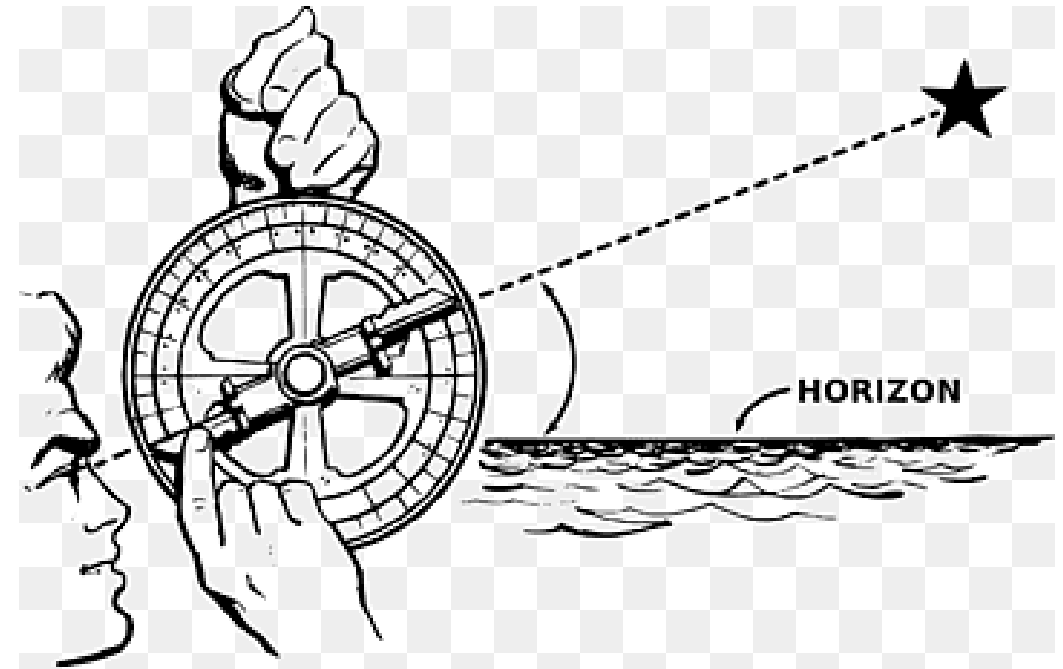




2021

# Criando uma API de Geo Localização com C# e Sql Server

Márcio Rogério Nizzola

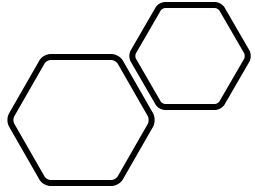




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**Técnico em Proc. De Dados - 1989**  
**Técnico em Proc. de Dados – 91-92**  
**Análise de Sistemas – 94-98**  
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Tecnologias: C#, Java, Angular, Python, Php,  
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Cobol, Pascal, Basic, Sql Server, My Sql, Oracle.



ItuDevelopers®

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Comunidade com 2 anos já organizou 7 Meetups,  
Palestras e Lives (TechChat).

<https://www.meetup.com/pt-BR/Itu-Developers>





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# Situação Problema

---

Com o avanço das aplicações na atualidade, precisamos realizar buscas identificando locais ou pessoas através do seu posicionamento geográfico.

Isto intensificou-se mais ainda com o uso da aplicações Mobile, onde todos os celulares já dispõem de GPS embutido.

Com isto passamos a ter listas de lugares e pessoas, e precisamos identificar pontos de interesse próximos à estas posições geográficas.

Exemplo: Apps de Hotéis, Comida, Entregas, Motoristas dentre outros.





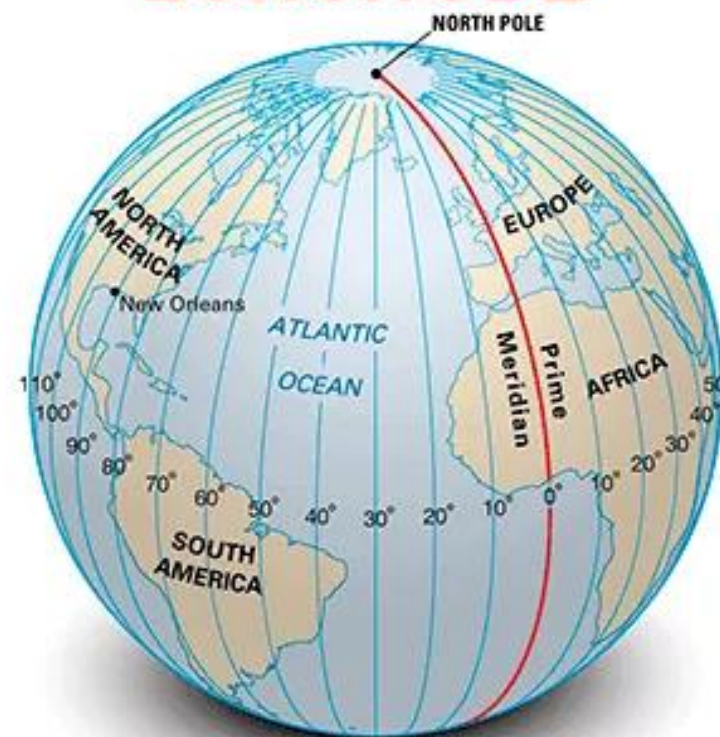
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Vamos  
entender o  
contexto da  
Geo  
Localização

## LATITUDE



## LONGITUDE



Como fazer para  
consultar um  
determinado  
ponto no mapa  
utilizando a  
tecnologia  
disponível ?



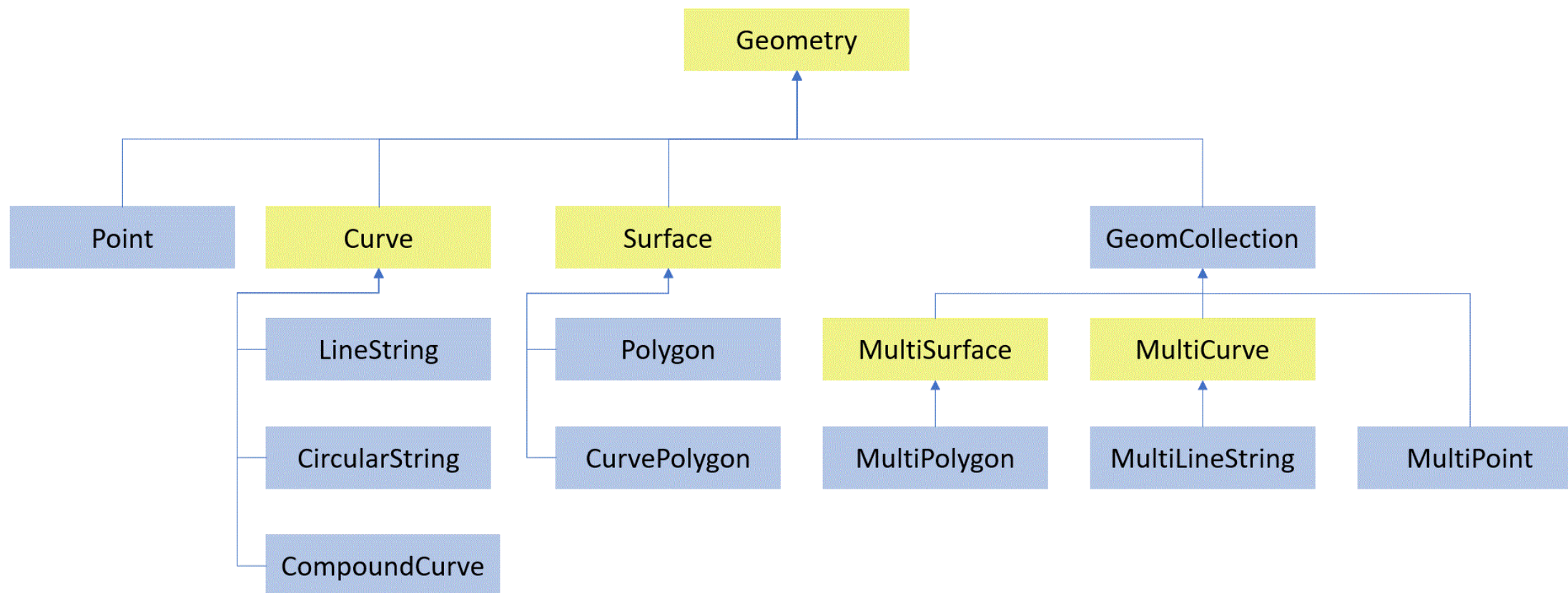
O Sql possui dois tipos de dados que poucos conhecem:

Geometry = utilizada para dados Geométricos

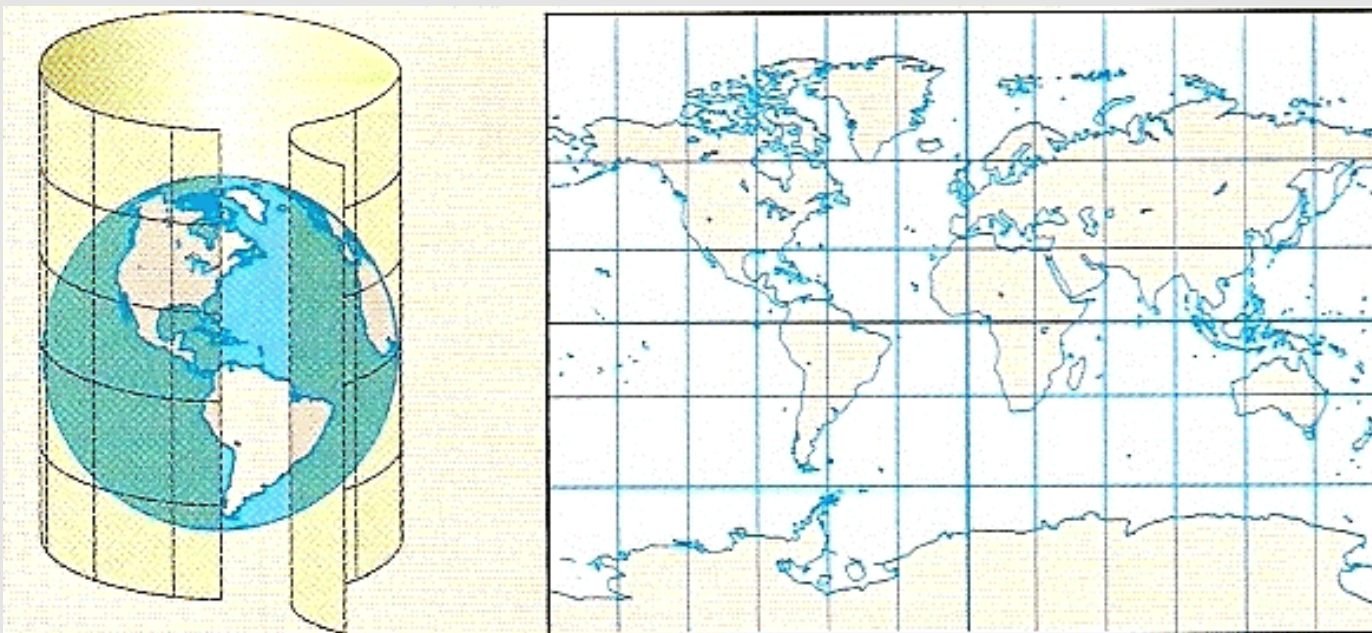
Geography = utilizada para dados Geográficos, é derivada de Geometry, porém é adaptada para a projeção cartográfica, pois a curvatura da terra é considerada em suas projeções.



Os tipos de dados **geometry** e **geography** dão suporte a 16 tipos de objetos de dados espaciais



# O que é o SRID



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Cada forma geométrica possui um sistema de referência espacial associado a ela, e cada um desses sistemas de referência possui um ID do Sistema de Referência Espacial para informar qual sistema será usado para interpretar cada objeto espacial.

Um SRID comum em uso é 4326, que representa dados espaciais usando coordenadas de longitude e latitude na superfície da Terra conforme definido no padrão WGS84, que também é usado para o Sistema de Posicionamento Global (GPS)





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# Principais métodos de Geography Sql usados

Métodos	Funcionalidade
Point()	Cria um ponto geo baseado nas coordenadas Ex: POINT(-23.17996298 ,-47.302378099)
STPointFromText()	Cria um ponto geo através de string Ex: STGeomFromText('POINT(-47.302378099 -23.17996298)', 4326)
STGeomFromText()	Cria um objeto geo através de string Ex: STGeomFromText('POINT(-23.2159214 -47.268590200000001)',4326)
STIntersects()	Verifica se um ponto está contido em um objeto geo
MakeValid()	Converte uma instância de <b>geometry</b> inválida num tipo válido de OGC
STIsValid()	Retorna se o objeto do tipo geography é válido
STAsText ( )	Retorna em string um objeto Geo do banco de dados
STBuffer( )	Cria uma circunferência baseada na distância em metros de um ponto
.STDistance ( )	Retorna a distância linear entre dois pontos Geography



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# Onde obteremos os polígonos ?

nomatim.openstreetmap.org/ui/search.html?q=varginha

Nominatim Search Reverse Search By ID About & Help

Simple Structured

varginha Search

Advanced options

Data from API request (debug output) Data last updated: 1 minute ago (Details)

Varginha, Região Geográfica Imediata de Varginha, Região Geográfica Intermediária de Varginha, Minas Gerais, Região Sudeste, Brasil

Administrative details

Varginha, Região Geográfica Imediata de Varginha, Região Geográfica Intermediária de Varginha, Minas Gerais, Região Sudeste, Brasil

Acessando o site Nominatim buscando pelo nome

nomatim.openstreetmap.org/ui/details.html?osmtype=R&osmid=315111&class=bou...

pt:Varginha (wikipedia)

## Address

Local name	Type	OSM	Address rank	Admin level	Distance	
Varginha	boundary:administrative (city)	<a href="#">relation 315111</a>	16	8	0	<a href="#">details</a>
Região Geográfica Imediata de Varginha	boundary:administrative	<a href="#">relation 12907482</a>	14	7	0	<a href="#">details</a>
Região Geográfica Intermediária de Varginha	boundary:administrative	<a href="#">relation 2235304</a>	10	5	0	<a href="#">details</a>
Minas Gerais	boundary:administrative (state)	<a href="#">relation 315173</a>	8	4	~3 m	<a href="#">details</a>
Região Sudeste	boundary:administrative	<a href="#">relation 3073228</a>	6	3	~2 m	<a href="#">details</a>
Brasil						<a href="#">search by name</a>

Depois obtendo o número da localidade



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# Onde obteremos os polígonos ?

Acessando o endereço: <https://polygons.openstreetmap.fr/index.py?id=315111>

← → ↻ 🔒 <https://polygons.openstreetmap.fr/index.py?id=315111>

## List of available polygons for id = 315111

params ▾	timestamp	NPoints	Length	WKT	GeoJSON	poly	Image
0	2021-06-08 15:54:06.492803	1541	0.302630299359633	<a href="#">WKT</a>	<a href="#">GeoJSON</a>	<a href="#">poly</a>	<a href="#">image</a>

Refresh original geometry

## Generate a simplified polygon

X, Y, Z are parameters for the following postgis equation. The default values are chosen according to the size of the original geometry to give a slightly bigger geometry, without too many nodes.

Note that:

- X > 0 will give a polygon bigger than the original geometry, and guaranteed to contain it.
- X = 0 will give a polygon similar to the original geometry.
- X < 0 will give a polygon smaller than the original geometry, and guaranteed to be smaller.

X	<input type="text" value="0.004000"/>
Y	<input type="text" value="0.001000"/>
Z	<input type="text" value="0.001000"/>
<input type="button" value="Enviar"/>	

SQL requests:

- X > 0: `ST_Union(ST_MakeValid(ST_SimplifyPreserveTopology(geom, 0.00001)), ST_Buffer(ST_SimplifyPreserveTopology(ST_SnapToGrid(ST_Buffer(geom, X), Y), Z)))`
- X = 0: `ST_Buffer(ST_SimplifyPreserveTopology(ST_SnapToGrid(ST_Buffer(geom, X), Y), Z))`
- X < 0: `ST_Intersection(geom, ST_Buffer(ST_SimplifyPreserveTopology(ST_SnapToGrid(ST_Buffer(geom, X), Y), Z))`

