



CAPACITAÇÃO EM MAPEAMENTO COM OPENSTREETMAP



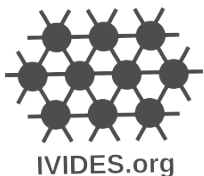
PARTE 2

Modelo de dados e armazenamento no OpenStreetMap

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Realização
IVIDES.org



Apoio



teach  **SM**



Modelo de dados e armazenamento no OpenStreetMap



- ✓ Elementos
- ✓ Objetos
- ✓ Rótulos
- ✓ Expressão dos elementos em XML



Elementos



O conjunto
de elementos
forma um **objeto**.

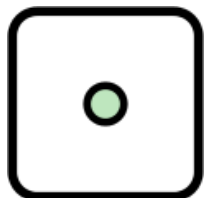


Elementos



NODE

[Página Wiki](#) 



NÓ
NODE

WAY

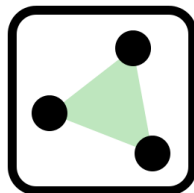
[Página Wiki](#) 



CAMINHO
WAY



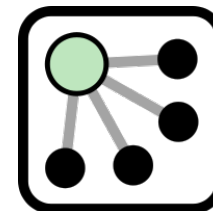
CAMINHO
FECHADO
CLOSED WAY



ÁREA
AREA

RELATION

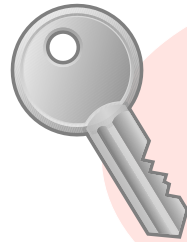
[Página Wiki](#) 



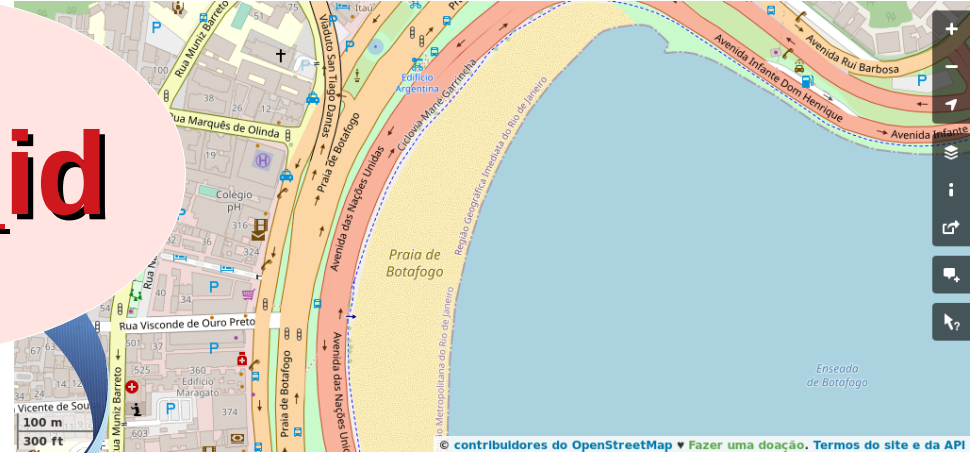
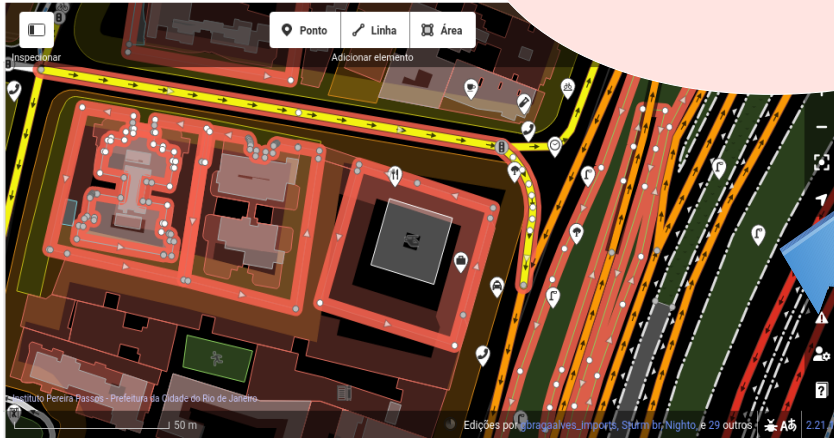
RELAÇÃO
RELATIONS



Elementos



osm_id





Elementos



osm_id



osm_id é um número positivo ou negativo?

