

Improving the performance of spatial joins with QadKeys

One of the challenges of every model of analytics and spatial big data is how to improve the spatial joins. Despite the recent advancements in **PostgreSQL + Post GIS**, it's always recommended to have additional alternatives handy. Among the several improvement strategies we applied the **QuadTree Keys** also known as **QuadKeys**.

In order to use the **QuadKeys** it is required that the area that will be analyzed is defined (in our case, the planet), and take it to a spatial definition of **2 dimensions** and generate a grid. As an example, when using MODIS satellite, we generate a **grid** over the map breaking it down to smaller square polygons, that we denominate **pixels**. These are squares of 256 by 256 meters.

Once the grid is completed, we end up with a count of pixels which we then **organize based on their position within the structure**. We proceed to assign a number to each one, creating a unique identifier, and that is called the **QuadKey**.

Advantages

The QuadKeys optimize the indexing and storage of the data when used as a key field in our B-tree indices, once:

- It's more efficient to produce a join by match using a full field type instead of a geography (Point) field. The former requires a function `St Equals(Polygon, Polygon)`.
- The QuadKey field in bigint format uses almost 4 times less storage than a Geography (Point) field.
- The B-tree index over the QuadKey field uses half of the storage compared to a GIST index over the same Geography (Point) field.
- The QuadKeys preserve the pixels proximity in space. Basically it means that the pixels closer to each other in space will have closer numbers. This improves the performance of our data bases even more, once the pixels that are near each other are consulted together and would be stored in the same block in the disc, minimizing the readings on the discs when running our queries.

Note: On 11/07/2018 this case is underdevelopment and will be expanded further later.