Agora temos o polígono aqui para ser inserido no Sql Server

← → ↻ 🔒 [https://polygons.openstreetmap.fr/get\\_wkt.py?id=315111&params=0](https://polygons.openstreetmap.fr/get_wkt.py?id=315111&params=0) ⚙️ 🌐 📄 📁 📧

```
SRID=4326;MULTIPOLYGON((( -45.5455844 -21.4985279, -45.5429562 -21.4976699, -45.5405328 -21.4969107, -45.5373697
-21.4971147, -45.5345592 -21.4984241, -45.5339611 -21.4991579, -45.5336341 -21.5000753, -45.5333688 -21.5011646, -45.5318217
-21.5022769, -45.5306747 -21.5035152, -45.5287054 -21.5047249, -45.5273141 -21.505238, -45.5254051 -21.505453, -45.5221481
-21.5086119, -45.5202678 -21.5099608, -45.5183382 -21.5101454, -45.5161375 -21.5113135, -45.5128275 -21.5127911, -45.5110019
-21.5126772, -45.507957 -21.5107055, -45.5060155 -21.5100063, -45.5016214 -21.5091351, -45.4979085 -21.5088305, -45.495983
-21.5097063, -45.4943779 -21.5117976, -45.493771 -21.5136137, -45.492346 -21.5147969, -45.4906723 -21.5152968, -45.4885054
-21.5153495, -45.4869447 -21.5146862, -45.486 -21.514, -45.485064 -21.5116217, -45.4844484 -21.5086177, -45.4842709
-21.5068118, -45.4837482 -21.505304, -45.4838119 -21.5036414, -45.4843507 -21.5028186, -45.4851581 -21.5019295, -45.4853577
-21.5015602, -45.4853753 -21.4999377, -45.4845123 -21.499049, -45.484093 -21.4970595, -45.4839057 -21.4940207, -45.4848644
-21.491429, -45.4874376 -21.4879519, -45.489 -21.4851629, -45.4892107 -21.4829865, -45.4891748 -21.4814064, -45.4896956
-21.4785049, -45.4885973 -21.4773409, -45.4860763 -21.4764951, -45.4844426 -21.4751217, -45.4838746 -21.4734554, -45.483869
-21.4716973, -45.4830096 -21.4703904, -45.4825761 -21.4695045, -45.4824762 -21.4688225, -45.4818033 -21.4687827, -45.4811865
-21.4684647, -45.481022 -21.4683007, -45.4808436 -21.4681826, -45.4802525 -21.4682496, -45.4793527 -21.4680515, -45.4786749
-21.4680119, -45.4782222 -21.4685369, -45.4776721 -21.4686683, -45.4770264 -21.4691621, -45.4760395 -21.4694362, -45.4751166
-21.4693866, -45.4740627 -21.4697544, -45.4727814 -21.4702734, -45.4724188 -21.4702704, -45.4721371 -21.4704512, -45.4719855
-21.4709044, -45.4717064 -21.470904, -45.4713785 -21.4707372, -45.4709343 -21.4707666, -45.4706614 -21.4710145, -45.4705675
-21.471565, -45.4702075 -21.4718705, -45.4698475 -21.4719188, -45.469081 -21.4716568, -45.468852 -21.4712837, -45.4687622
-21.4709084, -45.4678266 -21.4707592, -45.4666662 -21.4710263, -45.4659594 -21.4716075, -45.4651433 -21.4715258, -45.4647411
-21.4711564, -45.4647088 -21.4706272, -45.4644886 -21.4704415, -45.4639218 -21.4701913, -45.463551 -21.4698006, -45.4622845
-21.4678257, -45.4621246 -21.4667023, -45.4615684 -21.4666328, -45.4603993 -21.4669154, -45.459222 -21.4666902, -45.4587667
-21.4662015, -45.4588222 -21.4648241, -45.458 -21.464, -45.4568232 -21.4645847, -45.4562419 -21.4646805, -45.455618
-21.4646159, -45.4535192 -21.4637826, -45.4524927 -21.4639866, -45.4516004 -21.4645001, -45.4505666 -21.4652112, -45.449816
-21.4651054, -45.4490436 -21.4646355, -45.4483318 -21.4643241, -45.4477899 -21.4623473, -45.4481005 -21.4613107, -45.4475622
-21.4606211, -45.4467409 -21.4604608, -45.4459621 -21.4606046, -45.4451551 -21.4603005, -45.443453 -21.4593162, -45.4423613
-21.4598359, -45.4420624 -21.4612251, -45.4420592 -21.4625541, -45.4409202 -21.4635521, -45.4404108 -21.464599, -45.4396322
-21.4647403, -45.4392996 -21.4643762, -45.4392607 -21.463733, -45.438944 -21.4636618, -45.4385281 -21.4641175, -45.4375375
-21.4634444, -45.4367456 -21.46389, -45.4356139 -21.4634265, -45.4342977 -21.4632474, -45.4333565 -21.463764, -45.4329991
-21.4640881, -45.4317446 -21.4643292, -45.4312827 -21.4651501, -45.4304618 -21.4656686, -45.4301006 -21.4659623, -45.4297115
-21.465921, -45.4289279 -21.4655127, -45.4285194 -21.4655448, -45.4281638 -21.4656524, -45.4279384 -21.4657925, -45.4278135
-21.4661031, -45.4275284 -21.4668955, -45.4270337 -21.4673552, -45.4265867 -21.4677471, -45.426215 -21.4679194, -45.4255969
-21.4678738, -45.4253218 -21.4680922, -45.4251409 -21.4685854, -45.4251087 -21.4690946, -45.4254949 -21.4698933, -45.4252995
```



# Como importar os polígonos ?

- Primeiramente criamos uma tabela no banco de dados e uma procedure que fará a inserção da localização.

[-]	[Grid Icon]	dbo.Location
[-]	[Folder Icon]	Colunas
[Key Icon]		LocationId (PK, int, não nulo)
[List Icon]		LocationName (nvarchar(60), nulo)
[List Icon]		LocationCode (nvarchar(5), nulo)
[List Icon]		LocationPoint (geography, nulo)
[List Icon]		Polygon (geography, nulo)
[List Icon]		LocationType (int, não nulo)
[List Icon]		PolygonTemp (geography, nulo)

```
CREATE PROCEDURE [dbo].[LocationInsert]
```

```
@Lat decimal(15,9),  
@Long decimal(15,9),  
@GeoMultiPoly varchar(max),  
@PlaceName varchar(max),  
@PlaceCode varchar(3) = '',  
@PlaceType integer
```

```
AS BEGIN
```

```
SET TRANSACTION ISOLATION LEVEL READ UNCOMMITTED
```

```
DECLARE @g geography = geography::Point( @Lat, @Long, 4326);  
DECLARE @pol geography = geography::STGeomFromText(@GeoMultiPoly, 4326);
```

```
INSERT INTO LOCATION ( LocationName, LocationCode, LocationPoint, Polygon, LocationType )  
values ( @PlaceName, @PlaceCode, @g, @pol , @PlaceType );
```

```
END;
```



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# Como importar os polígonos ?

Depois foi só criar o método para realizar a inclusão utilizando-se do Dapper em .NET Core

```
public async Task<LocationModel> Add(LocationModel model)
{
    using (IDbConnection db = new SqlConnection(_connectionString))
    {
        var procedure = "LocationInsert";
        var values = new
        {
            @Lat = model.LocationPointValues.Latitude,
            @Long = model.LocationPointValues.Longitude,
            @GeoMultiPoly = model.MultiPolygonString,
            @PlaceName = model.LocationName,
            @PlaceCode = model.LocationCode,
            @PlaceType = (int)model.LocationType
        };

        var results = await db.QueryAsync<LocationModel>(procedure, values, commandType: CommandType.StoredProcedure);
        return results.FirstOrDefault();
    }
}
```