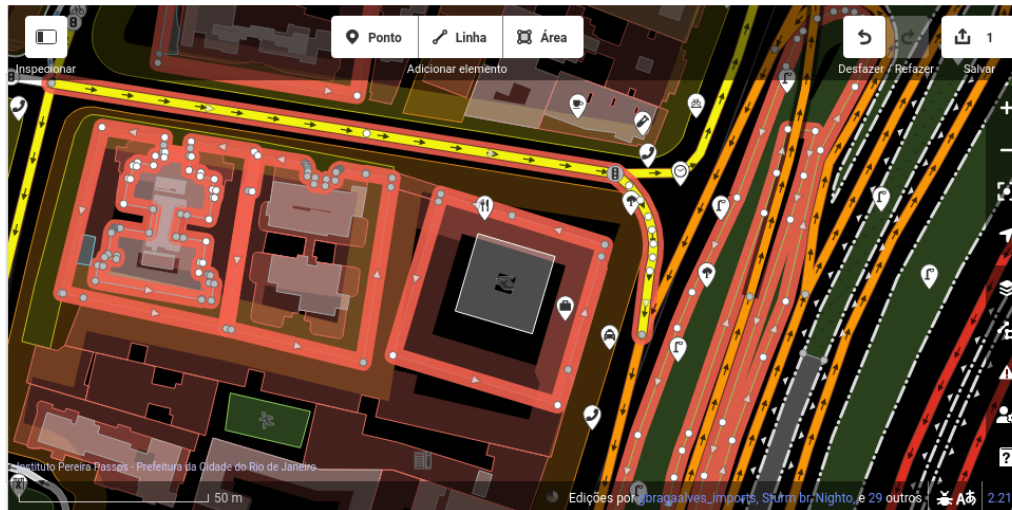
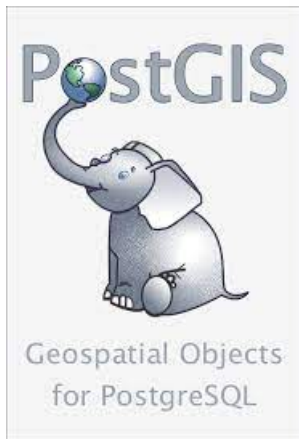
**(+) em nós, caminhos e áreas
(+) ou (-) em relações – podem indicar, p. ex., sentidos em vias.**



Elementos



PostgreSQL



osm_id





Objetos



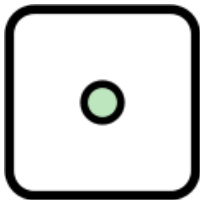
EDIFICAÇÃO

NÓ



ÁRVORE

(NODE)

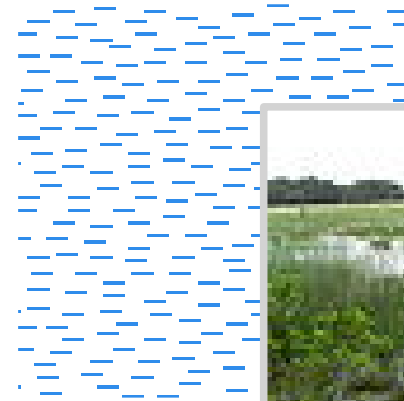


ESTRADA

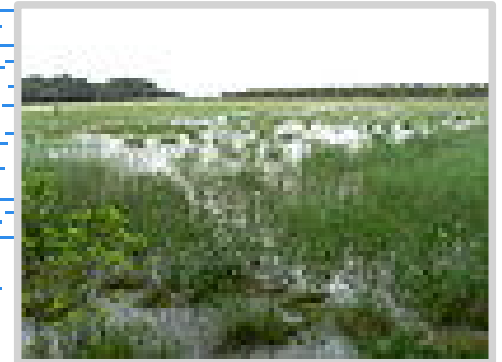


CAMINHO

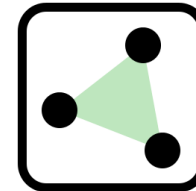
(WAY)



PÂNTANO



ÁREA (AREA)





Rótulos



.OSM ~ XML

Os dados do OSM seguem o padrão XML e são formados por pares (etiquetas ou *tags*)

Atenção!
na programação
(notação XML):

K:V



CHAVE = VALOR

(KEY = VALUE)

Exemplo: building = residential



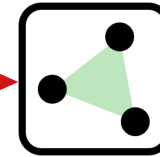
Rótulos



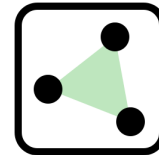
Observação 1: Em alguns casos, quando não é conhecido o tipo específico de objeto, usa-se **yes** no valor. Ex. `building=yes`



