addressing standardization
  - Data dictionary completely extensible
- **Base dictionary data available third parties**

Northport
680 Fort Salonga Rd
Huntington, NY 11768

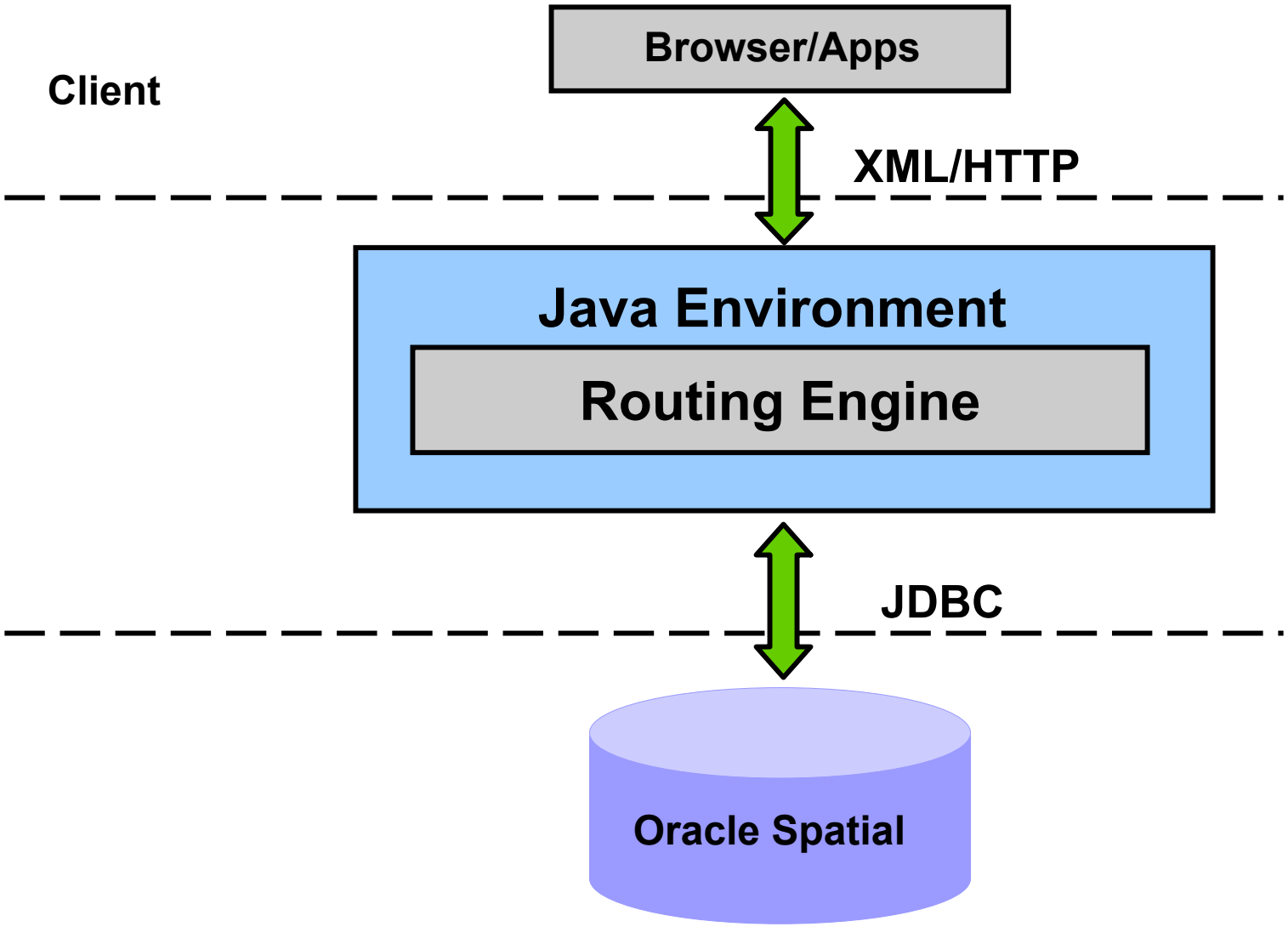


Oracle Spatial 10*g* Routing Engine

Oracle Spatial 10*g* Routing Engine

- The Oracle Spatial Routing Engine enables the hosting of XML-based Web services that:
  - Given a route request that includes start location and an end location (address information or latitude/longitude), returns route information (which can include directions, driving distances, estimated drive times, and geometry information) between the two locations
  - Given a batch route request consisting of a single start location and multiple end locations, can return information (driving distances and estimated drive times) for each of the start and end location pairs

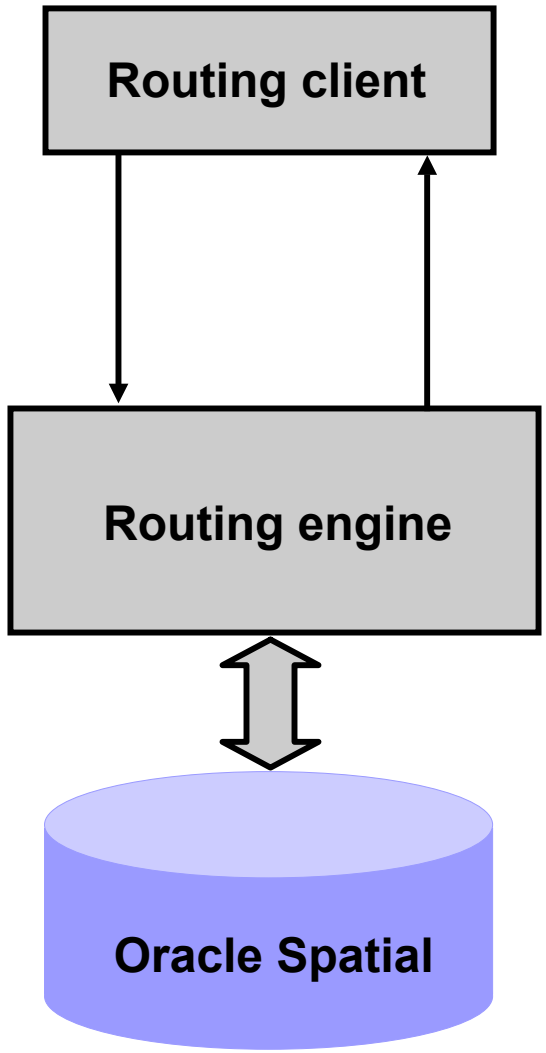
Routing Engine Architecture



Routing Query

- A route request consists of:
  - Preferences
  - Start location
  - End location

- A batch route request
- consists of:
  - Preferences
  - Start location
  - End locations



- A route response consists of:
  - Route information
    - Optional Geometry
  - Segment information (for each segment of the route)
- A batch route response consists of:
  - Route information (for each route)

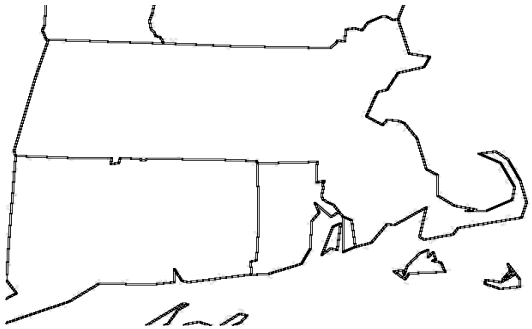
Oracle Spatial 10*g*
eLocation Quick Start

eLocation Quick Start

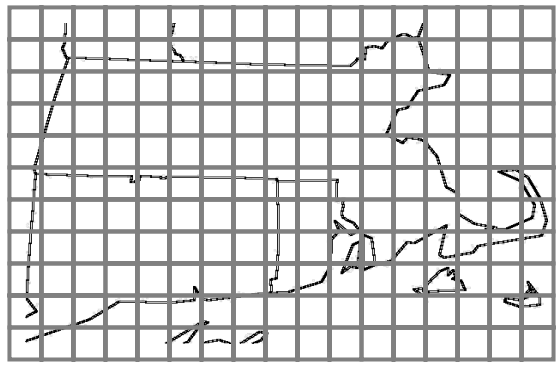
- New for 10g Release 2
- Location service Java and XML APIs
- Enables application developers to quickly and easily deploy mapping, geocoding, and routing services right "out of the box" from data stored in Oracle Spatial
- Ships with sample HTML interfaces to jump-start creation of driving directions, mapping, and geocoding applications
- Sample data & data sets in Oracle Spatial 10g format available from leading data providers
  - Visit http://www.oracle.com/technology/products/spatial for more info
- May be used by OracleAS MapViewer, many third party mapping tools, or user-developed applications

Oracle Spatial 10*g*
GeoRaster Support

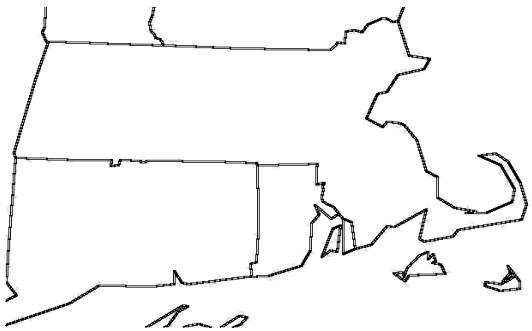
Raster Data and Cell Size

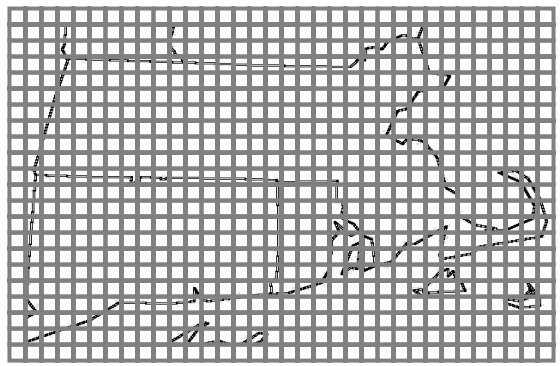


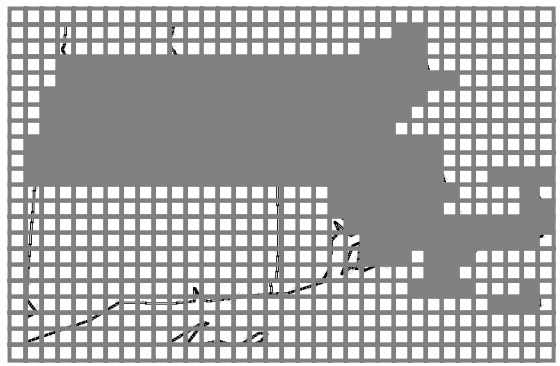
Coarser resolution



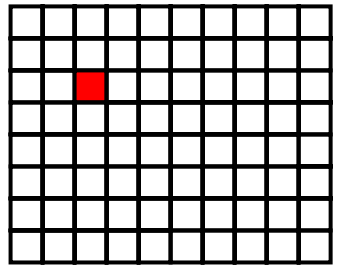
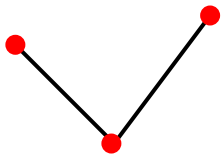
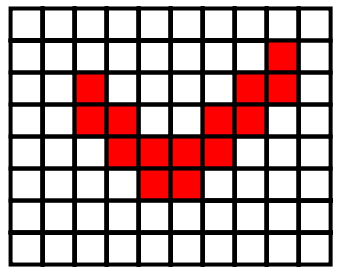
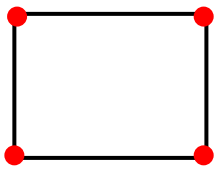
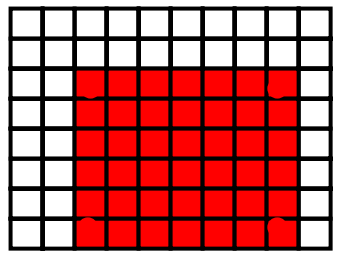
Finer resolution







Raster/Vector Data Differences

Vector Data	Vector Coordinates	Raster Data
	-74.1651749, 41.339141	
	-74.1651749, 41.339141, -73.4284481, 40.678193, -72.9792214, 41.686228	
	-74.1651749, 41.339141, -74.1651749, 39.559004, -72.9792214, 39.559004, -72. 9792214, 41.339141	

Raster Data Concepts

- **Grid Data** is a general term used for raster data
  - An area is overlayed by a regular or nearly regular grid of cells
  - The grid does not have to be rectangular
    - Can be other type of polygon such as triangle
  - Typically has associated table with attribute values for each cell in the grid
  - Examples of grid data include:
    - Digital terrain elevation data
    - Pollution concentrations
    - Land use and land cover types
    - Others

Grid Raster Data

Attribute values are stored for each cell in the grid

- For example, in a geological grid raster data set, numeric values can correspond to the geological period associated with the rock formations
  - The value 1 corresponds to the Quaternary Period
  - The value 2 corresponds to the Tertiary Period
  - The value 3 corresponds to the Paleocene-Cretaceous periods
  - The value 4 corresponds to the Mesozoic Period
  - The value 5 corresponds to the Gondwana Period
  - The value 6 corresponds to the Early Palaeozoic Period
  - The value 7 corresponds to the Late Proterozoic Period
  - The value 8 corresponds to the Early Proterozoic Period
  - The value 9 corresponds to the Archaean Period
- When rendering a map, colors can be assigned to the stored values

Grid Raster Data

A Value Attribute Table (VAT) is used to map the stored numeric values to the meaning of that value

- An example value attribute table for geological raster data

CELL VALUE	GEOLOGICAL PERIOD
1	Quaternary
2	Tertiary
3	Paleocene-Cretaceous
4	Mesozoic
5	Gondwana
6	Early Palaeozoic
7	Proterozoic
8	Early Proterozoic
9	Archaean
0	Blank Cell (no data)

Stored cell values

2	5	4	9	1	9	7	6
6	1	1	1	1	1	6	6
1	3	8	7	9	7	9	1
3	1	8	3	3	5	9	1
3	3	3	9	8	7	9	1
0	3	3	3	9	9	1	0
0	8	8	9	9	1	0	0
0	0	2	9	1	0	0	0