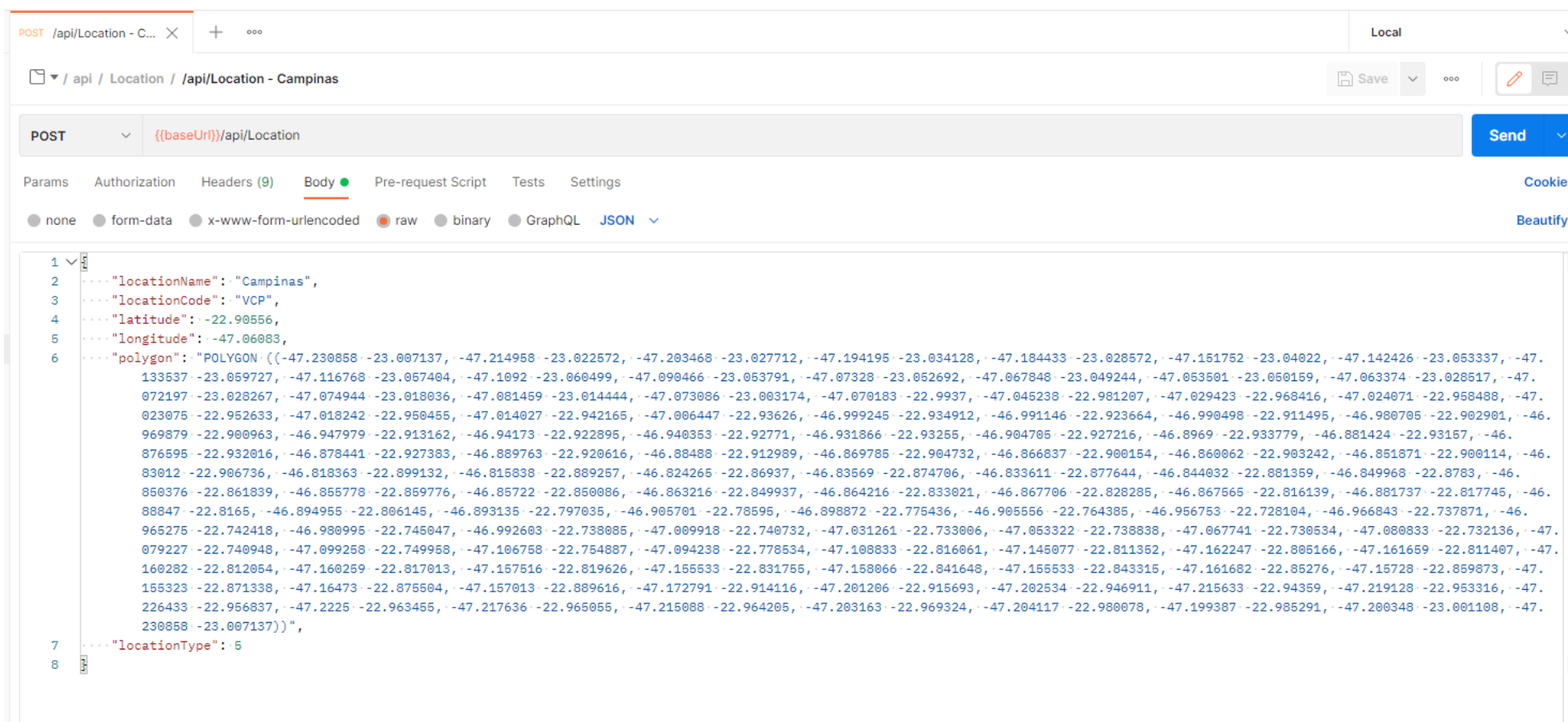




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# Como importar os polígonos ?

No nosso caso vamos executar a chamada da API pelo Postman, utilizando a API que desenvolvemos.



# Como importar os locais utilizados

Foi utilizada a biblioteca SharpKML para importar dados do Google Earth, através da exportação em formato KML.



```
padaria-sao paulo.xml x
C: > particular > palestras > RanchoDev2021 > kml > padaria-sao paulo.xml > kml > F
1  <?xml version="1.0" encoding="UTF-8"?>
2  <kml xmlns="http://www.opengis.net/kml/2.2" xmlns:gx="http://www.
3  <Folder id="results">
4      <name>padaria em São Paulo, SP</name>
5      <Placemark id="1.2.1">
6          <name>Padaria Bella Paulista</name>
7          <address>Rua Haddock Lobo, 354 - Cerqueira César, São Pau
8          <phoneNumber>(11) 3129-8340</phoneNumber>
9          <snippet>Rua Haddock Lobo, 354 - Cerqueira César, São Pau
10         <description><![CDATA[<!DOCTYPE html><html><head></head><
11         <styleUrl>#listing_A</styleUrl>
12         <ExtendedData>
13             <Data name="placepageUri">
14                 <value>https://www.google.com/earth/rpc/entity?la
15             </Data>
16         </ExtendedData>
17         <Point>
18             <coordinates>-46.660236,-23.5562144,0</coordinates>
19         </Point>
20     </Placemark>
```

## SharpKml.Core 5.2.0

SharpKML is an implementation of the Open Geospatial Consortium KML 2.2 standard developed in C#, able to read and write KML and KMZ files.

**Package Manager**

.NET CLI

PackageReference

Paket CLI


Script & Interactive


Cake












PM> Install-Package SharpKml.Core -Version 5.2.0

<https://www.nuget.org/packages/Sharp>

# E através de uma importação do arquivo pudemos inserir na tabela do banco

[-]  **dbo.Places**

[-]  **Colunas**

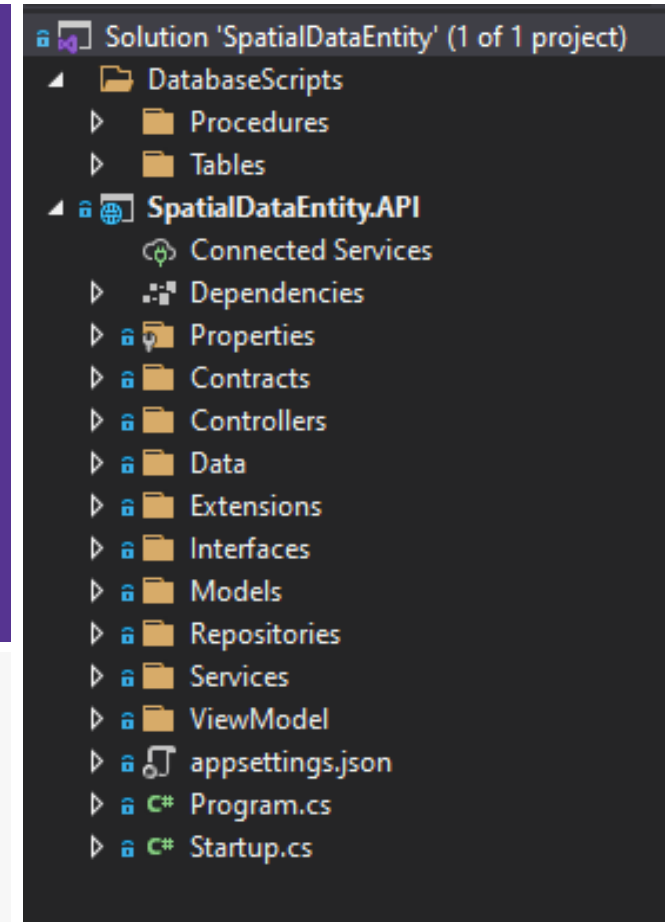
	PlaceId (PK, int, não nulo)
	Name (nvarchar(max), nulo)
	Address (nvarchar(max), nulo)
	PhoneNumber (nvarchar(max), nulo)
	Snippet (nvarchar(max), nulo)
	Description (nvarchar(max), nulo)
	StyleUrl (nvarchar(max), nulo)
	Latitude (float, não nulo)
	Longitude (float, não nulo)
	LocationPoint (geography, nulo)
	Id (nvarchar(max), nulo)

```
DECLARE @point geography = geography::Point( @Lat, @Long, 4326);
```

```
INSERT INTO [dbo].[Places]
([Name]
,[Address]
,[PhoneNumber]
,[Snippet]
,[Description]
,[StyleUrl]
,[Latitude]
,[Longitude]
,[LocationPoint]
,[Id])
VALUES
( @Name,
  @Address,
  @PhoneNumber,
  @Snippet,
  @Description,
  @styleUrl,
  @Lat,
  @Long,
  @point,
  @Id )
```

```
SELECT TOP 1 * FROM [DBO].[Places] where PlaceId =(SELECT MAX(PlaceId) FROM [dbo].[Places]);
```

Obs: Vale notar que utilizamos a função "Point" para gerar o ponto no formato do Sql Server