building=yes



building=hut



building=apartments

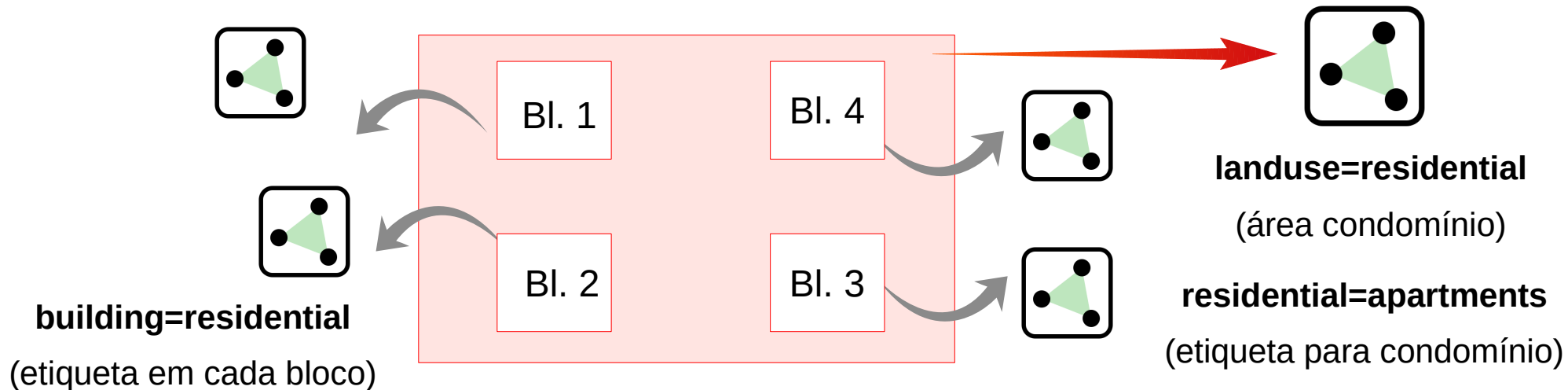




Rótulos



Observação 2: Uma feição no mundo real (ex. escola, hospital, lago ...) é representada por **apenas um objeto**, entretanto, **por vezes**, é necessário mapear **vários objetos**, para representá-la. Ex. Condomínio residencial:





Rótulos



Observação 3: Uma feição no mundo real pode ser representada com **mais de um rótulo**, a fim de **melhorar a sua descrição**. Ex. Vias e sua qualidade.




Way

highway=tertiary

(rótulo da via)

surface=unpaved

(rótulo especificando uma superfície não pavimentada)

Rodovia na Tanzânia. Fonte: 




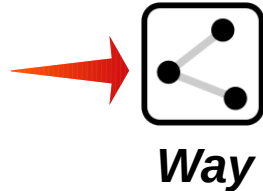
Rótulos



Observação 4: Uma feição no mundo real pode ser representada com mais de um rótulo, porém, **os rótulos devem ser coerentes**. Ex. Incoerência entre rótulos:



Rodovia na Tanzânia. Fonte: 



highway=tertiary

(tipo de via terciária)

surface=unpaved

(superfície não pavimentada)

surface=asphalt

(superfície com asfalto)

highway=tertiary

(tipo de via terciária)

highway=primary

(tipo de via primária)

surface=unpaved

(superfície não pavimentada)



Rótulos: Onde consultar?













Tags Aprovadas

Wiki OSM – **Map Features** – em Inglês

https://wiki.openstreetmap.org/wiki/Map_features

Wiki OSM – **Map Features** – em **Português**

https://wiki.openstreetmap.org/wiki/Pt:Map_Features

-  Angola
-  Brasil (*placas de sinalização*)
-  Cabo Verde
-  Guiné-Bissau
-  Guiné Equatorial
-  Macau
-  Moçambique
-  Portugal (*placas de sinalização*)
-  São Tomé e Príncipe
-  Timor-Leste



Rótulos: Onde consultar?



Outros Repositórios

Acervos de Tags utilizadas no mundo:

Taginfo: <https://taginfo.openstreetmap.org/>

TagFinder: <https://tagfinder.osm.ch/>

Algumas classificações aprovadas no Brasil:

https://wiki.openstreetmap.org/wiki/Pt:How_to_map_a

Sugestão de nova tag



Rótulos - Wiki OSM – Map Features



índice [ocultar]

- 1 Primary features
 - 1.1 Aerialway
 - 1.2 Aeroway
 - 1.3 Amenity
 - 1.3.1 Sustenance
 - 1.3.2 Education
 - 1.3.3 Transportation
 - 1.3.4 Financial
 - 1.3.5 Healthcare
 - 1.3.6 Entertainment, Arts & Culture
 - 1.3.7 Public Service
 - 1.3.8 Facilities
 - 1.3.9 Waste Management
 - 1.3.10 Others
 - 1.4 Barrier
 - 1.4.1 Linear barriers
 - 1.4.2 Access control on highways
 - 1.5 Boundary
 - 1.5.1 Boundary types
 - 1.5.2 Attributes

Feições Principais
(Primary Features)

Ex. Amenity

~ Ponto de Interesse



Rótulos - Wiki OSM – Map Features



Pares **chave-valor** (key=value) e comentários. Ex. [Amenity](#)




Key	Value	Element	Comment	Carto rendering	Photo
Sustenance					
amenity	bar		Bar is a purpose-built commercial establishment that sells alcoholic drinks to be consumed on the premises. They are characterised by a noisy and vibrant atmosphere, similar to a party and usually don't sell food. See also the description of the tags amenity=pub;bar;restaurant for a distinction between these.		
amenity	biergarten		Biergarten or beer garden is an open-air area where alcoholic beverages along with food is prepared and served. See also the description of the tags amenity=pub;bar;restaurant . A biergarten can commonly be found attached to a beer hall, pub, bar, or restaurant. In this case, you can use biergarten=yes additional to amenity=pub;bar;restaurant .		
amenity	cafe		Cafe is generally an informal place that offers casual meals and beverages; typically, the focus is on coffee or tea. Also known as a coffeehouse/shop , bistro or sidewalk cafe . The kind of food served may be mapped with the tags cuisine=* and diet:** . See also the tags amenity=restaurant;bar;fast_food .		
amenity	fast_food		Fast food restaurant (see also amenity=restaurant). The kind of food served can be tagged with cuisine=* and diet:** .		