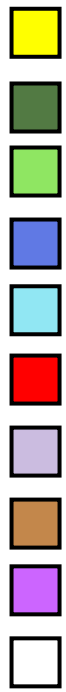
A value attribute table can also contain user-defined columns

Grid Raster Data

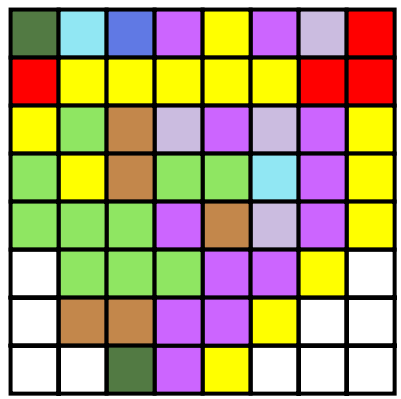
A COLORMAP table is used to map the stored numeric values to the display characteristics of that value

- An example COLORMAP table for geological raster data

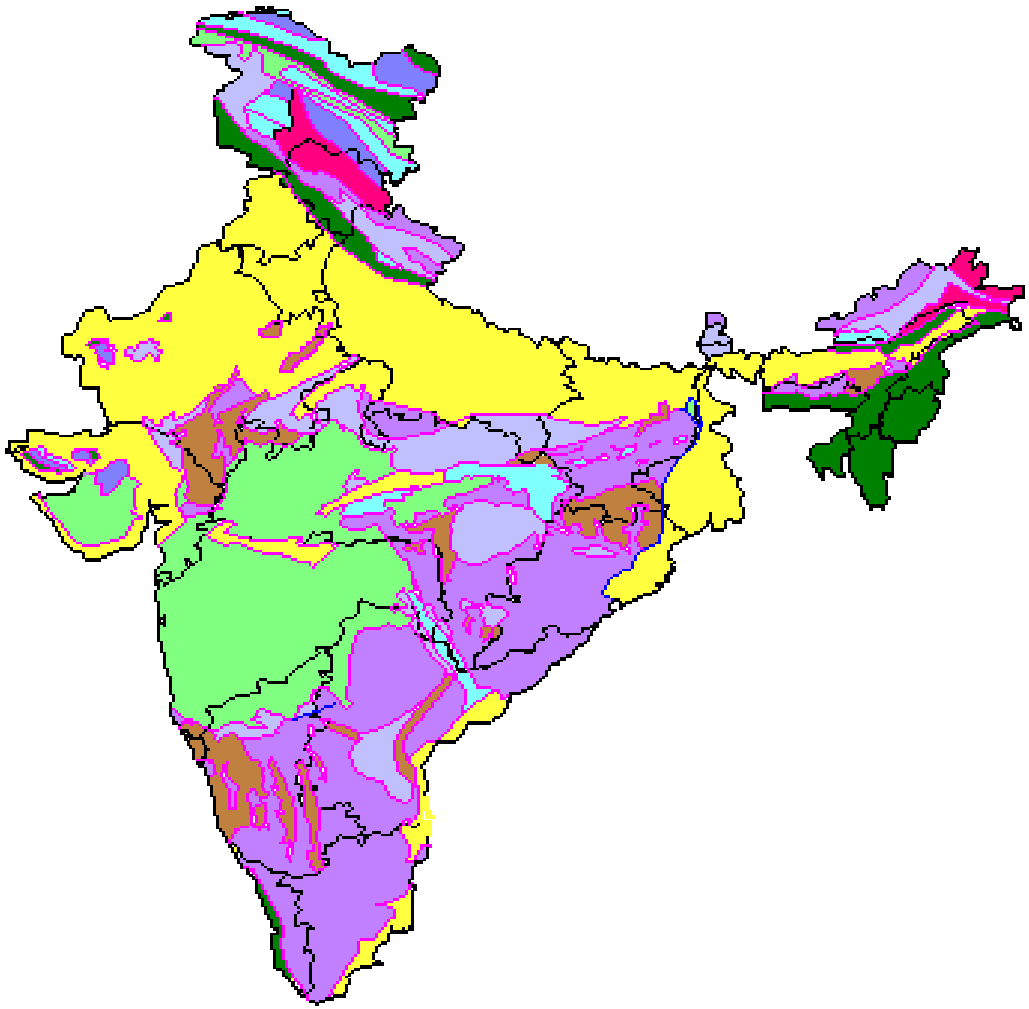
CELL VALUE	Red	Green	Blue
1	255	255	0
2	82	123	67
3	142	230	98
4	96	121	228
5	145	231	243
6	255	51	0
7	203	188	224
8	195	135	75
9	204	102	255
0	0	0	0



2	5	4	9	1	9	7	6
6	1	1	1	1	1	6	6
1	3	8	7	9	7	9	1
3	1	8	3	3	5	9	1
3	3	3	9	8	7	9	1
0	3	3	3	9	9	1	0
0	8	8	9	9	1	0	0
0	0	2	9	1	0	0	0



Geological Map of India (Grid Data)



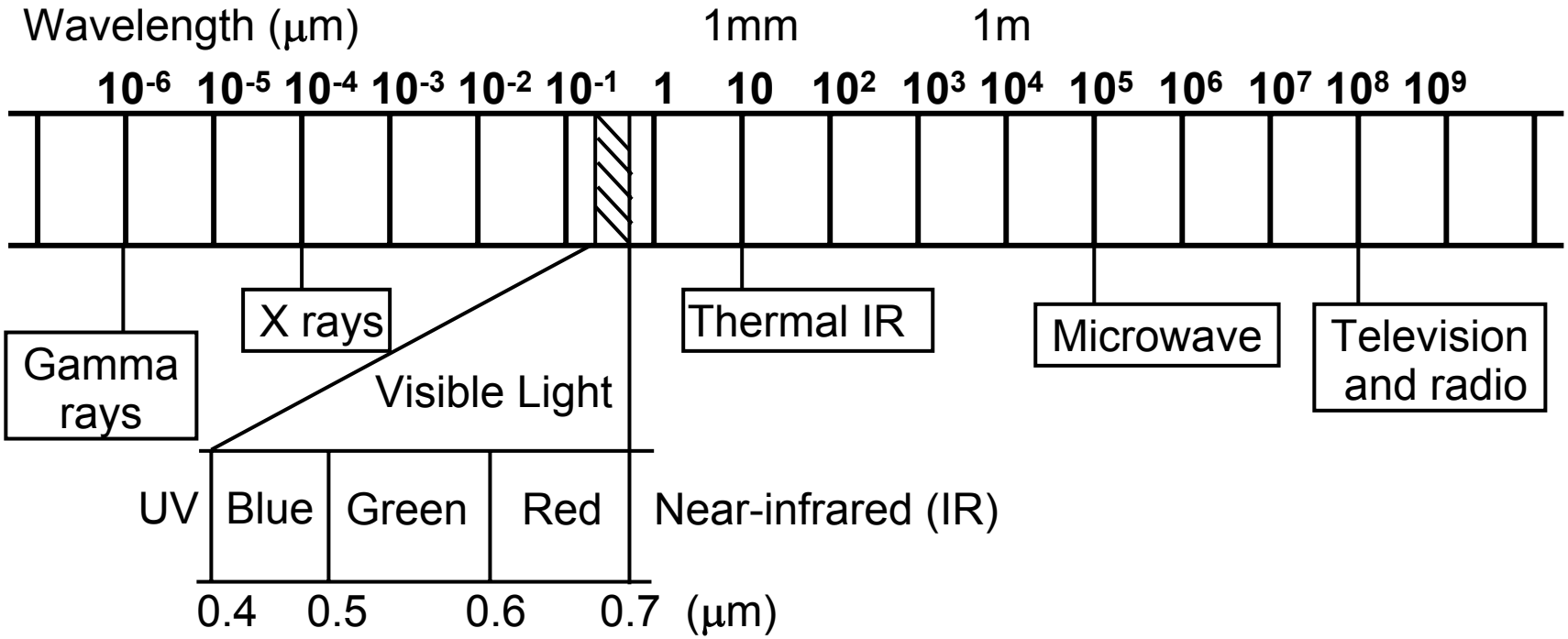
- Quaternary
- Tertiary
- Paleocene-Cretaceous
- Mesozoic
- Gondwana
- Early Palaeozoic
- Late Proterozoic
- Early Proterozoic
- Archaean

Raster Data Concepts – (continued)

- **Digital Imagery** - a specialized type of raster data
  - Two dimensional array of regularly spaced picture elements (pixels)
  - Created from optical or other sensor data
  - Usually doesn't require attribute table
  - Georeferencing allows each cell in the image to be mapped to its location on the surface of the Earth
  - Georectification is the process of assigning ground control points (GCPs) to digital images and processing the image to better map it to the surface of the Earth

Raster Data: Digital Images

The Electromagnetic Spectrum



Raster Data: Digital Images

Each band collected at different wavelength for later processing and/or display

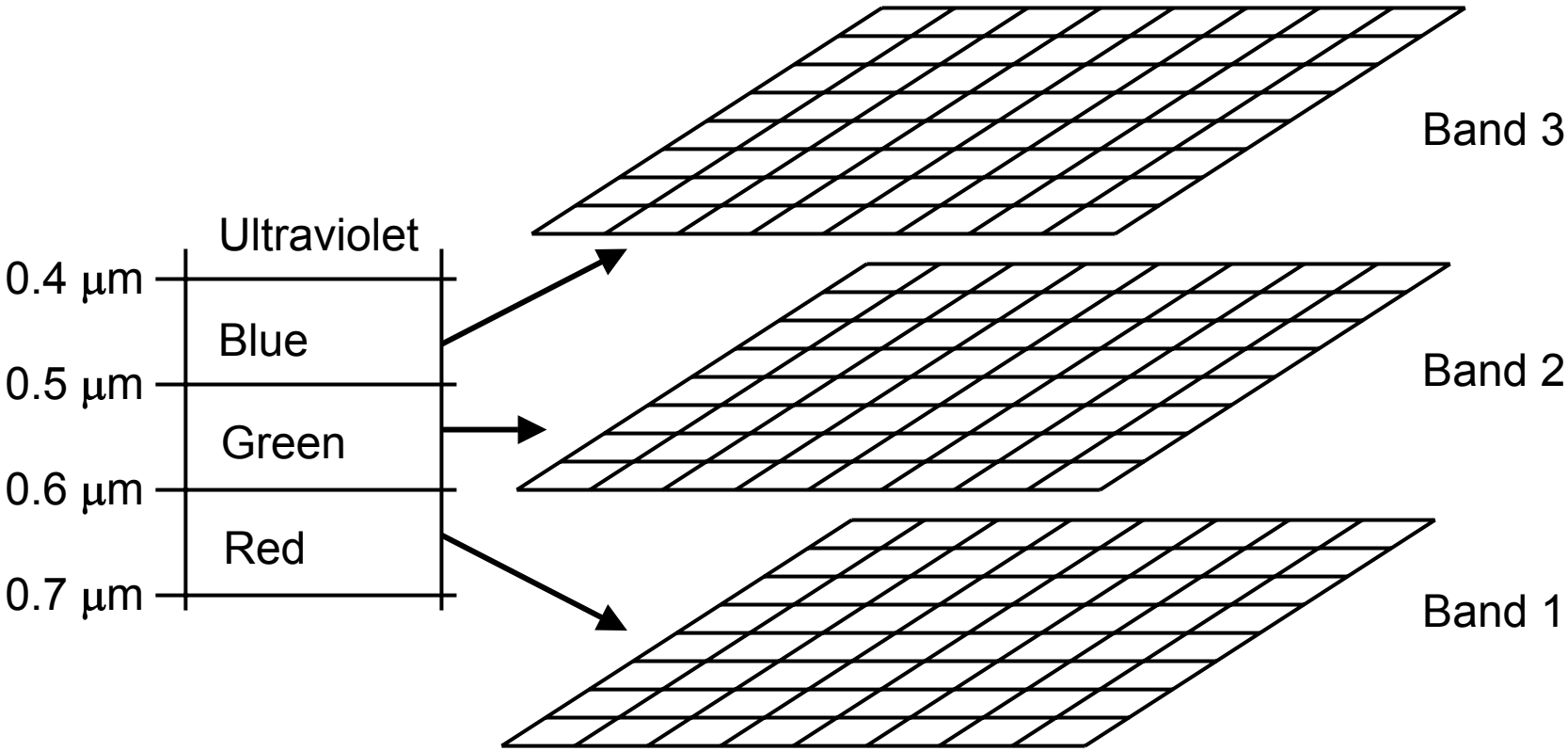
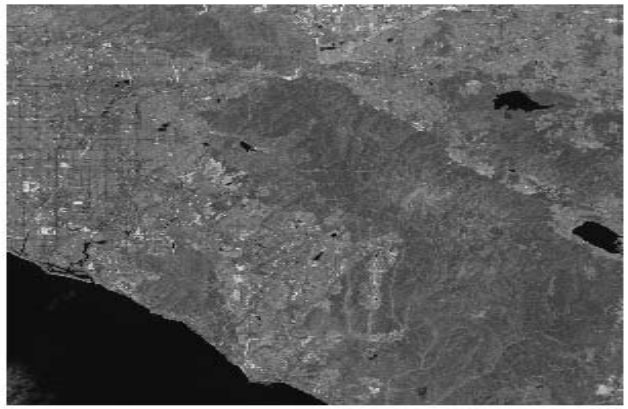
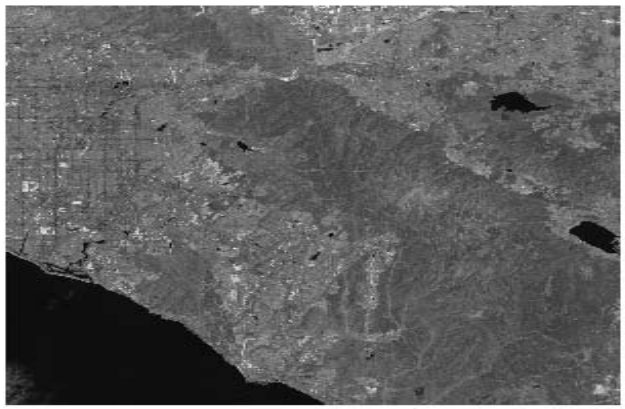