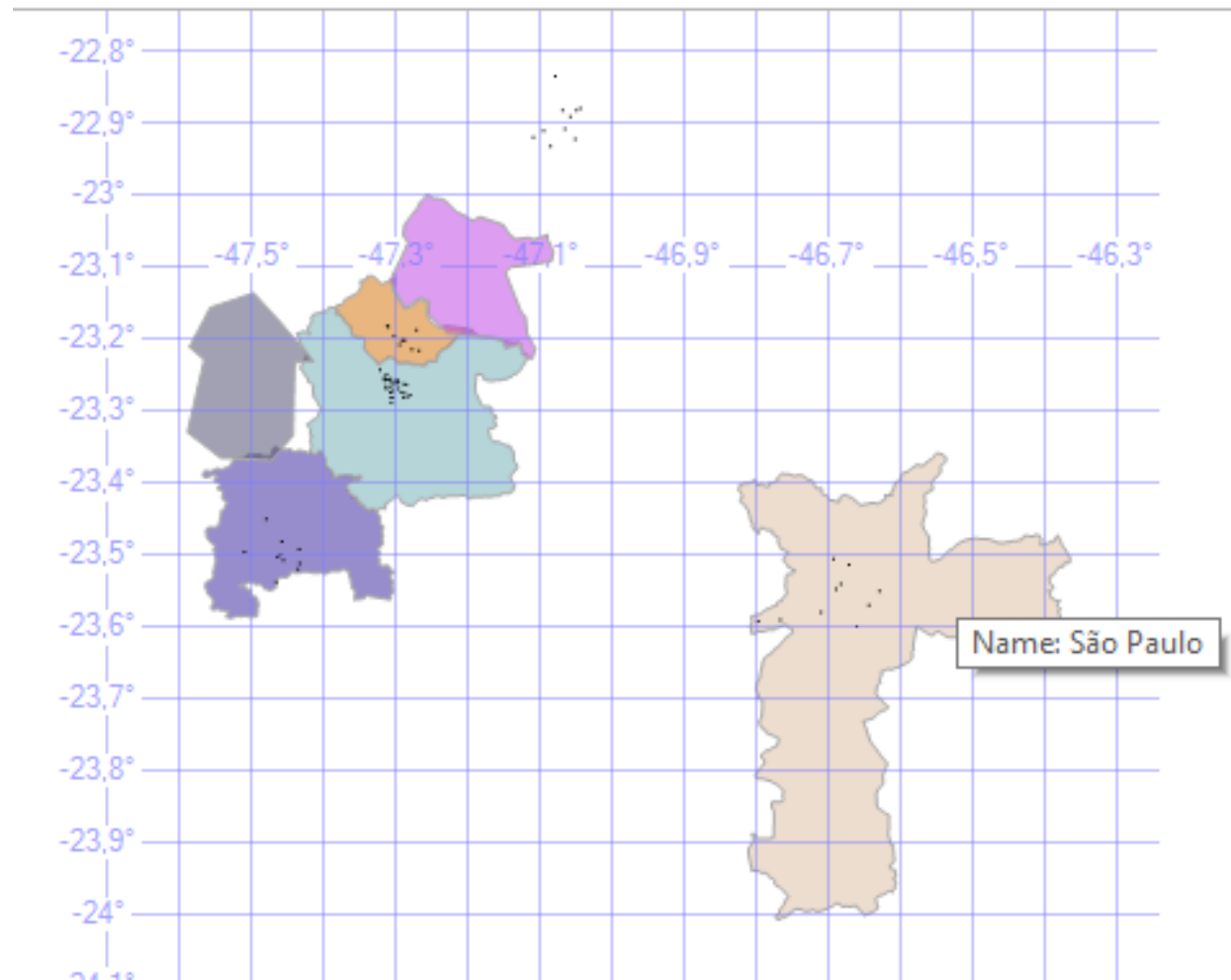


# Mesclando Pontos do Mapa x Polígonos

```
SELECT geography::Point(  
Latitude, Longitude, 4326)  
LocationPoint, Name FROM  
PLACES
```

union all

```
select Polygon, locationName  
from location where  
LocationType=5
```







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Podemos selecionar  
através de um raio a  
região desejada  
usando STBuffer

```
DECLARE @g geography, @circle geography
```

```
SET @g = geography::Point(-23.2159214 ,-  
47.26859020000001, 4326);
```

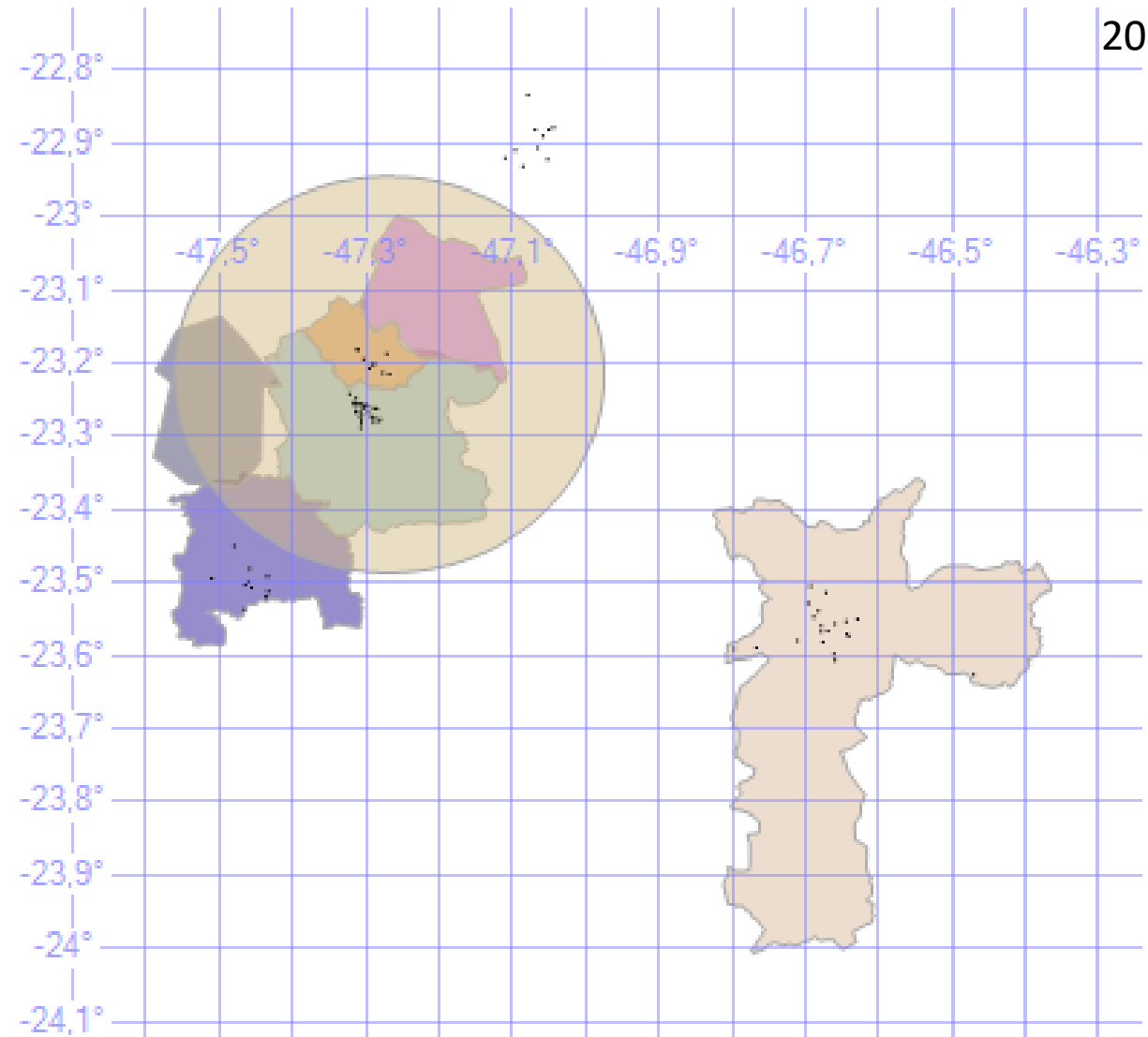
```
SET @circle=@g.STBuffer(30000);
```

```
SELECT geography::Point( Latitude, Longitude, 4326)  
LocationPoint, Name FROM PLACES  
union all
```

```
SELECT Polygon, locationName  
FROM location WHERE LocationType=5
```

```
union all
```

```
SELECT  
@circle,  
'regiao' name
```





Então agora podemos montar na API um método que busque os pontos por coordenadas em um raio.