Rótulos - Wiki OSM – Map Features



Tipos de elementos e fotografias. Ex. [Amenity](#) 

Key	Value	Element	Comment	Carto rendering	Photo
Sustenance					
amenity	bar		Bar is a purpose-built commercial establishment that sells alcoholic drinks to be consumed on the premises. They are characterised by a noisy and vibrant atmosphere, similar to a party and usually don't sell food. See also the description of the tags amenity=pub;bar;restaurant for a distinction between these.		
amenity	biergarten		Biergarten or beer garden is an open-air area where alcoholic beverages along with food is prepared and served. See also the description of the tags amenity=pub;bar;restaurant . A biergarten can commonly be found attached to a beer hall, pub, bar, or restaurant. In this case, you can use biergarten=yes additional to amenity=pub;bar;restaurant .		
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Rótulos - Wiki OSM – Map Features



Renderização do mapa – Símbolos Ex. [Amenity](#)  ~ POI

Key	Value	Element	Comment	Carto rendering	Photo
Sustenance					
amenity	bar		Bar is a purpose-built commercial establishment that sells alcoholic drinks to be consumed on the premises. They are characterised by a noisy and vibrant atmosphere, similar to a party and usually don't sell food. See also the description of the tags amenity=pub;bar;restaurant for a distinction between these.		
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Rótulos - Wiki OSM – Map Features



Renderização do mapa – símbolos Ex. [Natural](#)

Key	Value	Element	Description	Map rendering	Image
natural	tree		A single tree		
natural	tree_row		A line of trees		
natural	tundra		Treeless cold climate habitat with open, low growing sedges, grasses, mosses and lichens.		
natural	wood		Tree-covered area (a 'forest' or 'wood')		



Rótulos - Wiki OSM – Map Features



Avisos de possíveis erros

Ex. erros para

building=residential

(forma correta)



<ul style="list-style-type: none"> • type=residential If you know places with this tag, verify if it could be tagged with another tag. Automated edits are strongly discouraged unless you really know what you are doing! 	<table border="1"> <thead> <tr><th colspan="3">type=residential</th></tr> </thead> <tbody> <tr><td>✖</td><td>12 383</td><td>0,11%</td></tr> <tr><td>☐</td><td>279</td><td>0,38%</td></tr> <tr><td>☑</td><td>11 954</td><td>11,94%</td></tr> <tr><td>☒</td><td>150</td><td>0%</td></tr> </tbody> </table>	type=residential			✖	12 383	0,11%	☐	279	0,38%	☑	11 954	11,94%	☒	150	0%
type=residential																
✖	12 383	0,11%														
☐	279	0,38%														
☑	11 954	11,94%														
☒	150	0%														
<ul style="list-style-type: none"> • building=dwelling_house If you know places with this tag, verify if it could be tagged with another tag. Automated edits are strongly discouraged unless you really know what you are doing! 	<table border="1"> <thead> <tr><th colspan="3">building=dwelling house</th></tr> </thead> <tbody> <tr><td>✖</td><td>5 043</td><td>0%</td></tr> <tr><td>☐</td><td>7</td><td>0%</td></tr> <tr><td>☑</td><td>5 035</td><td>0%</td></tr> <tr><td>☒</td><td>1</td><td>0%</td></tr> </tbody> </table>	building=dwelling house			✖	5 043	0%	☐	7	0%	☑	5 035	0%	☒	1	0%
building=dwelling house																
✖	5 043	0%														
☐	7	0%														
☑	5 035	0%														
☒	1	0%														
<ul style="list-style-type: none"> • building=residences If you know places with this tag, verify if it could be tagged with another tag. Automated edits are strongly discouraged unless you really know what you are doing! 	<table border="1"> <thead> <tr><th colspan="3">building=residences</th></tr> </thead> <tbody> <tr><td>✖</td><td>15</td><td>0%</td></tr> <tr><td>☐</td><td>0</td><td>0%</td></tr> <tr><td>☑</td><td>15</td><td>0%</td></tr> <tr><td>☒</td><td>0</td><td>0%</td></tr> </tbody> </table>	building=residences			✖	15	0%	☐	0	0%	☑	15	0%	☒	0	0%
building=residences																
✖	15	0%														
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<ul style="list-style-type: none"> • building=residence If you know places with this tag, verify if it could be tagged with another tag. Automated edits are strongly discouraged unless you really know what you are doing! 	<table border="1"> <thead> <tr><th colspan="3">building=residence</th></tr> </thead> <tbody> <tr><td>✖</td><td>290</td><td>0%</td></tr> <tr><td>☐</td><td>10</td><td>0%</td></tr> <tr><td>☑</td><td>279</td><td>0%</td></tr> <tr><td>☒</td><td>1</td><td>0%</td></tr> </tbody> </table>	building=residence			✖	290	0%	☐	10	0%	☑	279	0%	☒	1	0%
building=residence																
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building=residential																
Esta etiqueta não aparece na base de dados do OSM.																