Image Data

TM Band 2



TM Band 3



TM Band 4

TM Band 432

Some bands may accentuate different features

GeoRaster Data Support

- Some of the types of data supported by GeoRaster, classified by:
  - Data source:
    - Satellite imagery
    - Airborne photographs
    - Thematic grid maps
    - Digital terrain/elevation models
    - Lattice GIS data
    - Scanned maps and graphs
    - Raster data associated with geology, geophysics, and geochemistry
    - Medical images
    - Others

GeoRaster Data Support

- Number of bands/layers in a data set:
  - Single band/layer (grid layers, black and white images)
  - Multiple band/layer (multispectral imagery, true color photos)
  - Hyperspectral (hyperspectral imagery)
- Base data types:
  - 1, 2, and 4 bit data types
  - 8, 16 bit signed/unsigned integers
  - 32 bit (integer and floating point)
  - 64 bit (floating point)

GeoRaster Data Support

- Georectification:
  - Georectified (typically georeferenced)
  - Non georectified (georeferenced or non georeferenced)
- Georeferenced:
  - Georeferenced
  - Non georeferenced

GeoRaster Data Support

- GeoRaster support for loaders and exporters:
  - TIFF/GeoTIFF
  - ESRI World File
  - JPEG
  - GIF
  - BMP
  - PNG
  - Others
- Oracle Application Server MapViewer provides simple support for visualization of GeoRaster data

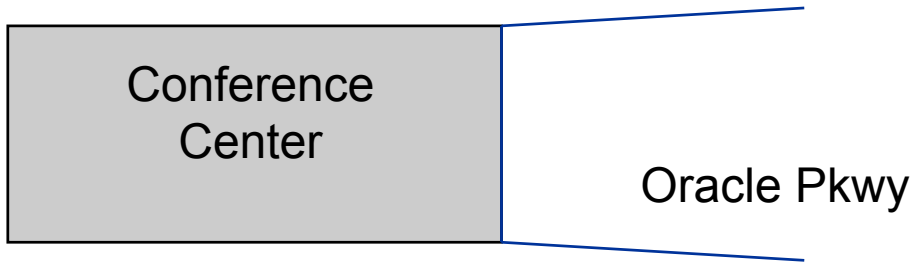
GeoRaster: Compression

- Natively support two industry standard compression techniques (New for 10g Release 2)
  - JPEG (lossy)
    - JPEG-B (abbreviated baseline JPEG format)
    - JPEG-F (full-format baseline JPEG format)
  - DEFLATE (lossless)
    - (a.k.a. ZIP)
  - each block is compressed and uncompressed individually
- All GeoRaster operations work on compressed/uncompressed GeoRaster objects
  - Automatic decompression on sub-set operations

Oracle Spatial 10*g*
Persistent Topology Model

Oracle Spatial Topology Model

- New data model to store ***persistent*** topology
  - Easier to do data consistency checks in this model
  - Example: when the road moves, the property boundary automatically moves with it
- Topology Data Model and Schema
  - Describes how different spatial features are related to each other
  - A land parcel shares the boundary with a road
- 10*g* continues to support transient topology
  - Topology computed on demand
  - Customers have choice of 2 topology management capabilities



Oracle Spatial Topology Model

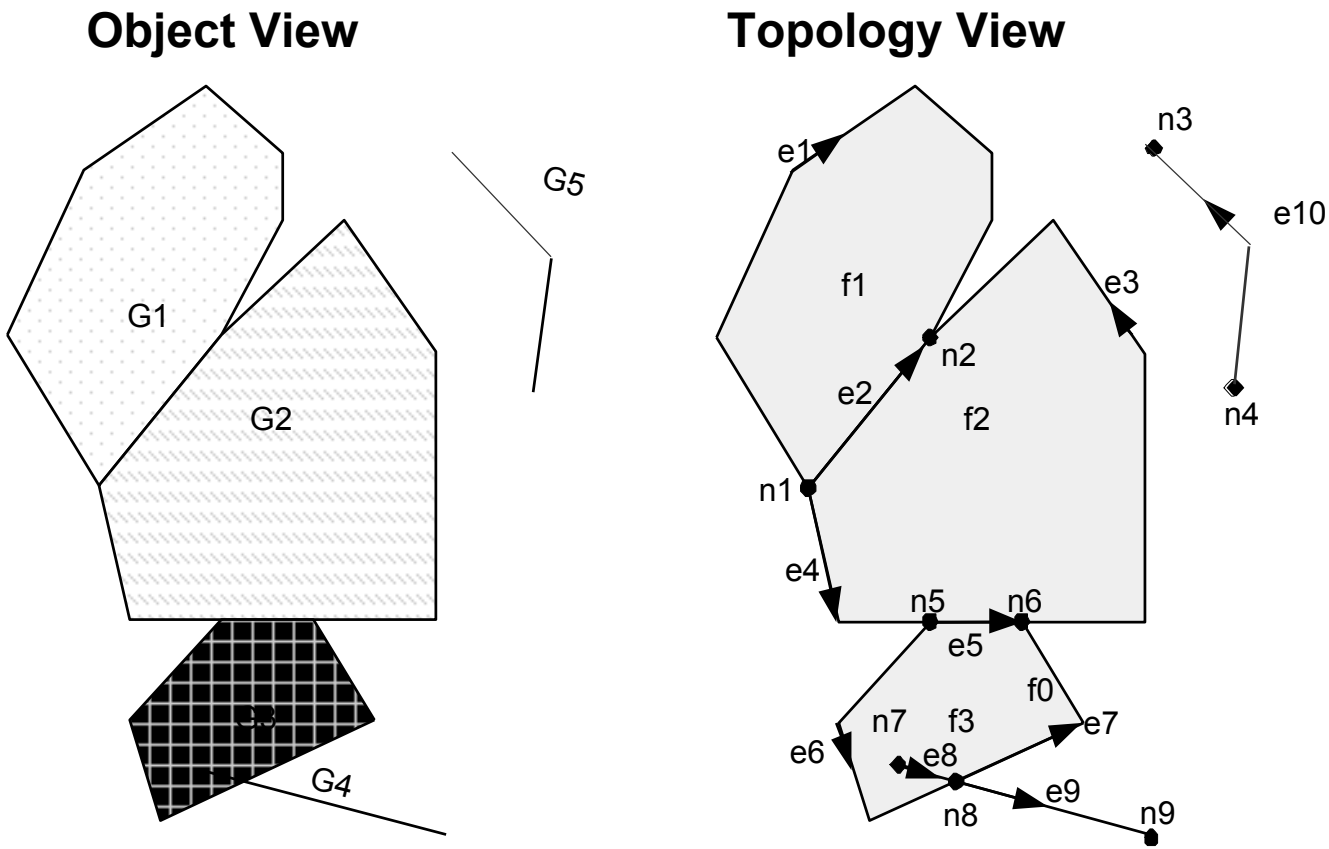
- Each of these represents a spatial feature.
- Oracle Spatial can store features in two ways:
  - Object storage: Each feature is stored as a separate, complete object.
  - Topology storage: Each feature is modeled in terms of the topological primitives it is composed of.

California

Main Street

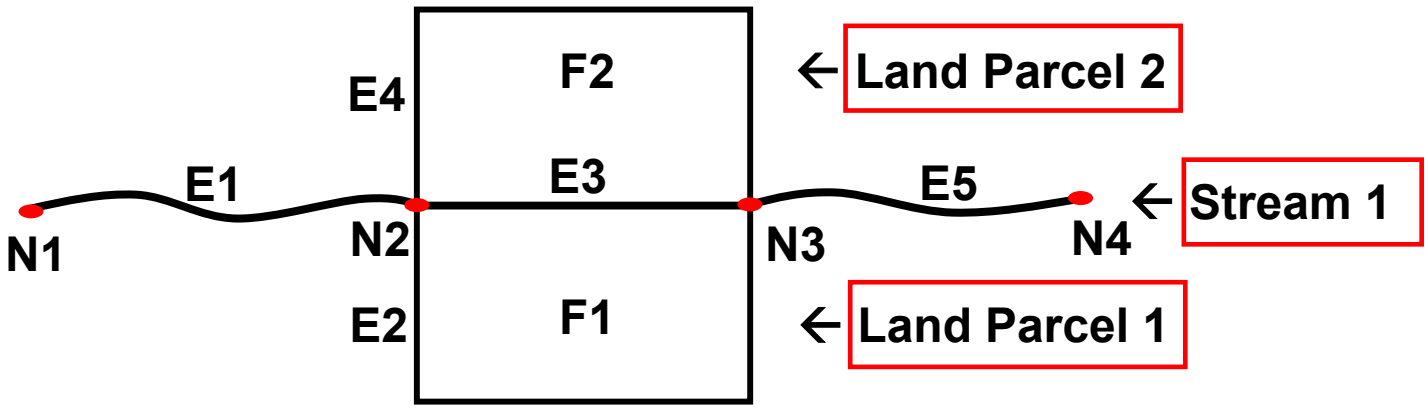
Current car location

Oracle Spatial Topology Model



Topology Example

- Land parcel features
  - Land Parcel 1 associated with face F1
  - Land Parcel 2 associated with face F2
  - Both faces include edge E3.
- Stream features
  - Stream 1 associated with edge E3 (and edges E1 and E5)



Hierarchical Feature Model: Example

- Parcels features derived from topological primitives (faces)
  - Oracle table called **`PARCELS`** with **`SDO_TOPO_GEOMETRY`** column
  - Each parcel feature is derived from topological primitives (faces)
- Neighborhoods features derived from parcels features
  - Oracle table called **`NEIGHBORHOODS`** with **`SDO_TOPO_GEOMETRY`** column
  - Each neighborhood is derived from a list of parcel features
- School District features derived from neighborhood features
  - Oracle table called **`SCHOOL_DISTRICTS`** with **`SDO_TOPO_GEOMETRY`** column
  - Each school district feature is derived from a list of neighborhood features

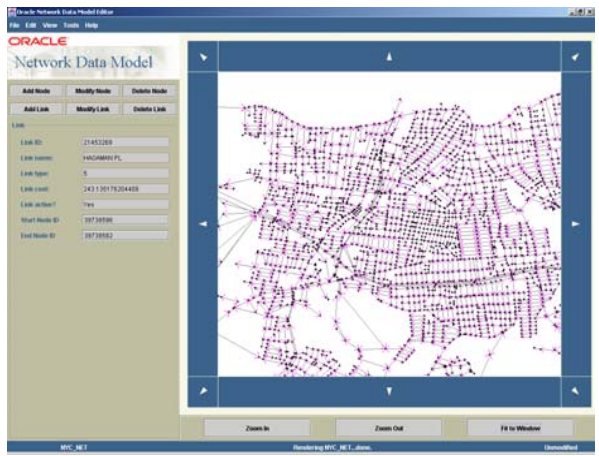
Advantages of Using Topology

- Some of the advantages of using topology to store and manage data:
  - No redundant storage of data
    - Shared edges between objects are stored only once.
    - Features from *different* columns can share edges, such as roads and land parcels.
  - Data consistency
    - There are no “registration” issues between geometries.
    - Moving a boundary between objects is done once.
  - Quick and easy determination of topological relationships

Oracle Spatial 10*g*
Network Data Model

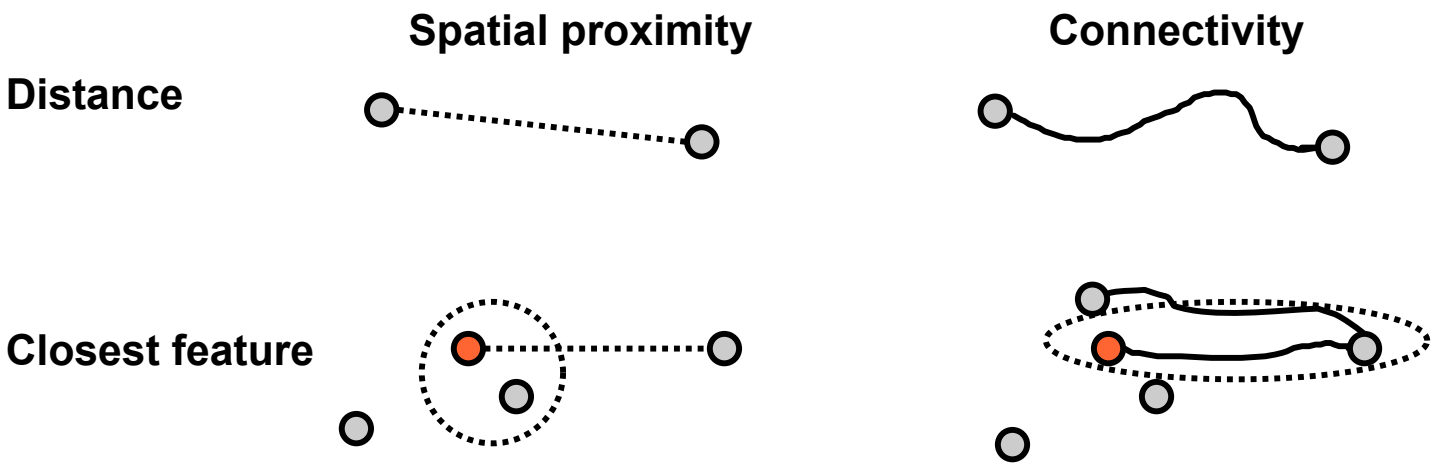
Network Data Model

- Network Data Model
  - A data model to store network (graph) structure in the database
  - Explicitly stores and maintains connectivity of the network
  - Attributes at link and node level
- Routing Engine
  - Street navigation for single or multiple destinations
  - Provide network analysis functionality in the database
- Supports Network solutions (Tracing & Routing)
  - Transportation and Transit Solutions
  - Field Service, Logistics
  - Location based Services, Telematics
- Bio-Info Pathways (Life Sciences)
  - Hierarchical Networks
  - Scale-free Networks
  - Small Worlds