Utilizando:

STIntersects

```
CREATE PROCEDURE [dbo].[WhatLocationIs]

    @Lat decimal(15,9),
    @Long decimal(15,9),
    @LocationType integer = 0

AS BEGIN

    SET TRANSACTION ISOLATION LEVEL READ UNCOMMITTED

    declare @point geography = geography::Point(@Lat,@Long, 4326);

    SELECT *
    FROM (
        select
            lo.LocationId,
            lo.LocationName,
            lo.Polygon,
            lo.LocationType

        from Location lo
        where ( @LocationType = 0 or lo.LocationType = @LocationType )
    ) A
    where A.Polygon.STIntersects(@point) = 1

END;
```



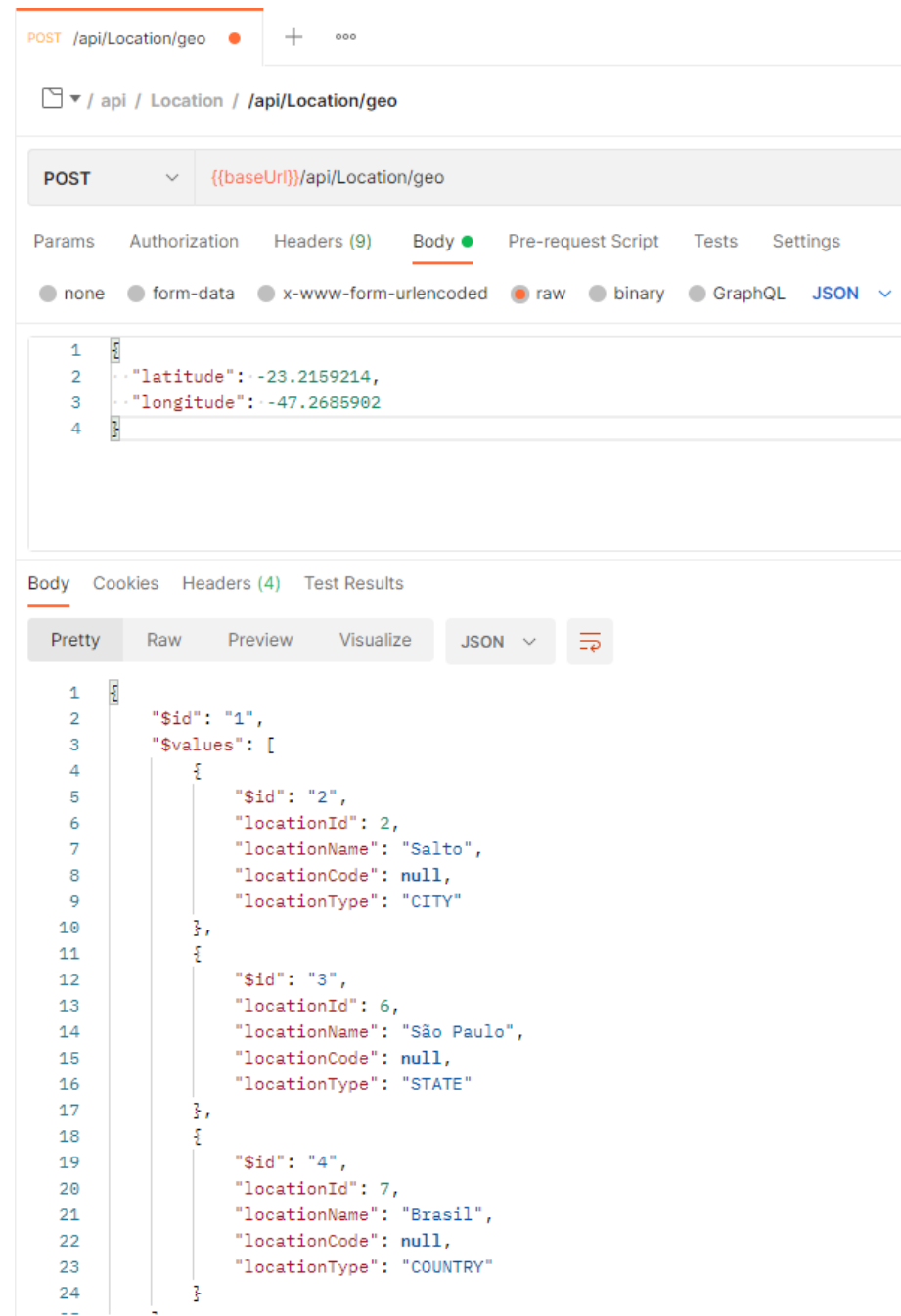
E com apenas a passagem da Latitude e Longitude obtemos toda a hierarquia da localização.

- Utilizamos Dapper para realizar a execução da Procedure no .NET Core garantindo que uma performance excepcional

```
public async Task<ICollection<LocationModel>> GetFromGeo(double latitude, double longitude)
{
    using (IDbConnection connection = new SqlConnection(_connectionString))
    {
        var procedure = "WhatLocationIs";
        var values = new { @Lat = latitude, @Long = longitude };
        var results = await connection.QueryAsync<LocationModel>(procedure, values, commandType: CommandType.StoredProcedure);
        return results.ToList();
    }
}
```

Executando via  
Postman podemos  
checar os resultados  
obtidos

## EXEMPLO I



The screenshot displays the Postman interface for a POST request to the endpoint `/api/Location/geo`. The request body is a JSON object with latitude and longitude coordinates. The response is also in JSON format, showing a list of location details.