BUILDING

BUILDING

EDIFICAÇÕES

são agrupadas de acordo com a sua **função**.

- Accommodation
- Commercial
- Religious
- Civic | Amenity
- Agriculture
- Sports
- Storage
- Power/ technical buildings
- Other buildings



BUILDING Wiki OSM – Map Features

Etiqueta (tag) genérica
building=yes



building=house



building=hut



building=farm
(residência)



building=farm_auxiliary
(celeiro ou outros)



building=houseboat



building=apartments

BUILDING Wiki OSM – Map Features

Etiqueta (tag) genérica
building=yes



building=supermarket



building=kiosk



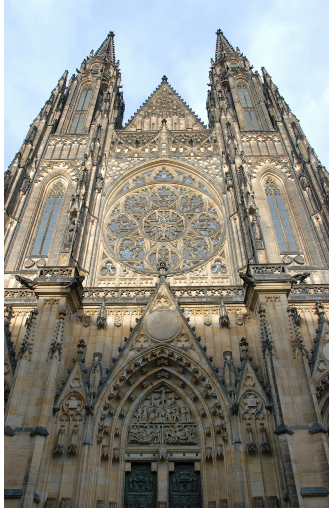
building=industrial



building=office

BUILDING Wiki OSM – Map Features

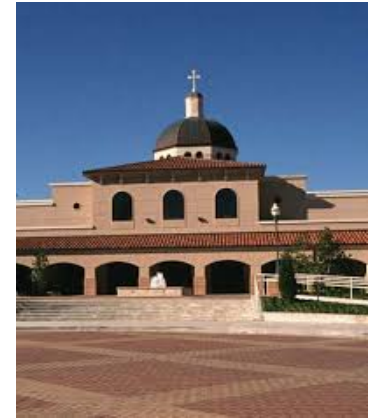
Etiqueta (tag) genérica
building=yes



building=cathedral



building=religious



building=temple

BUILDING Wiki OSM – Map Features

Etiqueta (tag) genérica
building=yes



building=stadium



building=school
(no Brasil: 1° e 2° graus)



building=university
building=college
(no Brasil: 3° grau)



building=public

BUILDING Wiki OSM – Map Features

Etiqueta (tag) genérica
building=yes



building=hospital



building=construction



building=train_station



building=garage

AMENITY

AMENITY

AMENIDADES

utilizadas por
residentes e
Visitantes
dos lugares

- Sustenance
- Education
- Transportation
- Financial
- Healthcare
- Entertainment, Arts
- Public Service
- Facilities
- Waste Management
- Others



AMENITY Wiki OSM – Map Features

`amenity=restaurant`



`amenity=fast_food`



`amenity=bar`



`amenity=cafe`

AMENITY Wiki OSM – Map Features



amenity=language_school
(escola de línguas)



amenity=school
(no Brasil: 1º e 2º graus)



amenity=university
amenity=college
(no Brasil: 3º grau)

AMENITY Wiki OSM – Map Features



amenity=fuel
(posto combustíveis)



amenity=parking
(estacionamento)



amenity=taxi
(ponto de táxi)

AMENITY Wiki OSM – Map Features



amenity=ferry_terminal
(terminal ferry boat,
terminal de barcas)



amenity=bicycle_park
(bicicletário)



amenity=bus_station
(rodoviária, terminal*)

*obs.

ponto de ônibus:
highway=bus_stop

AMENITY Wiki OSM – Map Features



amenity=atm
(terminal de autoatendimento)



amenity=bureau_de_change
(casa de câmbio)



amenity=bank
(banco)

AMENITY Wiki OSM – Map Features



amenity=clinic



amenity=hospital



amenity=veterinary



amenity=pharmacy

AMENITY Wiki OSM – Map Features



amenity=theater

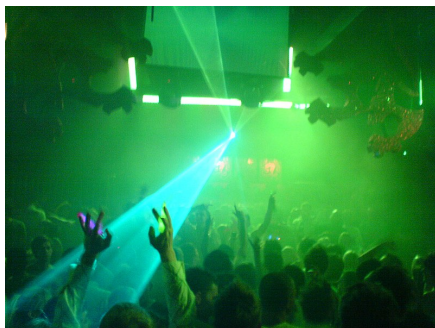


amenity=cinema



amenity=arts_center

amenity=
nightclub



amenity=fountain

AMENITY Wiki OSM – Map Features



amenity=courthouse
(fórum,
tribunal...)



