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Course code: **SPATIAL**

Course title: **Management of spatial data in Oracle Spatial**

Days: 3

Description:

**Course intended for:**

The training is intended for beginner programmers and administrators wishing to get familiar with the topic of spatial data and its functioning in the Oracle Database 11g.

**Course objective:**

The training objective is to get the participants familiar with theoretical and practical aspects of supplying, storage, edition, analysis and sharing of spatial data using Oracle Spatial in the Oracle Database 11g.

The training participants will learn to do the following in Oracle Database 11g:

- Import spatial data
- Effectively store and manage spatial data stored in the object-relational structure
- Edit, analyze and process spatial data using in-built Oracle Spatial mechanisms
- Export spatial data and make it available in standard formats

After the training, the participants will be able to use Oracle Database 11g on their own with Oracle Spatial in all processes associated with spatial data.

**Requirements:**

The participants are required to have the basic knowledge on SQL and relational databases. The learning process will be easier for those having basic knowledge of geographic information systems and PL/SQL.

**Course parameters:**

3*8 hours (3*7 net hours) of lectures and workshops (with a visible emphasis on workshops).

Group size: no more than 10 participants.

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Course curriculum:

1. Introduction - what is GIS
2. Oracle Spatial in the Oracle Database 11g
    - Object-relational model of spatial data
    - Geometry types
    - R-Tree type indexes
    - Spatial operators, procedures and functions
    - GeoRaptor for SQL Developer
3. Spatial data in the database
    - SDO_GEOMETRY type
    - SDO_GEOMETRY constructors and methods
    - Geometry metadata
4. Data import to database
    - Use of the INSERT instruction
    - Data loading from Shapefile format files (Oracle Map Builder)
5. Spatial indexes
    - Spatial index development
    - Spatial index structures
6. Spatial queries
7. Systems of coordinates in the database
    - SRID and EPSG
    - Geodetic and Projected type systems

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8. Linear Referencing
    - LRS data model
    - LRS data development
9. Analysis, edition and processing of spatial data in the database
    - Spatial operators and the philosophy of their use (ANYINTERACT, CONTAINS, COVEREDBY, COVERS, EQUAL, FILTER, INSIDE, JOIN, NN, ON, OVERLAP, RELATE, TOUCH, WITHIN_DISTANCE)
    - Type aggregation functions SDO_AGGR (CENTROID, CONCAT_LINES, CONVEX_HULL, MBR, SET_UNION, UNION)
    - Edition and analysis of geometric models
    - Geometric operations such as OR, AND, MINUS, XOR,
    - Other functions from the package of SDO_GEOM (RELATE, ARC_DENSIFY, AREA, BUFFER, CENTROID, CLOSEST_POINTS, CONVEXHULL, CONCAVEHULL, DISTANCE, LENGTH, TRIANGULATE)
    - Data operations such as LRS (LOCATE_PT, SEGMENT_START_PT, SEGMENT_END_PT, FIND_MEASURE)
    - Geometric object operation support – the SDO_UTIL package
    - Geometric data validation
    - Conversion between SDO_GEOMETRY and GML, KML, WKT
    - Other functions from the package SDO_UTIL (AFFINETRANSFORMS, APPEND, CONVERT_UNIT, EXTRACT, EXTRACT_ALL, GETNUMELEM, GETNUMVERTICES, GETVERTICES, POLYGONTOLINE, REMOVE_DUPLICATE_VERTICES, REVERSE_LINESTRING, SIMPLIFY)
    - Geometry transformations between coordinate systems
    - TIN networks
10. Oracle GeoRaster
    - Raster data model in Oracle Spatial
    - Channels, layers, metadata

- georeference
- pyramids
- loading and export of raster data
- raster indexing
- operations on raster data- package SDO_GEOR,

11. Spatial data export
    - Use of external applications and libraries (GDAL/OGR, OpenJUMP, QuantumGIS)