How to maximize data enrichment with a single set of geospatial data ?

Version 1.5

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Generally, how to increase the value of some existing data?

- Through data enrichment
- By aggregating the existing data with other relevant data
  - Adding more context and meaning
  - e.g. aggregation of time data, location data, ...
- Reason why relational database became popular
Not recommended

Avoid creating new data silos dragging the unneeded data constantly
Requirement 1: Data aware data management, not relying on applications
Knowing what data type is being stored. Multimodel, Schema-on-Write
Requirement 2: Flexible and endless aggregation capabilities

- Easy join using SQL language
- Combined with built-in functions and operators
- Developed and tested
- Temporary objects during the operation created within the same space
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A set of custom point-to-point integration between the stovepipes (data silos)

- Each integration can be unique
- Unknown consequence in case of upgrade of one of the silos
- Unclarity on the ‘temporary’ objects during the joins
- Dubious data security, management, availability and scalability
Oracle **Converged Database**
Multimodel + Multi workload (OLTP & Analysis/Data Warehouse)

- **Native Binary JSON**
  Collections of OSON encoded documents
  NoSQL like API

- **Blockchain tables**
  Tamper resistant rows

- **Relational**
  Data stored as rows

- **Spatial**
  Data stored as geometry (GeoJSON compatible)

- **In-Memory analytics**
  Data as columns in RAM and rows on disk
  (in columns on Exadata infrastructure)

- **Graph**
  Data as property graph or RDF

- **In-Database Machine Learning**
  Create and use Models in SQL, PL/SQL, R and Python

- **REST Data Services**
  Data from tables, collection, SQL queries...
  exposed as REST APIs

- **Text Data**
  Binary data: PDF, DOCX, PPTX...

- **XML**
  Data stored as XML

- **External Data**
  External data can be accessed: csv, json, avro, parquet, orc, hdfs, hive, S3, Azure BLOB, GCP...
Oracle provides support for all the common data types each at the top level
Write once, read many

- Endless combination (join) capability
- **Maximum data reusability**
- Join driven by the application
  - Using database languages of SQL & PL/SQL
  - Supported by built-in operators & functions
  - Each combination is no hard integration, just to serve one application
  - Application written in the developer's favorite language (Java, .Net, Python, node.js, C++, ...)
- The operation entirely within Oracle Database
  - In-database data integration process protected by the database
- One single data set can lead to multiple data enrichment
  - Providing additional context to each data set
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One single SQL statement for fetching relational + text + spatial data
Using Oracle’s predefined and built-in operator / function

```sql
SELECT count(p), p.age, p.xray
FROM patients p, cities c
WHERE p.age > 50
AND c.name = 'Apeldoorn'
AND SDO_WITHIN_DISTANCE(p.loc, c.loc, '<= 35 km')
AND Contains(p.medical_history, 'covid AND cancer') >0
```

Oracle Spatial operator

Oracle Text index operator

Intended for application displaying a map with annotation text from reusable text content table
Oracle Spatial Analysis: 100’s of built-in SQL spatial analysis operators

- Filter
- Combine
- Transform
- Measure
Spatial features of Oracle Database

Deployable Components

- Mapping
- Geocoding
- Routing
- Web Services (OGC)
- Studio

Oracle

- Points
- Lines
- Polygons
- Location Tracking (Geofencing)
- Networks
- Raster
- 3D / LiDAR
- Topologies
- Spatial Geocoding
- Linear Referencing

Address Geocoding

Location Tracking

Routing
Rich choice of front-end application environment

Oracle Spatial Studio
(with built-in geocoder)

Oracle Map Visualization
(f.k.a. MapViewer)

Oracle Analytics Server &
Oracle Analytics Cloud

Any low-code custom application using
Oracle Spatial built-in functions & operators
Oracle Spatial Studio: Also for the non-geospatial specialized analysts
Summary

• Geospatial data can add essential context to data set
• Each data enrichment can lead to new insight
• Using the appropriate technology one can achieve data enrichment repeatedly with a single geospatial data
• Oracle Database with its converged database feature is one of such data management platforms capable of combining any data type
• Maximized data reuse leads to lower costs and higher data quality