Welcome to your AskTOM Office Hours session!

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AskTOM Office Hours: Spatial & Maps in Oracle Database

https://asktom.oracle.com/pls/apex/asktom.search?oh=7761

- Explore location and geospatial features and map tools - *free* in Oracle Database
- Monthly sessions include demos, use cases, tutorials to jumpstart your development
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**Upcoming sessions:**

- **Graph Database and Analytics : Graph Algorithms: The Core of Graph Analytics (Pacific time zone)**
  Melli Annamalai - Senior Principal Product Manager
  August 27 01:00 UTC

- **Oracle Application Express (APEX) : Location matters! Map Visualization for APEX developers**
  Joel Kallman - Senior Director, Software Development
  September 17 14:00 UTC
The Spatial & Graph User Community
Part of Analytics and Data User Community

- Vibrant community of tech enthusiasts – customers, partners, students
- Sharing knowledge online, and at conferences and events.
- Global – Americas, Europe, Africa, Asia

Join us

LinkedIn Oracle Spatial and Graph group [linkedin.com/groups/1848520/](https://www.linkedin.com/groups/1848520/)

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Spatial and Maps in Oracle Database Office Hours

Python and Autonomous Database: Better together for Location Analytics

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Product Manager
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Director of Product Management
Oracle Spatial and Graph
Everything happens somewhere!

Systems manage incidents, events, activities.

Are events occurring within a mile of each other? Which is the nearest? Which tax zone is this in? Where can we deliver within 35 minutes? Is this built in a flood zone?

Where are the unemployment hot spots? Are traffic crashes distributed randomly or correlated with location? What is the predicted future trend in home prices based on trends over time in surrounding regions?
Agenda

• Spatial in Autonomous DB
• Spatial libraries in Python
• Demo; best of both worlds
Spatial in Oracle Database

- **Deployable Components**
  - Points
  - Lines
  - Polygons
  - Location Tracking (Geofencing)
  - Networks
  - Topologies

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

- **ORACLE**
- **Raster**
- **3D / LiDAR**
- **Address Geocoding**
- **Linear Referencing**

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The following are not enabled on Shared: geocoder, 3D, ndm, georaster, topology, to/from_gml/kml, from_wkt/wkb, pt cloud/tin, gml, geo_search. Buffer and georaster are being enabled with ongoing ADW update based on 19c database. Access to ORACLE_HOME is restricted so the following deployable components are not provided: ndm, routing engine, spatial viz, web-based geocoder, ogrc services. We plan to provide these on the Cloud Marketplace.
Robust Python geospatial library ecosystem

GeoDjango - Django geographic web framework.
Landsat-util - Landsat-util is a command line utility that makes it easy to search, download, and process Landsat imagery.
Rasterio - Rasterio employs GDAL under the hood for file I/O and raster formatting.
Rasterstats - Python module for summarizing geospatial raster datasets based on vector geometries.
PyQGIS - Python for QGIS.
GeoPandas - Python tools for geographic data.
Shapely - Manipulation and analysis of geometric objects in the Cartesian plane.
mapboxgl-jupyter - Use Mapbox GL JS to visualize data in a Python Jupyter notebook.
Cartopy - A library providing cartographic tools for python for plotting spatial data.
Rtree - For efficiently querying spatial data.
geospatialalchemy - Using SQLAlchemy with spatial databases.
geopy - geopy is a Python 2 and 3 client for several popular geocoding web services.
Fiona - For making it easy to read/write geospatial data formats.
PySAL - For all your spatial econometrics needs.
Descartes - Plot geometries in matplotlib.
PyShp - For reading and writing shapefiles.
PyProj - For conversions between projections.
chupaESRI - ChupaESRI is a Python module/command line tool to extract features from ArcGIS Server map services.
geosio.py - Open GeoJSON data on geojson.io from Python. geojsonio.py also contains a command line utility that is a Python port of geojsonio-cli.
ogcserver - Python WMS implementation using Mapnik.
RSGISLib - The Remote Sensing and GIS software library (RSGISLib) is a collection of tools for processing remote sensing and GIS datasets. The tools are accessed using Python bindings or an XML interface.
OSMnet - Tools for the extraction of OpenStreetMap street network data.
geosio-area - Calculate the area inside of any GeoJSON geometry. This is a port of Mapbox's GeoJSON library for Python.
GeoDaSpace - Software for Advanced Spatial Econometrics.
Verde - Verde is a Python library for processing spatial data (bathymetry, geophysics surveys, etc) and interpolating it on regular grids (i.e., gridding).

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Key geospatial libraries

Shapely
• Geometric object manipulation and analysis (cartesian)
• Handles standard formats (JSON, WKT, WKB)

GeoPandas
• Extends Pandas for geospatial (GeoDataFrame)
• Uses Shapely geo types/operations
• Uses add’l packages for i/o, plotting

PySAL
• Geospatial data science library
• Geostatistical, spatio-temporal, exploratory analyses (vast)
• i.e. spatial autocorrelation, spatial econometrics
cx_Oracle module

• Robust access to Oracle Database from Python
• Handles advanced features and data types
  - Object types (i.e. SDO_GEOMETRY), LOBs, JSON
  - SODA (Simple Oracle Document Access)
  - Array operations
  - Cursor support
  - Advanced Queuing
  - too much more to mention here...
• https://oracle.github.io/python-cx_Oracle/
Demo

Wrap-up

- Oracle Autonomous Database includes spatial data management, processing, and analysis
- Python ecosystem provides modules for specialized spatial analysis and data science
- Combining them is straightforward and effective
Resources - Oracle Database – Spatial Features

- Spatial Features Homepage: oracle.com/goto/spatial
- Map Visualization: bit.ly/OracleMapViz
- YouTube Channel: youtube.com/c/OracleSpatialandGraph
- Blog: blogs.oracle.com/oraclespatial
- LiveSQL tutorial (write spatial queries on 19c in 5 mins!): bit.ly/LiveSQLSpatial
- Oracle Spatial and Graph User Group: linkedin.com/groups/1848520/
- Twitter: @SpatialHannes @JeanIhm @oraspatsig
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