**Request:**

```
POST /api/Location/geo
```

**Body (raw):**

```
{ 1 2 3 4  "latitude": -23.2159214,  "longitude": -47.2685902}
```

**Response (JSON):**

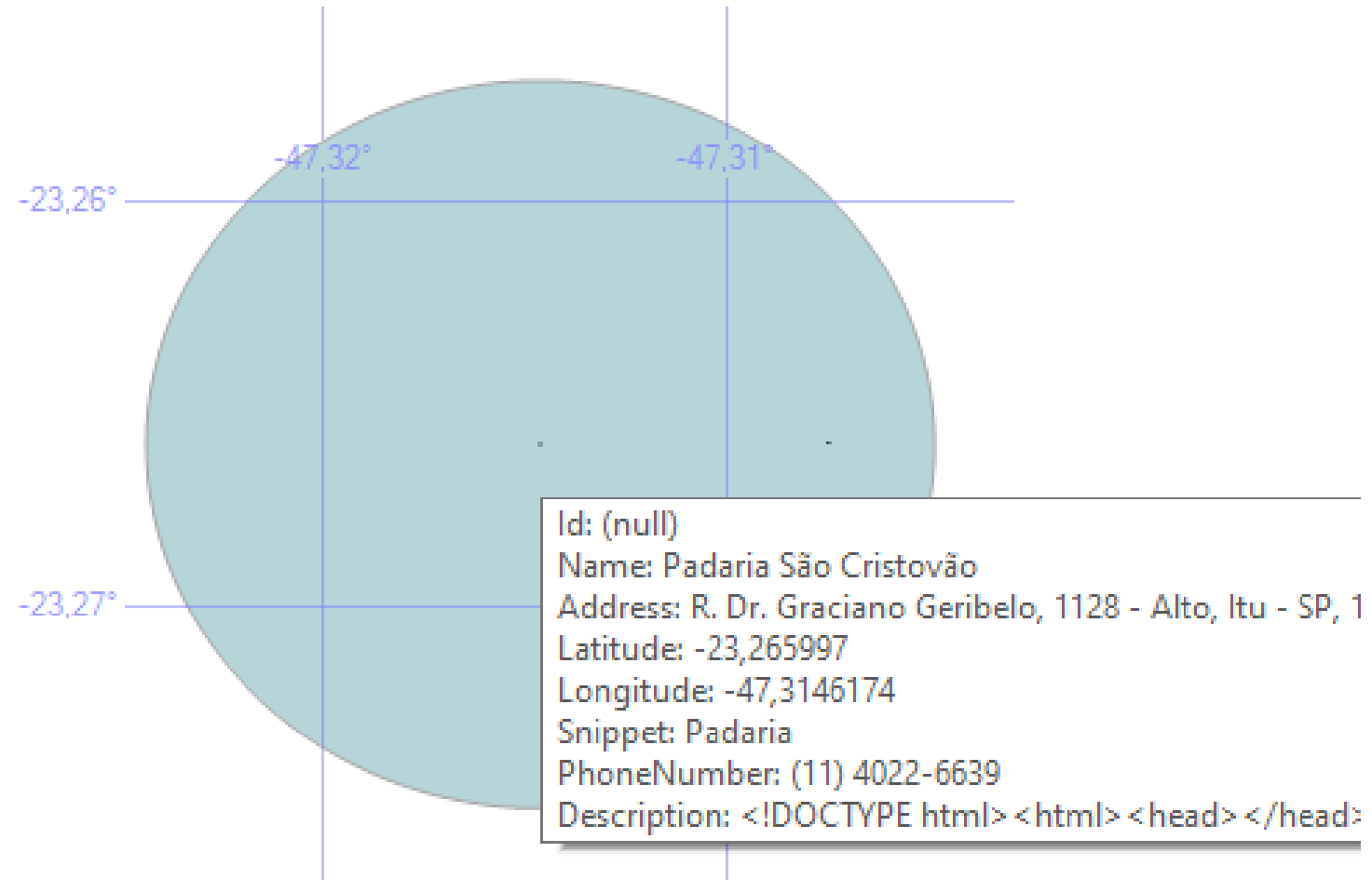
```
{ 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 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1821 1822 1823 1824 1825 1826 1827 1828 1829 1830 1831 1832 1833 1834 1835 1836 1837 1838 1839 1840 1841 1842 1843 1844 1845 1846 1847 1848 1849 1850 1851 1852 1853 1854 1855 1856 1857 1858 1859 1860 1861 1862 1863 1864 1865 1866 1867 1868 1869 1870 1871 1872 1873 1874 1875 1876 1877 1878 1879 1880 1881 1882 1883 1884 1885 1886 1887 1888 1889 1890 1891 1892 1893 1894 1895 1896 1897 1898 1899 1900 1901 1902 1903 1904 1905 1906 1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048 2049 2050 2051 2052 2053 2054 2055 2056 2057 2058 2059 2060 2061 2062 2063 2064 2065 2066 2067 2068 2069 2070 2071 2072 2073 2074 2075 2076 2077 2078 2079 2080 2081 2082 2083 2084 2085 2086 2087 2088 2089 2090 2091 2092 2093 2094 2095 2096 2097 2098 2099 2100 2101 2102 2103 2104 2105 2106 2107 2108 2109 2110 2111 2112 2113 2114 2115 2116 2117 2118 2119 2120 2121 2122 2123 2124 2125 2126 2127 2128 2129 2130 2131 2132 2133 2134 2135 2136 2137 2138 2139 2140 2141 2142 2143 2144 2145 2146 2147 2148 2149 2150 2151 2152 2153 2154 2155 2156 2157 2158 2159 2160 2161 2162 2163 2164 2165 2166 2167 2168 2169 2170 2171 2172 2173 2174 2175 2176 2177 2178 2179 2180 2181 2182 2183 2184 2185 2186 2187 2188 2189 2190 2191 2192 2193 2194 2195 2196 2197 2198 2199 2200 2201 2202 2203 2204 2205 2206 2207 2208 2209 2210 2211 2212 2213 2214 2215 2216 2217 2218 2219 2220 2221 2222 2223 2224 2225 2226 2227 2228 2229 2230 2231 2232 2233 2234 2235 2236 2237 2238 2239 2240 2241 2242 2243 2244 2245 2246 2247 2248 2249 2250 2251 2252 2253 2254 2255 2256 2257 2258 2259 2260 2261 2262 2263 2264 2265 2266 2267 2268 2269 2270 2271 2272 2273 2274 2275 2276 2277 2278 2279 2280 2281 2282 2283 2284 2285 2286 2287 2288 2289 2290 2291 2292 2293 2294 2295 2296 2297 2298 2299 2300 2301 2302 2303 2304 2305 2306 2307 2308 2309 2310 2311 2312 2313 2314 2315 2316 2317 2318 2319 2320 2321 2322 2323 2324 2325 2326 2327 2328 2329 2330 2331 2332 2333 2334 2335 2336 2337 2338 2339 2340 2341 2342 2343 2344 2345 2346 2347 2348 2349 2350 2351 2352 2353 2354 2355 2356 2357 2358 2359 2360 2361 2362 2363 2364 2365 2366 2367 2368 2369 2370 2371 2372 2373 2374 2375 2376 2377 2378 2379 2380 2381 2382 2383 2384 2385 2386 2387 2388 2389 2390 2391 2392 2393 2394 2395 2396 2397 2398 2399 2400 2401 2402 2403 2404 2405 2406 2407 2408 2409 2410 2411 2412 2413 2414 2415 2416 2417 2418 2419 2420 2421 2422 2423 2424 2425 2426 2427 2428 2429 2430 2431 2432 2433 2434 2435 2436 2437 2438 2439 2440 2441 2442 2443 2444 2445 2446 2447 2448 2449 2450 2451 2452 2453 2454 2455 2456 2457 2458 2459 2460 2461 2462 2463 2464 2465 2466 2467 2468 2469 2470 2471 2472 2473 2474 2475 2476 2477 2478 2479 2480 2481 2482 2483 2484 2485 2486 2487 2488 2489 2490 2491 2492 2493 2494 2495 2496 2497 2498 2499 2500 2501 2502 2503 2504 2505 2506 2507 2508 2509 2510 2511 2512 2513 2514 2515 2516 2517 2518 2519 2520 2521 2522 2523 2524 2525 2526 2527 2528 2529 2530 2531 2532 2533 2534 2535 2536 2537 2538 2539 2540 2541 2542 2543 2544 2545 2546 2547 2548 2549 2550 2551 2552 2553 2554 2555 2556 2557 2558 2559 2560 2561 2562 2563 2564 2565 2566 2567 2568 2569 2570 2571 2572 2573 2574 2575 2576 2577 2578 2579 2580 2581 2582 2583 2584 2585 2586 2587 2588 2589 2590 2591 2592 2593 2594 2595 2596 2597 2598 2599 2600 2601 2602 2603 2604 2605 2606 2607 2608 2609 2610 2611 2612 2613 2614 2615 2616 2617 2618 2619 2620 2621 2622 2623 2624 2625 2626 2627 2628 2629 2630 2631 2632 2633 2634 2635 2636
```



E se agora quisermos  
buscar locais perto de  
uma coordenada em  
um Raio ?

```
DECLARE @point geography =
geography::Point(@Lat,@Long, 4326);
DECLARE @Circle geography =
@point.STBuffer(@Ray);
```

```
SELECT *
FROM (
SELECT
  PL.*
  FROM Places pl
  WHERE ( @PlaceType = " or @PlaceType =
pl.Snippet)
) A
WHERE
@circle.STIntersects(a.LocationPoint) = 1
```







E com apenas a passagem dos parâmetros desejados de localização obteremos todos os objetos.

```
public async Task<ICollection<PlaceModel>> GetByLocation(double latitude, double longitude, double meters, string type)
{
    using (IDbConnection db = new SqlConnection(_connectionString))
    {
        var procedure = "GetPlacesOn";
        var values = new
        {
            @Lat = latitude,
            @Long = longitude,
            @Ray = meters,
            @PlaceType = type == null ? "" : type
        };

        var result = await db.QueryAsync<PlaceModel>(procedure, values, commandType: CommandType.StoredProcedure);
        return result.ToList();
    }
}
```

Passando as propriedades obtemos a lista de lugares perto das coordenadas

## EXEMPLO II



2021

POST /api/Place/getbyL... + ...

api / Place / /api/Place/getbylocation 1 issue

POST {{baseUrl}}/api/Place/getbylocation

Params Authorization Headers (8) Body Pre-request Script Tests Settings

none form-data x-www-form-urlencoded raw binary GraphQL JSON

```
1 {
2   "latitude": -23.265997,
3   "longitude": -47.3146174,
4   "meters": 1000,
5   "type": null
6 }
```

Body Cookies Headers (4) Test Results

Pretty Raw Preview Visualize JSON

```
1 {
2   "$id": "1",
3   "$values": [
4     {
5       "$id": "2",
6       "placeId": 50,
7       "name": "Panificadora Delicias da Vovó",
8       "address": "R. Padre Bartolomeu Tadei, 412 - Alto, Itu - SP, 13311-020",
9       "phoneNumber": "(11) 4013-5248",
10      "snippet": "Padaria",
11      "description": "<!DOCTYPE html><html><head></head><body><script type='\"text/javascr
12      fid=0x94cf501723d5f99f:0xf6b1d1164b257cb5&hl=pt-BR&gl=br&client=earth-client&cv=
13      client:Pro;type=default)</script></body></html>",
14      "styleUrl": "",
15      "latitude": -23.2659523,
16      "longitude": -47.3074789,
17      "id": null
18    },
19    {
20      "$id": "3",
21      "placeId": 53,
22      "name": "Padaria São Cristovão",
23      "address": "R. Dr. Graciano Geribelo, 1128 - Alto, Itu - SP, 13311-010",
24      "phoneNumber": "(11) 4022-6639",
25      "snippet": "Padaria".
26    }
27  ]
28 }
```