amenity=post_office
(posto correios)



amenity=police
(delegacia)

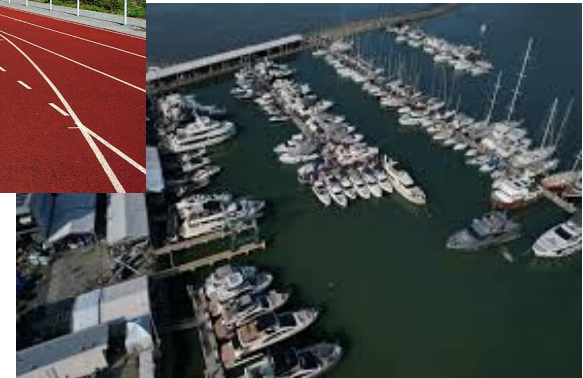


amenity=fire_station
(posto bombeiros)

LEISURE

LEISURE

Equipamentos
de lazer, esportivos, ...



LEISURE Wiki OSM – Map Features



leisure=swimming_pool



leisure=beach_resort



leisure=marina



leisure=park
(usualmente
Parque
público)

LEISURE Wiki OSM – Map Features



leisure=nature_reserve



leisure=sport_center



leisure=track



leisure=water_park

LANDUSE

LANDUSE

USO E COBERTURA DA TERRA

Área representando a cobertura e o uso da terra: assentamentos, agricultura, aquicultura...

Representado, por um caminho fechado (área).





ÁREA URBANA

- Commercial
- Construction
- Education
- Industrial
- Residential
- Institutional

Ex. landuse=construction



ÁREA RURAL

- Aquaculture (aquacultura)
- Farmland (plantação)
- Farmyard (pátio da fazenda, curral)
- Forest (floresta manejada)
- Greenhouse_horticulture (estufa)
- Salt_pond (*salina*)

Ex. landuse=aquaculture

LANDUSE Wiki OSM – Map Features



landuse=cemetery



landuse=harbour



**landuse=landfill
(aterro sanit rio)**



landuse=military



**landuse=grass
(gramado)**

LANDUSE Wiki OSM – Map Features



landuse=aquaculture



landuse=forest
(florestas manejadas,
ex. eucalipto)



landuse=farmland
(área de cultivo)



landuse=farmyard
(área construída
da fazenda)

NATURAL

NATURAL

VEGETAÇÃO

HIDROGRAFIA

GEOLOGIA

Feições naturais:
matas, florestas, lagos,
praias, montanhas...



NATURAL Wiki OSM – Map Features



natural=wood



natural=tree
(uma única árvore)



natural=line_tree
(linha de árvores)

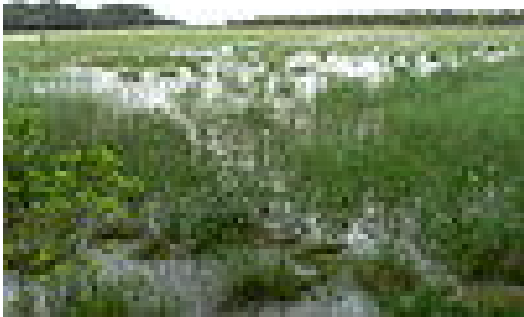


natural=tundra



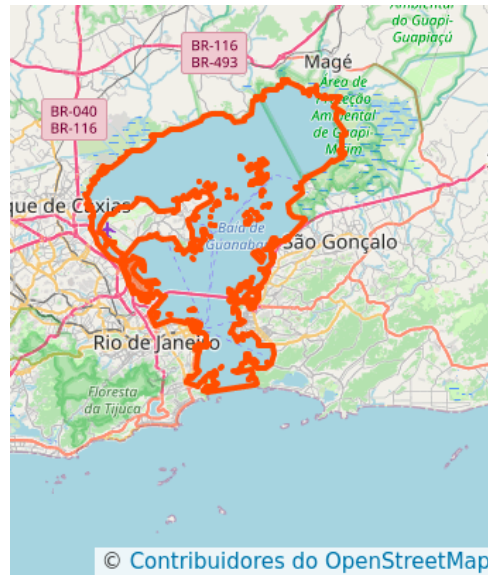
natural=grassland

NATURAL Wiki OSM – Map Features



natural=wetland
(pântanos ou
terrenos alagadiços)

natural=bay
(corpos de água abertos:
Baías, enseadas, lagoas)



natural=water
(corpo de água fechado:
lago, lagoa, açude, ...)



