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Updated on 27/06/2025

Sign up

PostGIS training with PostgreSQL

3 days (21 hours)

Presentation

Master the geospatial capabilities of PostgreSQL with our PostGIS training, designed to make you fully operational in managing, analyzing and exploiting spatial data. You'll learn how to store GPS coordinates, query distances, manipulate complex geometries and integrate this data into modern business and mapping applications.

You'll start by installing PostGIS, configuring geographic types and creating your first spatial tables. The aim is to quickly understand the fundamental concepts of geolocalized data and handle your first GIS queries.

You'll then explore the powerful spatial functions of PostGIS: distance calculations, inclusion in zones, intersections, buffers and more. You'll learn how to optimize your queries with GIST indexes and structure efficient data models.

An entire module will be dedicated to integration with GIS tools such as QGIS or Leaflet, to visualize your data on maps, manipulate it dynamically and expose it via a modern REST API.

Like all our training courses, this one is based on the latest stable version of PostGIS.

Objectives

- Understand the fundamental concepts of spatial databases and the benefits of the PostGIS extension in PostgreSQL.
- create, manipulate and query geometric and geographic objects
- Master essential spatial functions and optimize performance with GIST indexes
- Integrate geospatial data into third-party tools such as QGIS, Leaflet or Mapbox, and design geolocalized REST APIs
- Be able to import, transform and exploit real spatial data, in a production-ready production-ready architecture

Target audience

- Backend developers
- Fullstack developers
- Data engineers

Prerequisites

- Good command of SQL
- Basic command line skills

PostGIS with PostgreSQL training program

Introduction to PostgreSQL and PostGIS

- Introduction to PostgreSQL
- Data types, indexes, SQL queries
- Client/server architecture
- Definition of a Geographic Information System
- The role of PostGIS in the PostgreSQL ecosystem
- Use cases: geolocation, logistics, environment, urban planning
- Installing PostgreSQL and PostGIS on Linux / Windows / Docker
- Activate PostGIS extension: CREATE EXTENSION postgis
- Check available versions and components

Geometric and geographic types

- GEOMETRY vs GEOGRAPHY: differences and choices
- Types : POINT, LINESTRING, POLYGON, MULTI*, GEOMETRYCOLLECTION
- SRID, focus on 4326
- ST_GeomFromText(), ST_Point(), ST_MakeLine(), etc.
- WKT (Well-Known Text) and WKB (Well-Known Binary) formats
- Spatial fields in PostgreSQL tables

Spatial queries

- ST_Distance, ST_Within, ST_Intersects, ST_Contains, ST_Touches
- Spatial proximity queries: radius, buffer, neighborhood
- Spatial comparison: equality, overlap, inclusion
- Find points close to a given point
- Calculate distances in meters with GEOGRAPHY
- Create buffer zones: ST_Buffer()
- GIST vs. SP-GIST index
- Creating a spatial index: CREATE INDEX ... USING GIST

- Performance analysis with EXPLAIN ANALYZE

Advanced geometry manipulation

- ST_Transform(): change projection
- ST_Simplify(), ST_Segmentize(), ST_SnapToGrid()
- Centroid and envelope generation : ST_Centroid(), ST_Envelope()
- ST_Union(): merge geometries
- ST_Collect(): group multiple entities
- Area, length and perimeter calculations

Integration with GIS tools

- Connection to a PostgreSQL database with PostGIS
- Visualization of spatial layers
- Executing spatial queries from QGIS
- Structure of a REST API with spatial data
- Backend spatial queries
- Interactive map display

Real data and exchange formats

- shp2pgsql: import a Shapefile
- ogr2ogr: format conversion
- GeoJSON export: ST_AsGeoJSON()
- Understanding EPSG/SRID and transformations
- WKT ? GeoJSON ? SHP CONVERSION
- Loading OpenStreetMap or IGN data

Business use cases and projects

- Geolocation and point-of-interest search
- Mobility analysis
- Urban planning: zoning, intersection with cadastre
- Natural hazards: flood zones, fire, seismic
- Spatial database modeling
- Creation of APIs to search for locations by radius
- Interactive map visualization

Best practices and performance

- Choosing between GEOMETRY and GEOGRAPHY
- Proper use of indexes and spatial joins
- Partitioning and spatial filtering
- Rights on spatial tables
- Role management for viewing and editing

- Change logging

Going further

- Raster data support
- Raster functions: ST_Value(), ST_MapAlgebra()
- 3D data and TIN objects, PolyhedralSurface
- pgRouting: route calculation
- TopoJSON and TopoGeometry
- PostGIS Viewer, GeoServer, CARTO, Superset

Companies concerned

This training course is aimed at both individuals and companies, large or small, wishing to train their teams in a new advanced computer technology, or to acquire specific business knowledge or modern methods.

Positioning on entry to training

Positioning at the start of training complies with Qualiopi quality criteria. As soon as registration is finalized, the learner receives a self-assessment questionnaire which enables us to assess his or her estimated level of proficiency in different types of technology, as well as his or her expectations and personal objectives for the forthcoming course, within the limits imposed by the selected format. This questionnaire also enables us to anticipate any connection or security difficulties within the company (intra-company or virtual classroom) which could be problematic for the follow-up and smooth running of the training session.

Teaching methods

Practical training: 60% hands-on, 40% theory. Training material distributed in digital format to all participants.

Organization

The course alternates theoretical input from the trainer, supported by examples, with brainstorming sessions and group work.

Validation

At the end of the session, a multiple-choice questionnaire verifies the correct acquisition of skills.

Certification

A certificate will be awarded to each trainee who has completed the entire course.