Spatial Analysis Versus Network Analysis

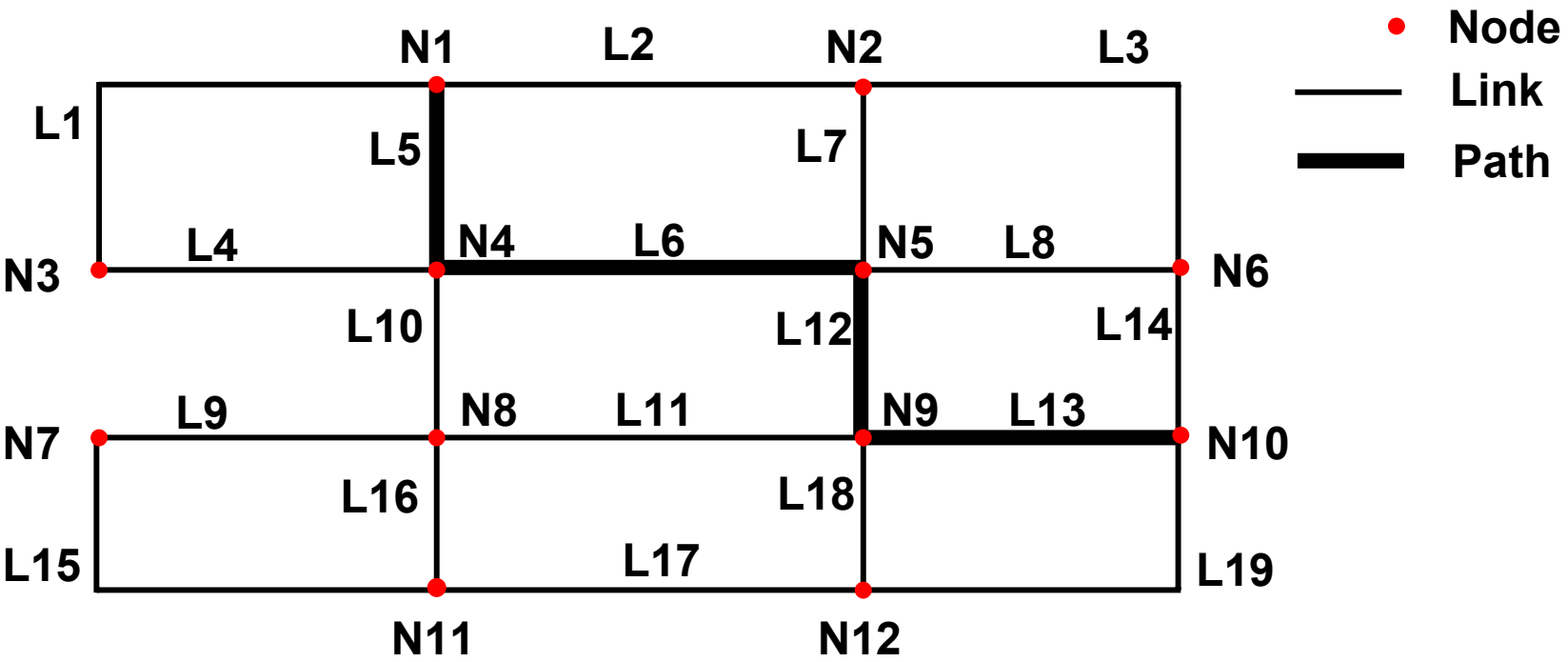
- Oracle Locator and Oracle Spatial solve spatial proximity problems. Another type of analysis required by users and applications is network analysis.
  - Network applications deal with the connectivity and (optionally) cost of features. Spatial data is optional.



What Is a Network?

- A *network* (also called a *graph*) is a model that represents relationships between objects of interest.
  - In a network model, objects of interest are defined as nodes.
    - A cost may be associated with a node
  - A direct relationship between two objects (nodes) is defined as a link. A link connects two nodes.
    - A link may have associated cost (time or distance).
    - Links can be directed or bidirected.
  - The ability to traverse links to go from one node to another node is known as accessibility.
  - The sets of ordered links between two nodes is called a path.

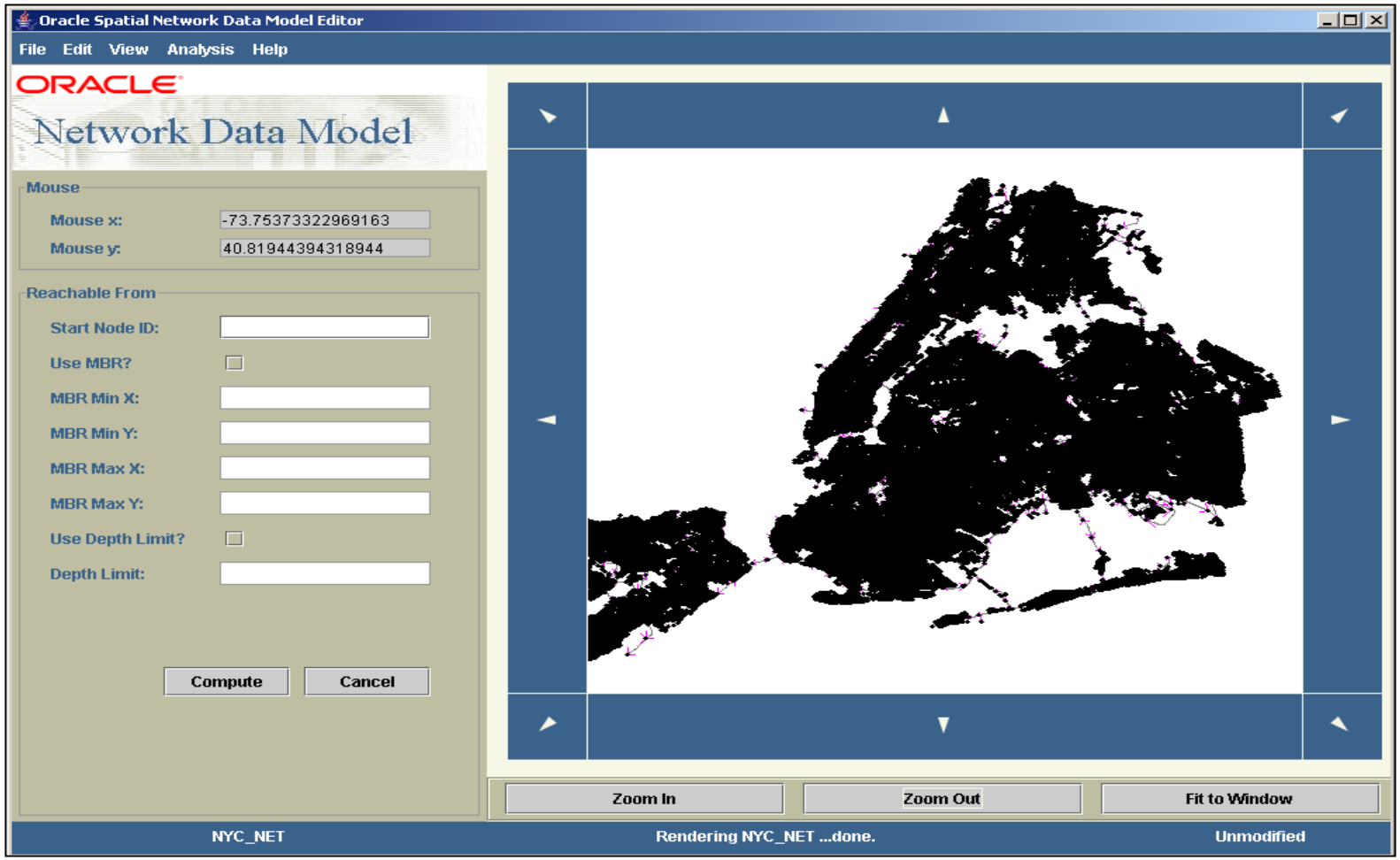
A Simple Network



- If this network represented streets and intersections:
  - Nodes are intersections
  - Links are streets
  - A path is a route between two nodes

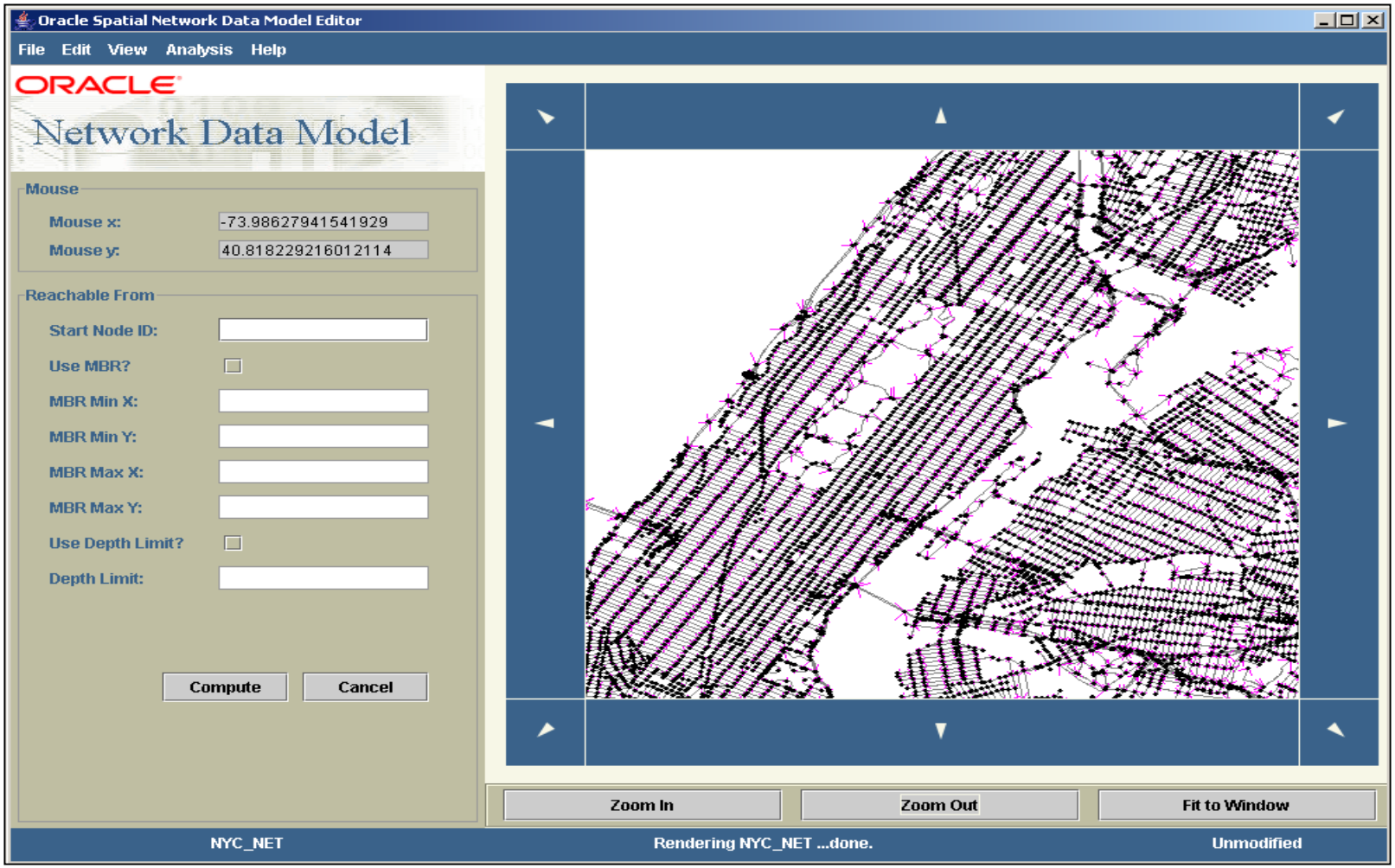
A More Complicated Network

- New York City Streets Data



A More Complicated Network

- New York City Streets Data (zoomed in)



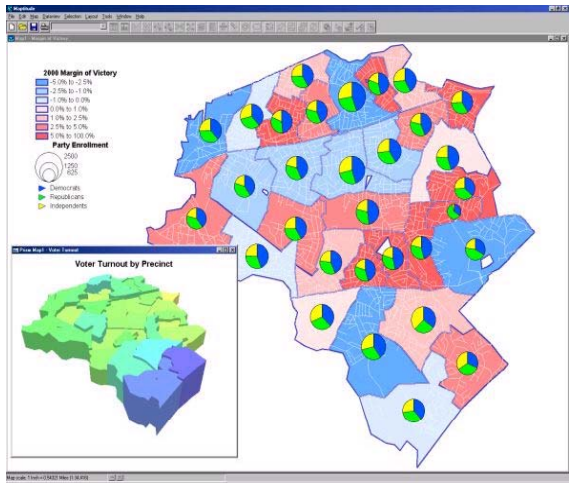
What Is the Oracle Spatial Network Data Model?

- The Oracle Spatial Network Data Model stores and analyzes network data.
  - Connectivity is determined using links and nodes:
    - Each link has a start node and an end node.
  - Analysis is done based on connectivity and optionally cost information. Common analysis includes:
    - Accessibility
    - Shortest path analysis
    - Within cost analysis
    - Minimum cost spanning tree
    - Traveling salesman problem
    - Reachable nodes
    - Reaching nodes
  - Result of analysis is often a path.
    - A path has start and end nodes, and one or more links.