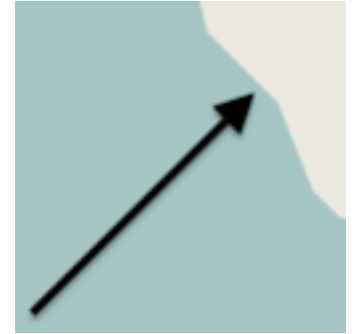
waterway=river



natural=ditch
(canais de irrigação,
transversais ao curso
do rio ou canal)



waterway=canal



natural=
coastline
(linha de costa)

NATURAL Wiki OSM – Map Features



natural=cliff
(falésia)



natural=hill
(montanha, morro, monte)



natural=cave_entrance
(entrada de caverna)

natural=dune
(duna)



natural=sand

NATURAL

Wiki OSM – Map Features



Obs. para ilha:
place=island
natural=coastline



wetland=
mangrove
(manguezal)



natural=beach
Obs. para praia:
surface=sand |
gravel | pebbles |
stones | shells



natural=reef
(recife de corais)

NATURAL Wiki OSM – Map Features

natural=cape



natural=strait



natural=isthmus

HIGHWAY

HIGHWAY

VIAS
ESTRADAS,
RUAS,
CAMINHOS,...

- **Motorway**
- **Trunk**
- **Primary**
- **Secondary**
- **Tertiary**
- **Path**



Maior complexidade

Maior largura

Maior número de faixas

HIGHWAY

Wiki OSM – Map Features



highway=motorway

Principais vias do país, com, pelo menos, duas faixas em cada um dos dois sentidos; com separador central; apenas veículos motorizados (proibida a passagem de pessoas, cavalos, bicicletas, ...). No Brasil: corresponde às vias expressas (Ex. [BR-262](#)).



highway=trunk

Principais vias do país, não necessariamente com separador central; apenas veículos motorizados. No Brasil: corresponde às rodovias (Ex. [MG-427](#)).

HIGHWAY Wiki OSM – Map Features



highway=primary

Via que liga **grandes cidades.**



highway=secondary

Via que liga **cidades.**



highway=tertiary

Via que liga **pequenas cidades ou vilas.**

A classificação do tamanho das cidades depende das normas do país. No Brasil: [IBGE](#).

HIGHWAY

Proposta de classificação de vias,
aprovada pela comunidade no Brasil

Fonte: Comunidade OpenStreetMap Brasil



HIGHWAY Wiki OSM – Map Features

CASOS ESPECIAIS



highway=residential

Vias em áreas residenciais.



highway=service

Vias de acesso a serviços, vias em estacionamentos ...



highway=footway

Caminho exclusivo para pedestres ...



highway=path

Trilha.

HIGHWAY Wiki OSM – Map Features



highway=cycleway
Ciclovias.



highway=steps
Escadarias.



highway=track

Vias em áreas rurais e no meio de florestas, matas, larga para passagem de carros (~3 m).

HIGHWAY [Wiki OSM – Map Features](#) 

~Tipos de superfícies

TAGS EXTRAS: **SURFACE**

Valores:

paved | unpaved | asphalt | concrete | paving_stones | sett | cobblestone | metal |
wood | compacted | fine_gravel | gravel | pebblestone | plastic | grass_paver | grass |
dirt | earth | mud | sand | ground

Ex. caminho de terra

highway=path

surface=unpaved

surface=ground



TAGS EXTRAS: SURFACE

surface=paved

+



surface=asphalt
Superfície asfaltada.



surface=wood
Superfície de madeira.



surface=paving_stones
Blocos artificiais.

TAGS EXTRAS: SURFACE

surface=unpaved

+



surface=ground
Cobertura de terra.



surface=grass
Cobertura de grama.



surface= sand
Cobertura de areia.

HIGHWAY Wiki OSM – Map Features 

~Estado de conservação das superfícies

TAGS EXTRAS: **SMOOTHNESS**

Valores:

excellent | good | internediate | bad | very_bad | horrible | very horrible | impassable



smoothness=excellent



smoothness=horrible

HIGHWAY

TAGS EXTRAS

Demais atributos - highway

https://wiki.openstreetmap.org/wiki/Map_features#Roads



ford=yes

Ponto no qual a via cruza um riacho ou córrego.