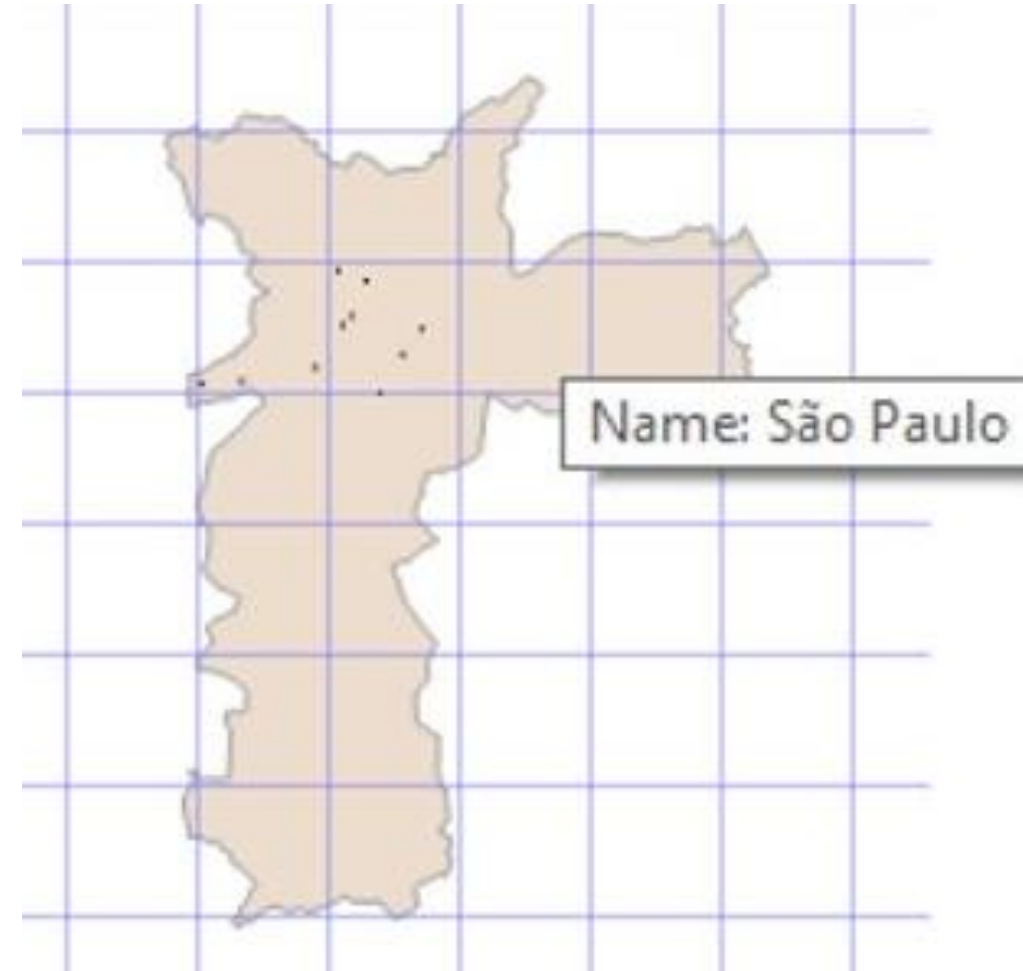


E podemos também  
buscar pelo polígono  
exato da cidade

```
DECLARE @poly geography;
```

```
SELECT @poly = Polygon  
FROM Location  
WHERE LocationId=@LocationId;
```

```
SELECT *  
FROM (  
  SELECT  
    PL.*  
  FROM Places pl  
  WHERE ( @PlaceType = "  
           or @PlaceType = pl.Snippet )  
  ) A  
WHERE  
@poly.STIntersects(a.LocationPoint) = 1
```





E com apenas a passagem dos parâmetros desejados de localização obteremos todos os objetos.

```
public async Task<ICollection<PlaceModel>> GetByLocationId(int locationId, string type)
{
    using (IDbConnection db = new SqlConnection(_connectionString))
    {
        var procedure = "GetPlacesByLocationId";
        var values = new
        {
            @LocationId = locationId,
            @PlaceType = type == null? "" : type
        };

        var result = await db.QueryAsync<PlaceModel>(procedure, values, commandType: CommandType.StoredProcedure);
        return result.ToList();
    }
}
```

E assim podemos  
filtrar pela  
localidade exata

## EXEMPLO III



2021

api / Place / /api/Place/getbylocationid 4 issues

GET {{baseUrl}}/api/Place/getbylocationid?locationId=2&type=Supermercado

Params Authorization Headers (6) Body Pre-request Script Tests Settings

Query Params

	KEY	VALUE
<input checked="" type="checkbox"/>	locationId	2
<input checked="" type="checkbox"/>	type	Supermercado
	Key	Value

Body Cookies Headers (4) Test Results

Pretty Raw Preview Visualize JSON

```
1  {
2    "$id": "1",
3    "$values": [
4      {
5        "$id": "2",
6        "placeId": 88,
7        "name": "Sonda Supermercados - Salto I",
8        "address": "Av. dos Trabalhadores, 1506 - Jardim Marilia, Salto - SP, 13323-000",
9        "phoneNumber": "(11) 4602-5800",
10       "snippet": "Supermercado",
11       "description": "<!DOCTYPE html><html><head></head><body><script type='\"text/javascript\"'>win
fid=0x94cf4e04a3922747:0xdb713ed00440dcd9&hl=pt-BR&gl=br&client=earth-client&cv=7.3.4.82;
client:Pro;type:default)\";</script></body></html>",
12       "styleUrl": "",
13       "latitude": -23.2137453,
14       "longitude": -47.2782576,
15       "id": null
16     },
17   ],
18   "$id": "3",
19   "placeId": 89,
20   "name": "Supermercados São Vicente",
```



E a tão esperada hora chegou....



# Referências técnicas:

Tipo : Point

<https://docs.microsoft.com/pt-br/sql/t-sql/spatial-geography/point-geography-data-type?view=sql-server-ver15>

Tipo : Polygon

<https://docs.microsoft.com/pt-br/sql/relational-databases/spatial/polygon?view=sql-server-ver15>

Multipolygon

<https://docs.microsoft.com/pt-br/sql/relational-databases/spatial/multipolygon?view=sql-server-ver15>

STIsValid

<https://docs.microsoft.com/pt-br/sql/t-sql/spatial-geography/stisvalid-geography-data-type?view=sql-server-ver15>

MakeValid

<https://docs.microsoft.com/pt-br/sql/t-sql/spatial-geography/makevalid-geography-data-type?view=sql-server-ver15>

STIntersects

<https://docs.microsoft.com/pt-br/sql/t-sql/spatial-geography/stintersects-geography-data-type?view=sql-server-ver15>

STDistance

<https://docs.microsoft.com/pt-br/sql/t-sql/spatial-geography/stdistance-geography-data-type?view=sql-server-ver15>

STBuffer

<https://docs.microsoft.com/pt-br/sql/t-sql/spatial-geography/stbuffer-geography-data-type?view=sql-server-ver15>

StUnion

<https://docs.microsoft.com/pt-br/sql/t-sql/spatial-geometry/stunion-geometry-data-type?view=sql-server-ver15>



2021

# Bibliotecas utilizadas

Dapper

SharpKml

Entity Framework

## LINKS ÚTEIS

Para obter locais geográficos:

<https://nominatim.openstreetmap.org/ui/details.html?osmtype=R&osmid=298285&class=boundary>

Para obter o polígono:

<https://polygons.openstreetmap.fr/index.py?id=298285>



2021

# Contatos

<https://linktr.ee/NIZZOLA>

<https://github.com/nizzola>

Link do exemplo:

<https://github.com/NIZZOLA/RanchoDev2021>

The screenshot shows the GitHub profile of Marcio Rogério Nizzola. The profile includes a circular profile picture, the name "Marcio Rogério Nizzola", and the username "NIZZOLA". Below the name is a bio: "Analista de Sistemas, Pós Graduado em Gestão de Projetos, atuando como Professor de Tí da Etec Itu, Tech Lead na Dextra e Membro da Itu Developers". There is an "Edit profile" button. The profile statistics show "34 followers · 21 following · ☆ 1". The location is "Itu" and the company is "Dextra". The email is "marcio.nizzola@dextra-sw.com" and the website is "www.nizzola.com.br". The profile tabs are "Overview", "Repositories" (52), "Projects", and "Packages". The "Overview" tab is selected, showing a welcome message "Olá 🙌 Bem vindos ao meu perfil!" and a list of bio points: "Professor na Etec Martinho di Ciero em Itu e Tech Lead na Dextra Digital", "Membro fundador da Comunidade Itu Developers", "Atualmente trabalhando com .NET Core, PHP, Angular e Sql Server.", and "Tenho estudado .NET, Angular, Ionic, Azure e ferramentas cloud.". Below the bio points are social media links for "Github", "LinkedIn", "Medium", "Instagram", "Facebook", and "Twitter". The "Popular repositories" section shows four repositories: "EtecItuDsPw1" (HTML, 1 star), "ExemploMultiTierDotNetCore" (C#, 1 star), "dotnetConsoleDependencyInjection" (C#, 1 star), and "scietec2020" (C#, 1 star).