Oracle Spatial 10*g*
Spatial Analysis and Mining

Spatial Analysis & Mining

- Pattern Discovery Process
  - Based on spatial patterns
  - Integration with Oracle Data Mining
- Example Applications
  - Demographic analysis, customer profiling
  - Epidemiology, Site location
  - Crime or Insurance Risk analysis:
    - cluster house-holds based on high risk neighborhoods
  - Identify business prospects across a region:
    - examine the average incomes across different regions of the space



Spatial Analysis in Oracle Database 10*g*

- Spatial Analysis and Mining includes functions for:
  - Neighborhood analysis
    - Aggregates a theme layer attribute for a given area of interest (AOI)
    - Applies the overlap ratio of theme layer and AOI to the aggregated attribute
  - Spatial binning
    - Classifies data based on location
  - Spatial clustering
    - Determines patterns based on location
  - Colocation analysis
    - Determines how the location of one thing correlates to the location of something else

Oracle Locator & Oracle Spatial: Summary of 10*g* Release 2 Enhancements

Oracle Locator: 10*g* Release 2 Enhancements

- Coordinate system support for European Petroleum Survey Group (EPSG) specification
- Explicit coordinate transformations (new to Locator in 10g Release 2)
- Utility package (new to Locator in 10g Release 2)
- Tuning functions and procedures (new to Locator in 10g Release 2)

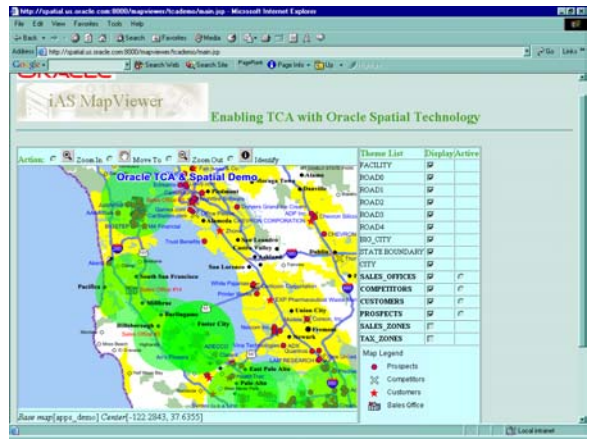
Oracle Spatial: 10*g* Release 2 Enhancements

- Coordinate system support for European Petroleum Survey Group (EPSG) specification
- eLocation Quick Start
- GeoRaster compression
  - JPEG baseline (lossy)
  - DEFLATE (lossless)
- Topology Data Model – feature level spatial transactions
- Network Data Model – PL/SQL interface for creating, editing, analyzing network data
- Routing engine support for Western Europe
- Reverse & batch geocoding
- RDF Data Model

Oracle Application Server MapViewer

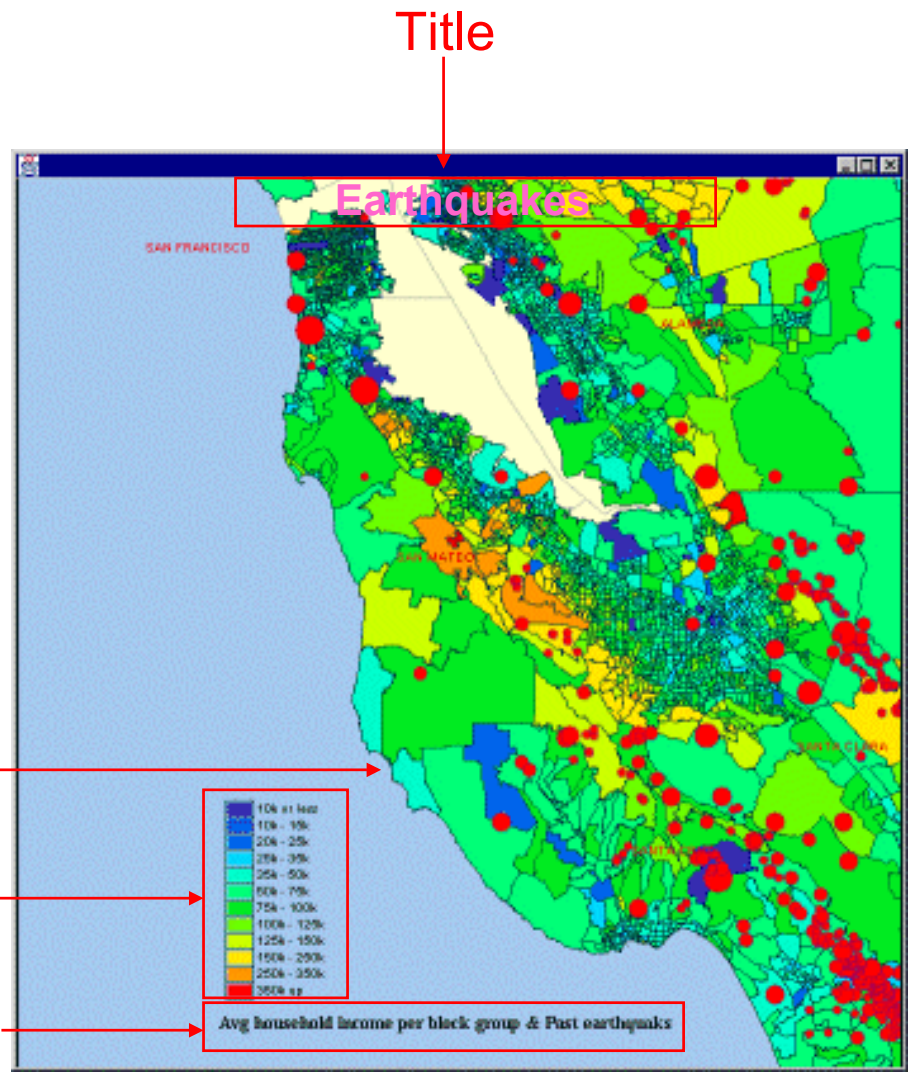
Oracle Application Server 10*g* MapViewer

- No cost feature of the Oracle Application Server
- Supports vector and raster data (SDO_GEOMETRY and SDO_GEORASTER)
  - Integrated with Oracle Locator and Spatial
- Easily publishes spatial data to the web
- Centralized managed symbology, annotation and map definition rules
- Provides an XML API, Java API, JSP Tag library and OGC WMS interface

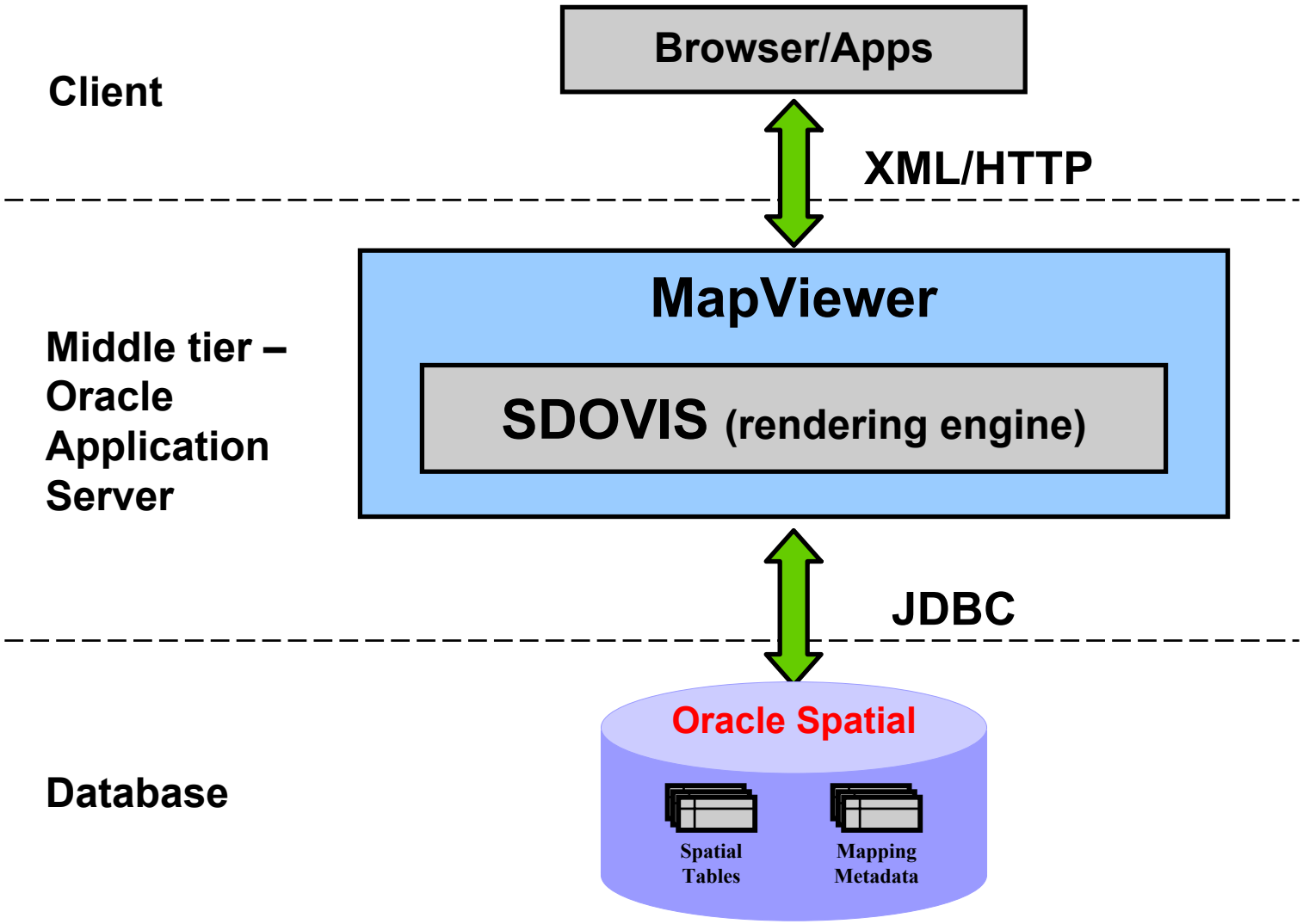


MapViewer: Map

- Renders from spatial data stored in Oracle database
- Defined as a collection of themes
- May contain a legend, title and footnote
- Users request maps using via a MapRequest
- MapViewer returns a map via a MapResponse



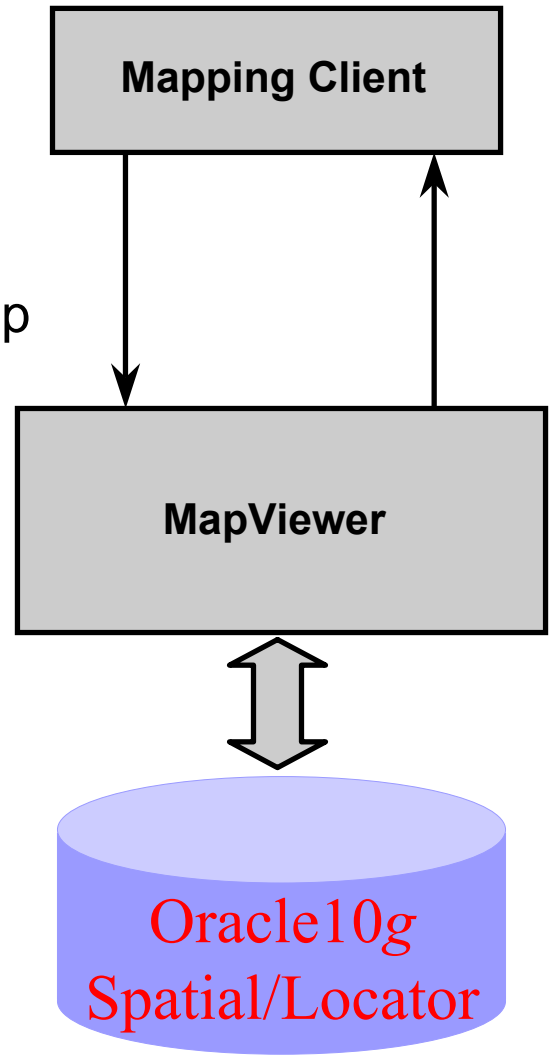
MapViewer Architecture



MapViewer Query

Map request consists of:

- Base map name
- Center of map
- Width and height of map
- Optional tags
  - map name
  - JDBC query
  - legend
  - others



Map response consists of:

- A streamed map image

or

- A URL to the map image along with the map MBR

MapViewer XML: Map Request

- XML/HTTP Based Request
- Client sends XML map request to URL of listening Map Server
- A map request element must define a data source as one of its attributes
- A map request can include a base map name, theme elements, JDBC query elements and geographic feature elements

```
<?xml version="1.0" standalone="yes"?>
<map_request
  title="Oracle LBS Map"
  datasource="mvdemo"
  basemap="demo_map"
  width="500"
  height="375"
  antialiasing="true"
  format="GIF_URL" >
  <center size="1.5">
    <geoFeature render_style="m.star"
    radius="1600, 4800"
    label="The Place"
    text_style="t.Street Name" >
      <geometricProperty >
        <Point>
          <coordinates>
            -122.2615, 37.5266
          </coordinates>
        </Point>
      </geometricProperty>
    </geoFeature>
  </center>
</map_request>
```

MapViewer XML: Map Response

- For every user-submitted map request, MapViewer sends back a Map-Response
- Contains the URL to where the generated map is located

```
<map_response>
  <map_image>
    <map_content
      url="http://mapsrus:8888/mapviewer/images/omsmap78.gif?refresh=66737789482409838" />
    <box srsName="default">
      <coordinates>  -122.9615,37.0016  -121.5615,38.0516     </coordinates>
    </box>
    <WMTException version="1.0.0" error_code="SUCCESS"/>
  </map_image>
</map_response>
```

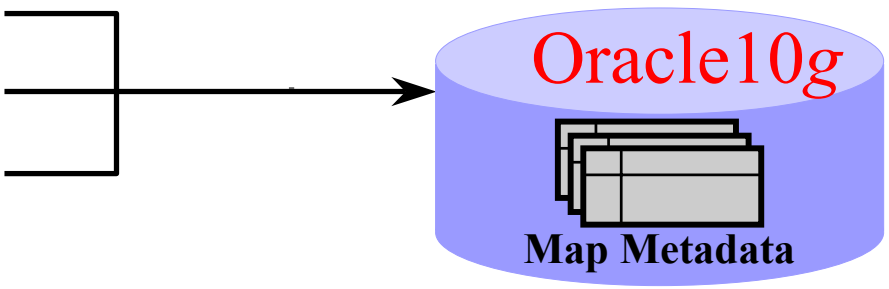
MapViewer XML: Resulting Map

MapViewer Oracle Workspace Manager Support

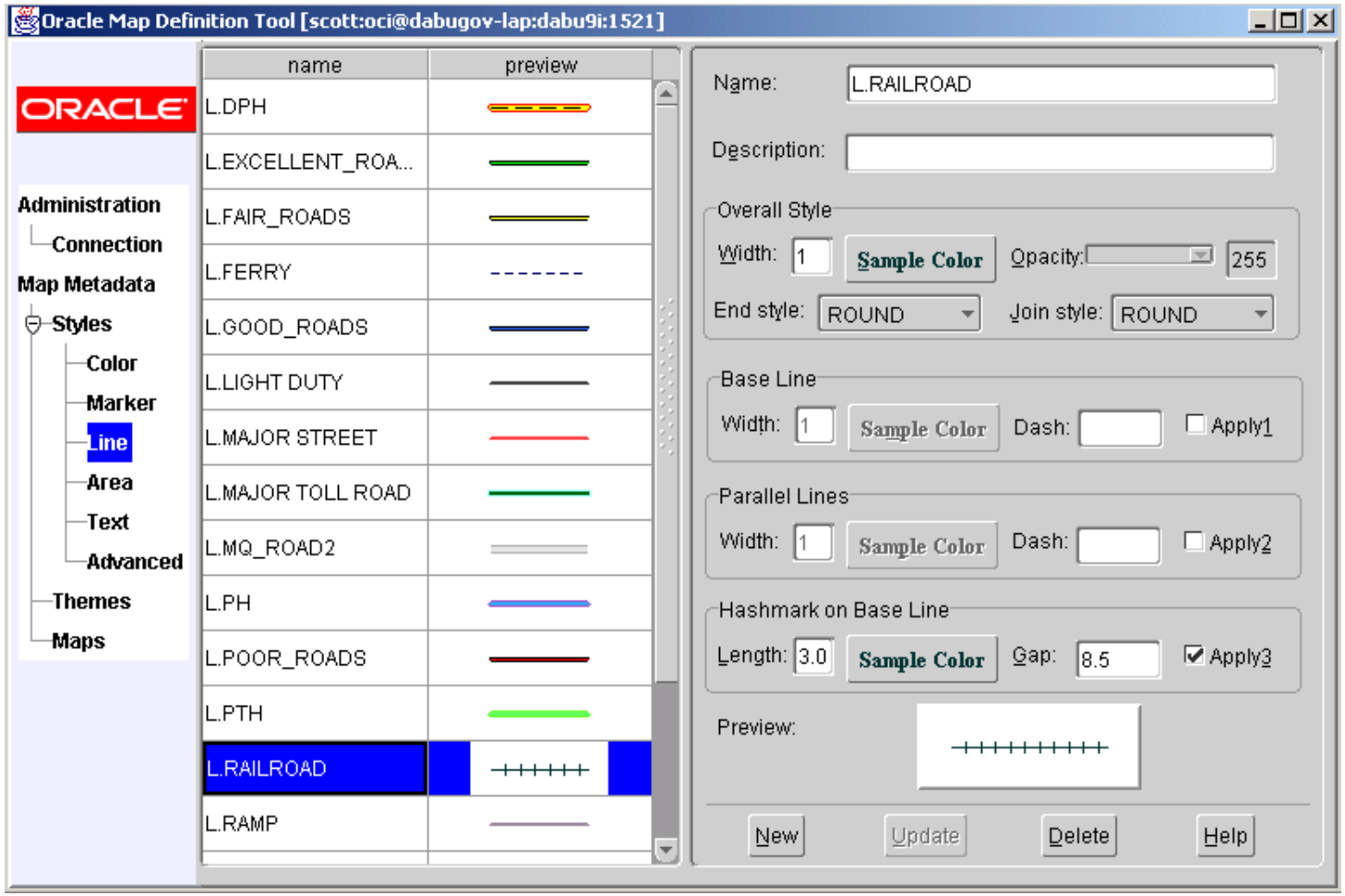
- Workspace Manager
  - Oracle Database feature that lets you version-enable one or more tables in the database
  - Users can create workspaces
  - Users can go to workspaces
  - Edits to versioned enabled tables in a workspacace, can only be seen by users in that workspace
- MapViewer supports map requests from:
  - A specific workspace
  - A savepoint in a workspace

Map Definition Tool (Manages Mapping Metadata)

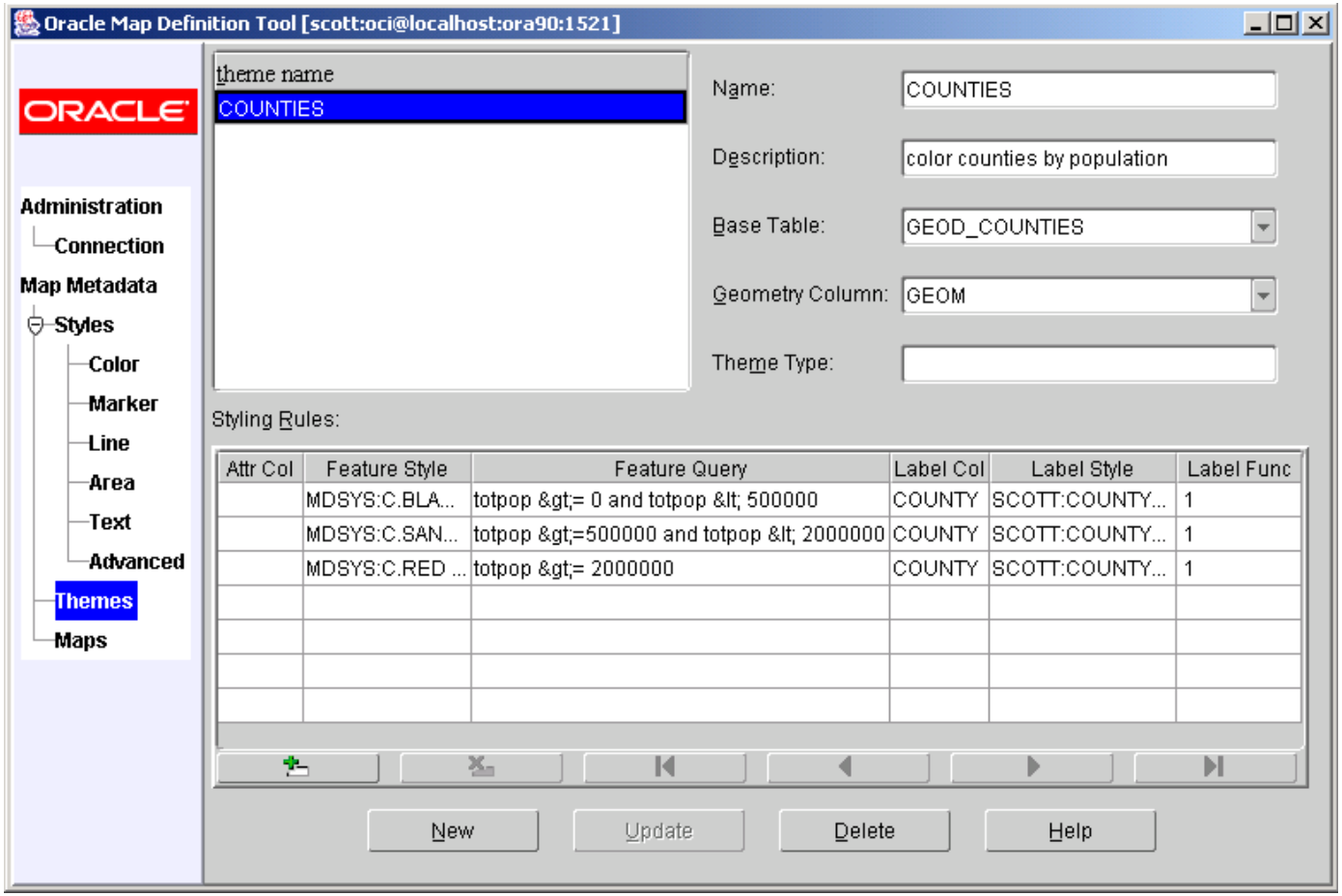
- Currently in Beta & downloadable from Oracle Technology Network
  - http://www.oracle.com/technology/products/mapviewer/index.html
  - Click on "software" on right side
- Production Map Builder Tool planned for release with upcoming release of MapViewer
- Map Definition Tool is written in Java
- Used to manage or modify the following Oracle dictionary views:
  - USER_SDO_MAPS
  - USER_SDO_THEMES
  - USER_SDO_STYLES



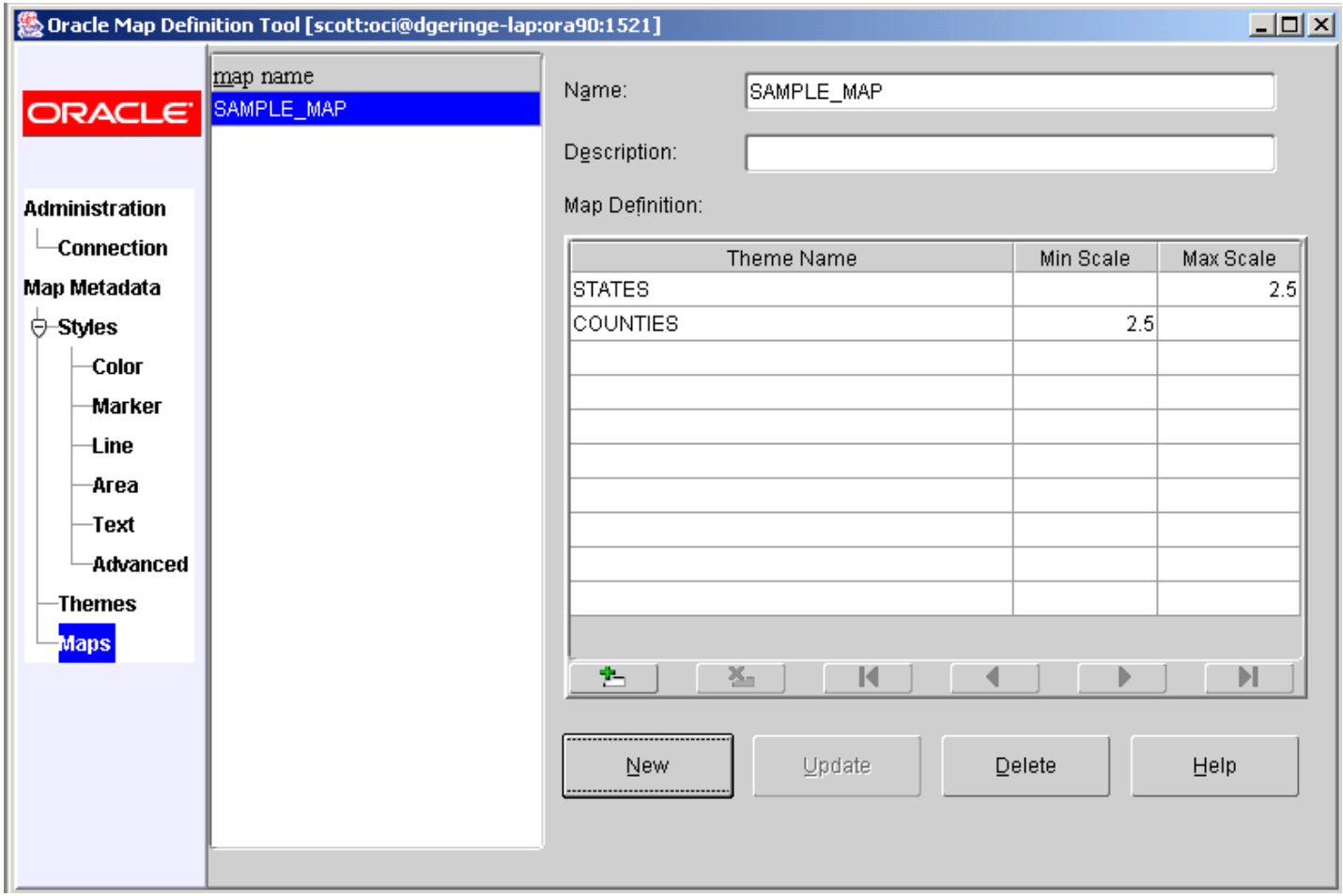
Map Definition Tool – Styles: Line



Map Definition Tool: Managing Themes

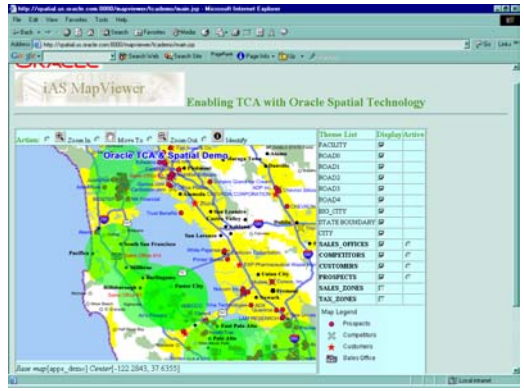


Map Definition Tool: Managing Maps



Oracle Application Server 10*g* MapViewer Enhancement Summary

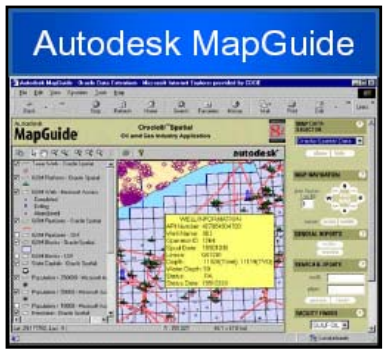
- Support for Spatial 10g features
  - GeoRaster
  - Topology data model
  - Network data model
- Workspace Manager support
- SVG, JPEG, transparent PNG, HTML imagemap support
- Open Geospatial Consortium's Web Map Service 1.1 interface
- Dynamic coordinate transformations, multiple datasources per map, and temporary styles in a map request

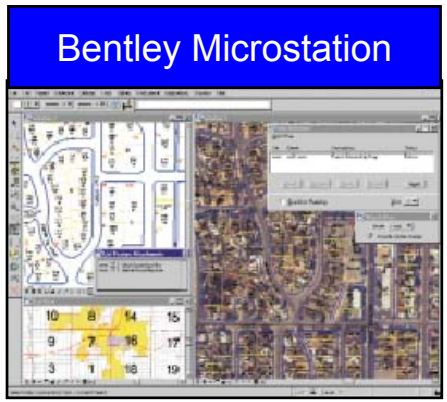


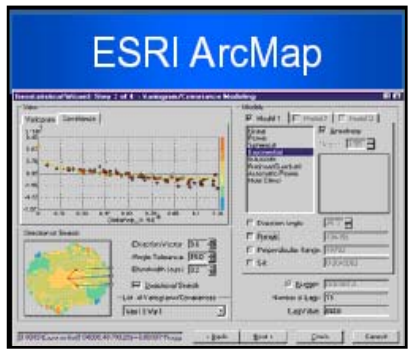
Oracle Spatial Technology Partners

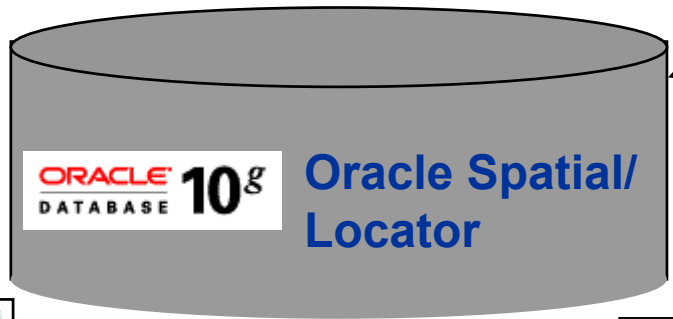
Oracle Locator, Spatial and MapViewer Partners

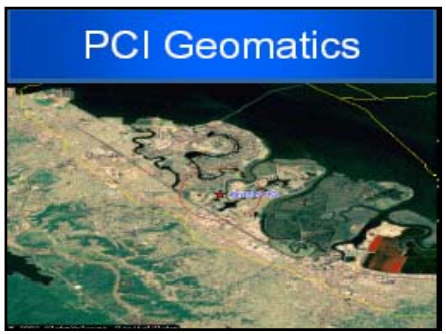
Locator and Spatial Solution Providers





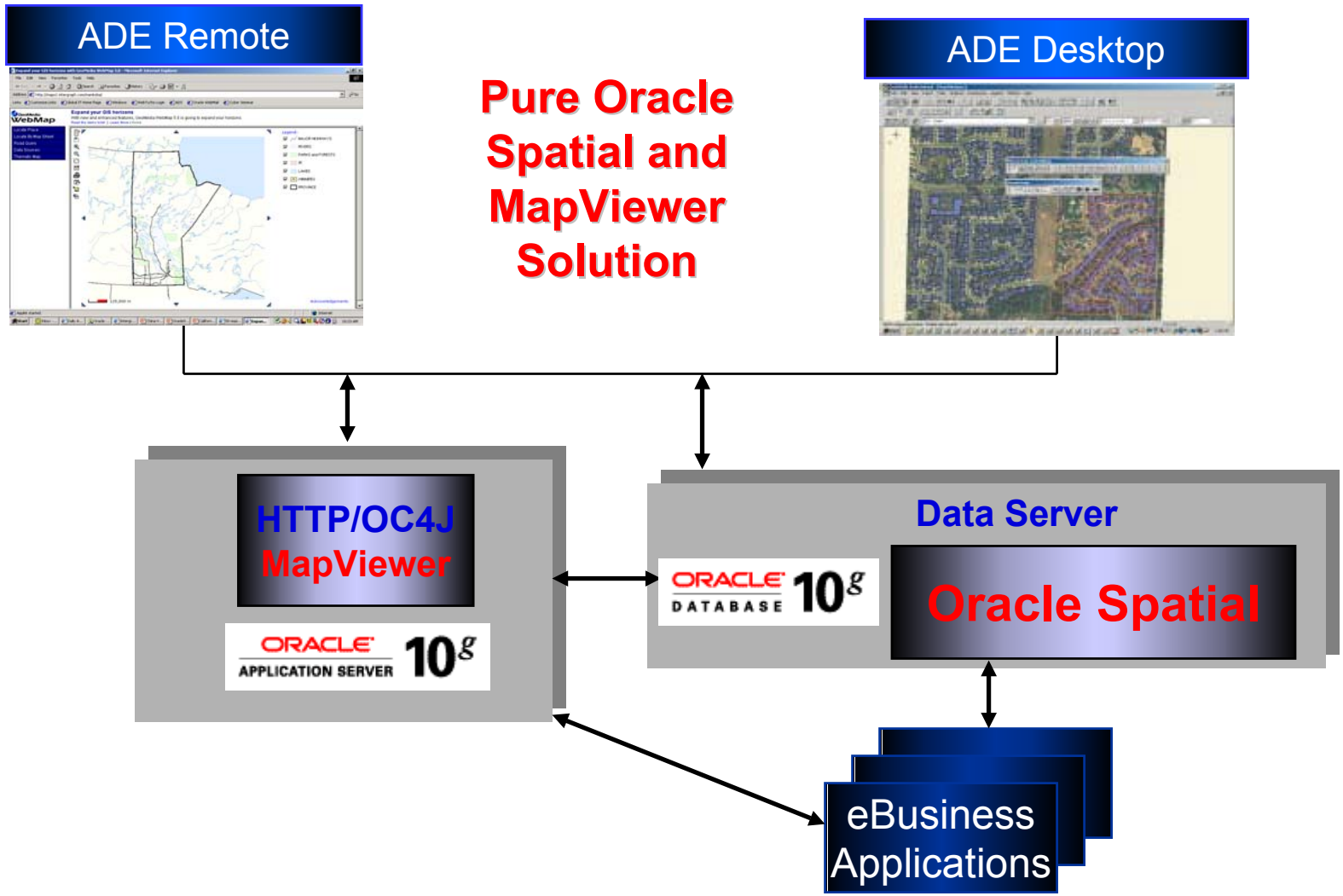




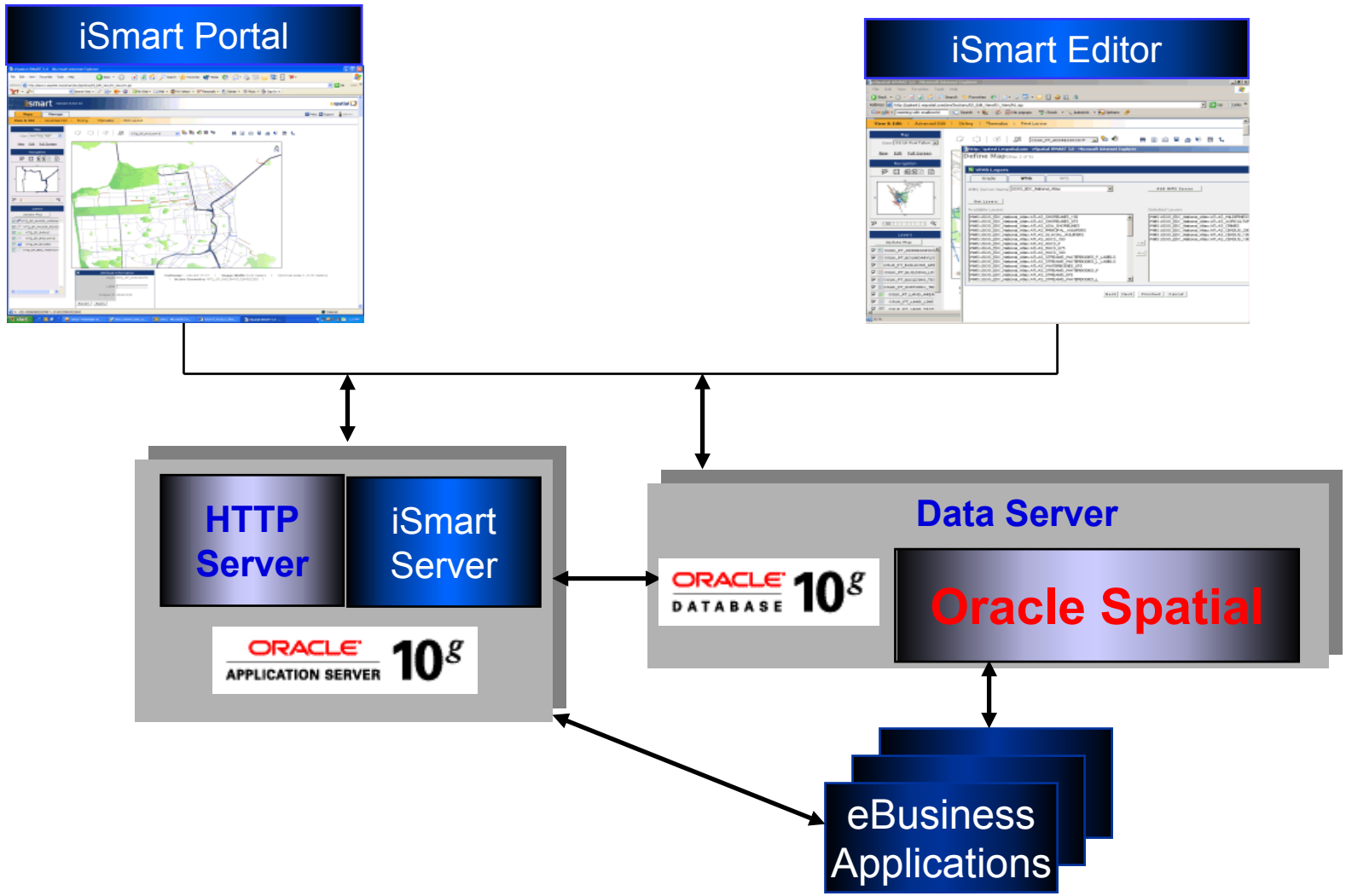


Skyline
Smallworld
Laser-Scan

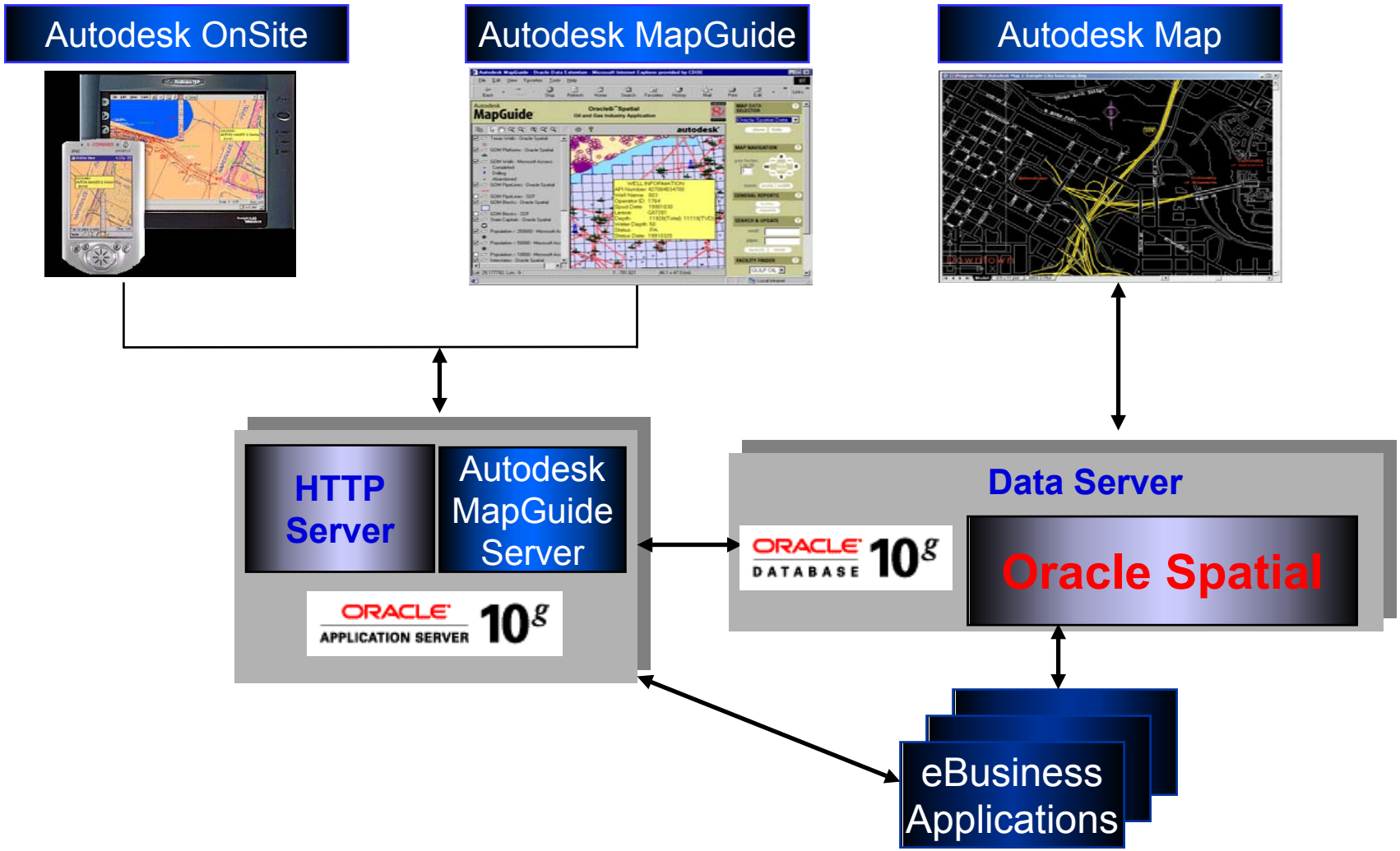
Oracle & Acquis



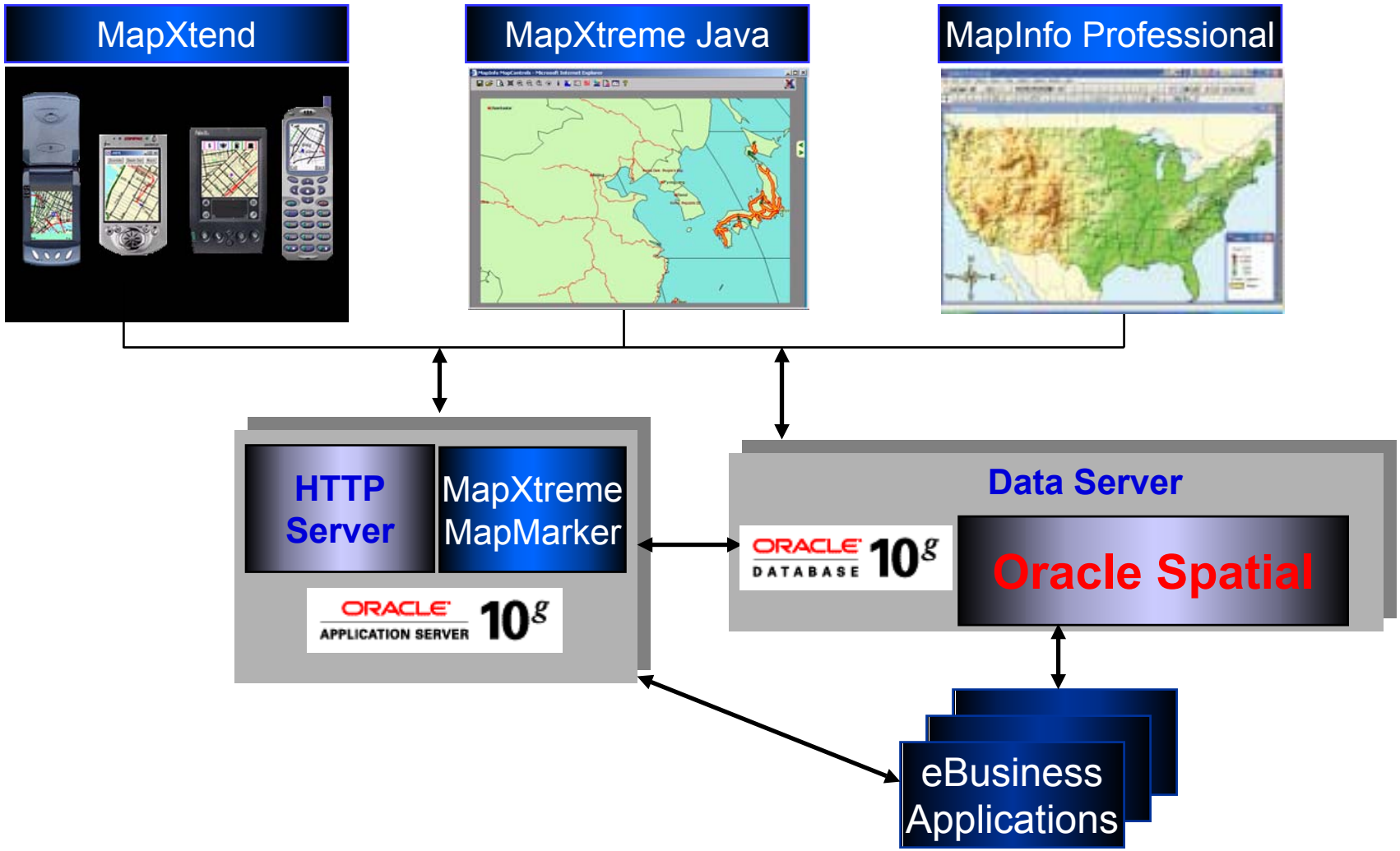
Oracle & eSpatial



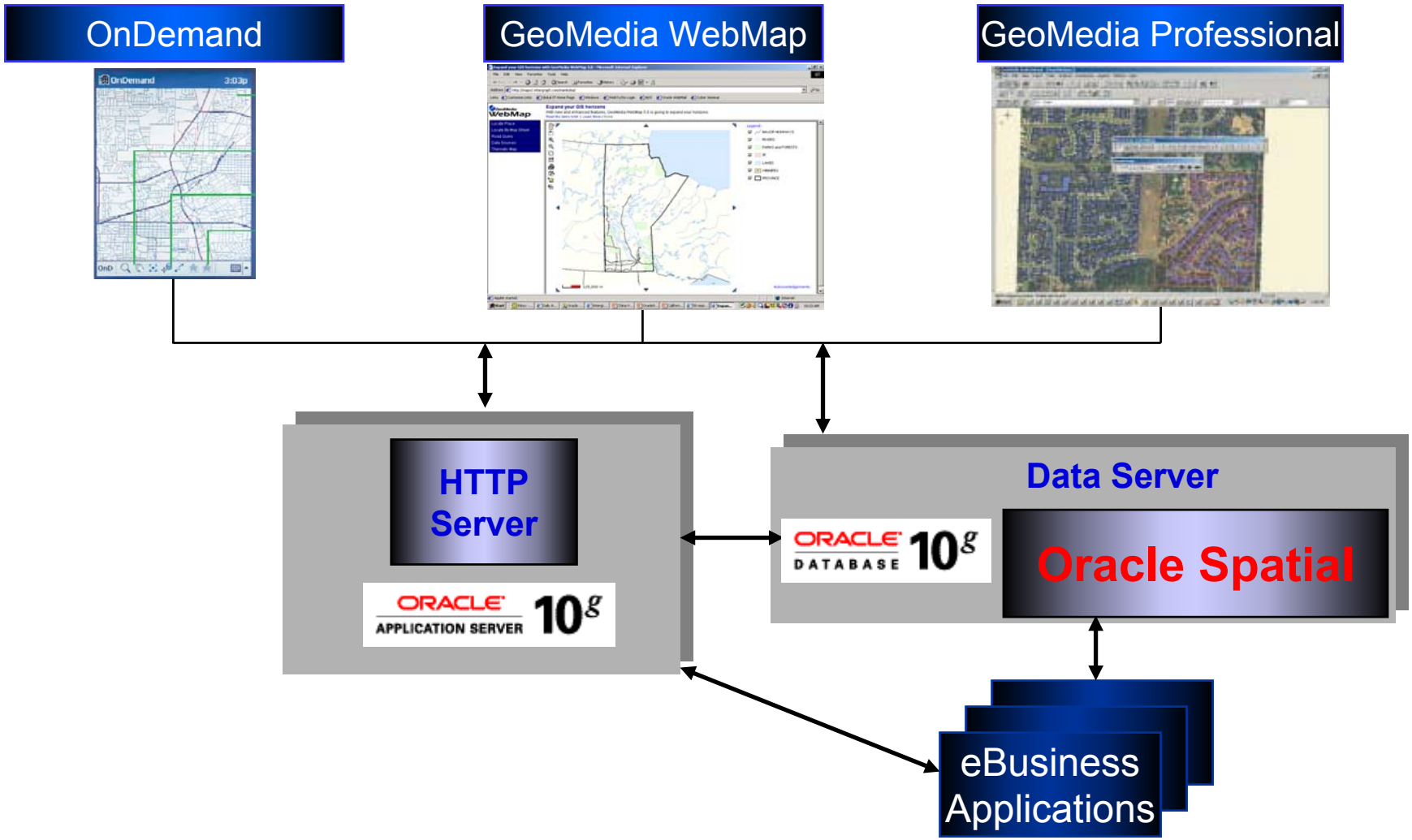
Oracle & Autodesk



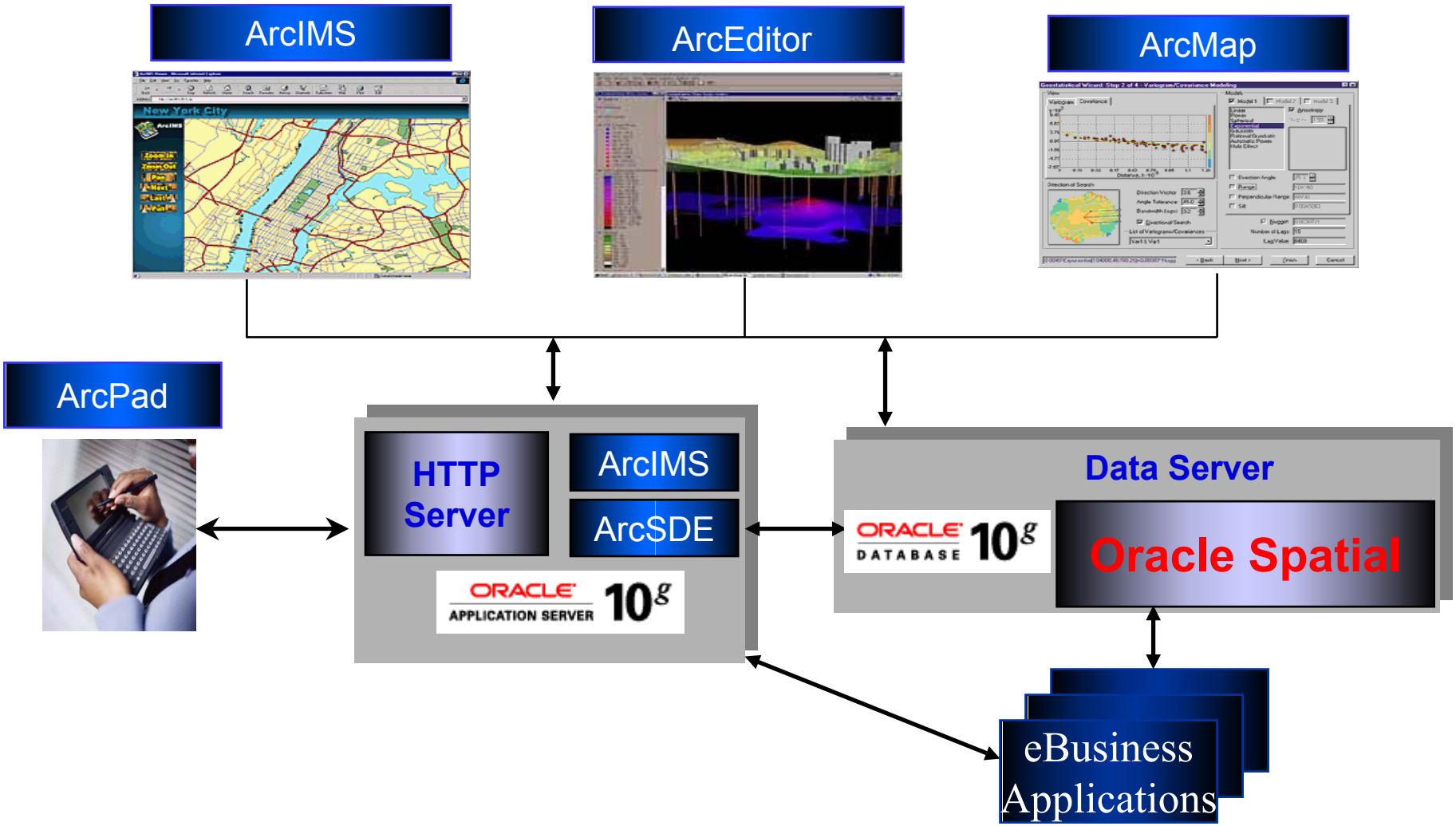
Oracle & MapInfo



Oracle & Intergraph

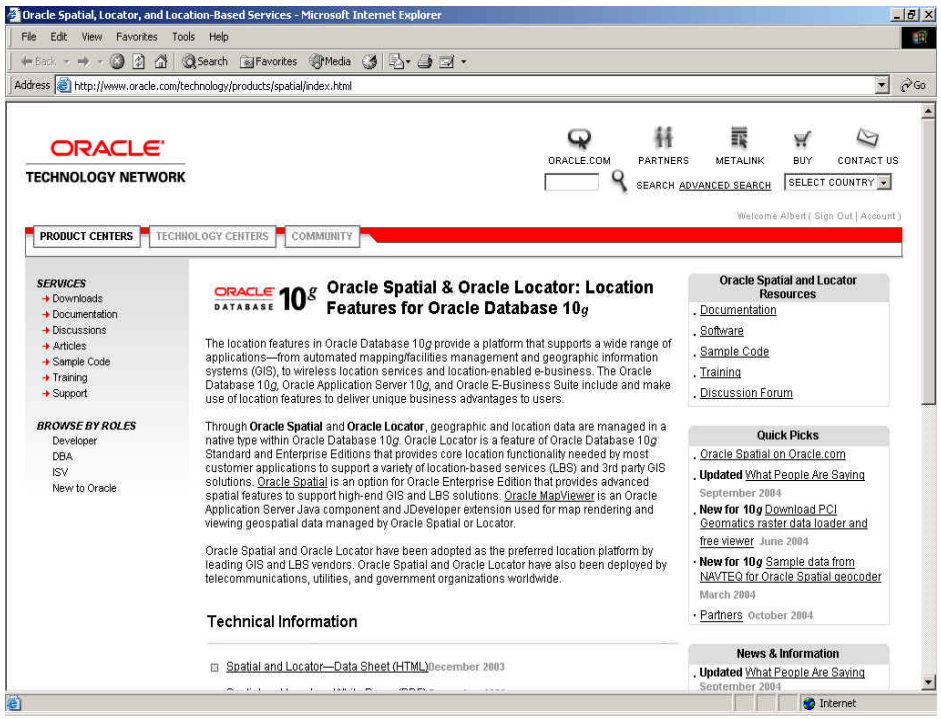


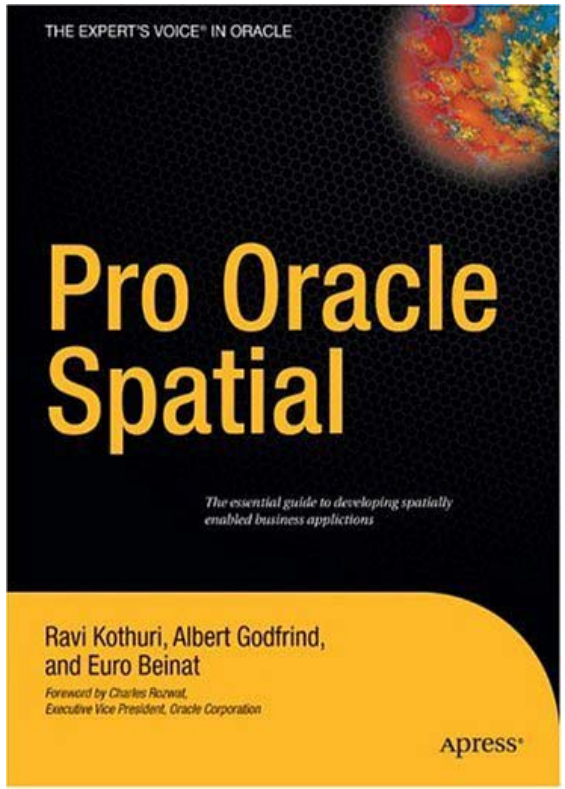
ESRI/Oracle Architecture Options



To find out more...

http://www.oracle.com/technology/products/spatial/





Examples, white papers, downloads, discussion forum, sample data, customer successes, partner information, more