maxspeed=N

Onde: N = limite de velocidade da via
Ex. maxspeed=60 ou maxspeed=none



highway=bus_stop

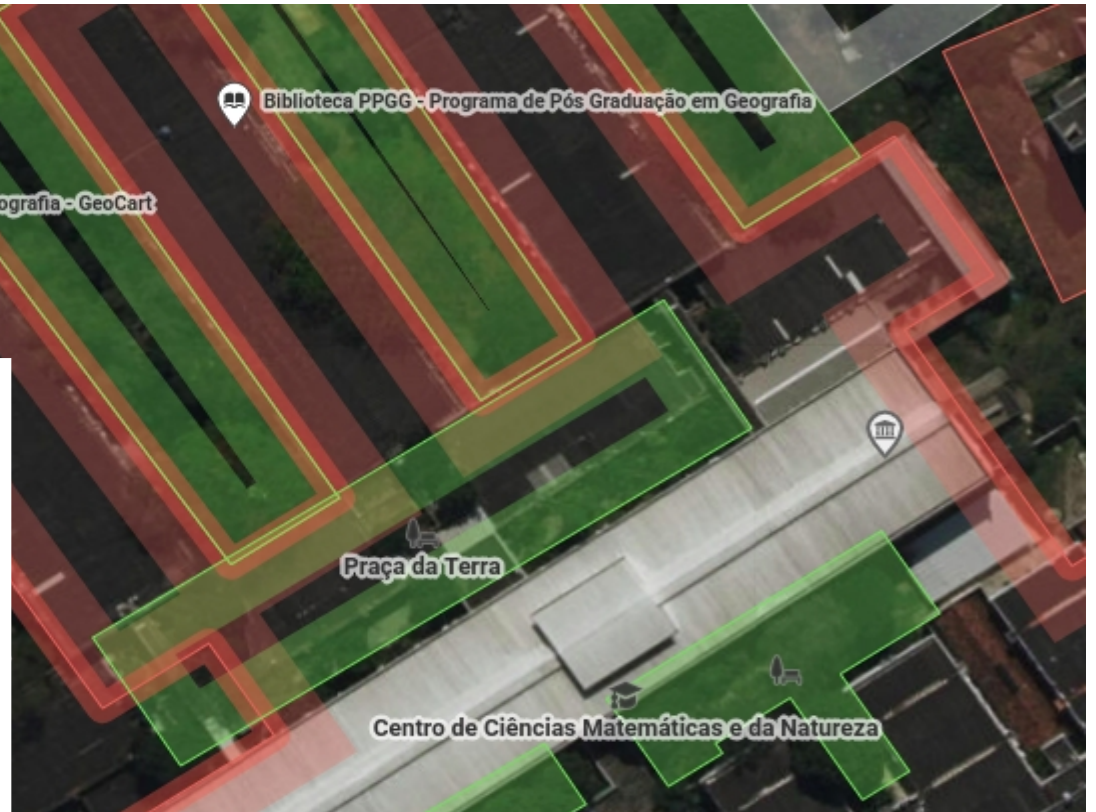
Ponto de parada de ônibus.

PLACE

PLACE

NOME DO LUGAR










Para nomear os lugares, tais como os assentamentos humanos: cidades, vilas, aldeias etc.; ou as feições naturais: praias, morros, lagoas, oceanos e outros.



Fonte: contribuidores do OpenStreetMap.




Wiki OSM – Map Features

ADMINISTRATIVOS

place	country		A nation state or other high-level national political/administrative area.
place	state	 	A large sub-national political/administrative area.
place	region	  	Used both as a broad tag for geographic or historical areas with no clear boundary and for distinct administration areas (with specific boundaries) in some countries.
place	province	  	A subdivision of a country similar to a state

Wiki OSM – Map Features

ADMINISTRATIVOS

place	district		A district - a type of administrative division that, in some countries, is managed by local government.
place	county		A county - a geographical region of a country.
place	municipality		A municipality - single urban administrative division having corporate status.

Wiki OSM – Map Features

ASSENTAMENTOS HUMANOS URBANOS

place	city		The largest urban settlement or settlements within the territory.
place	borough		A part in larger city grouped into administrative unit.
place	suburb		A part of a town or city with a well-known name and often a distinct identity.
place	quarter		A quarter is a named, geographically localised place within a suburb of a larger city or within a town which is bigger than a neighbourhood
place	neighbourhood		A neighbourhood is a smaller named, geographically localised place within a suburb of a larger city or within a town or village

Wiki OSM – Map Features

ASSENTAMENTOS HUMANOS URBANOS OU RURAIS

place	town		An important urban centre, between a village and a city in size.
place	village		A smaller distinct settlement, smaller than a town with few facilities available with people traveling to nearby towns to access these.
place	hamlet		A smaller rural community, typically with fewer than 100-1000 inhabitants, and little infrastructure.
place	isolated_dwelling		The smallest kind of settlement (1-2 households).
place	farm		An individually named farm.
place	allotments		A separate settlement, which is located outside an officially inhabited locality and has its own addressing

Wiki OSM – Map Features

Observações

- Para nomear outros objetos no OpenStreetMap, como vias, centros comerciais, lojas etc., usa-se a etiqueta específica do objeto e mais a chave name: **name=nome do objeto**
Ex. highway=motorway name=BR-262
- Para mapear os objetos aqui apresentados, usa-se **name** também:
Ex. place=city name=Rio de Janeiro

Observações

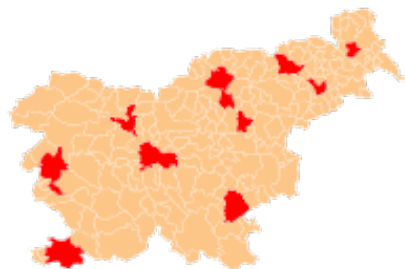
- Para distinguir ainda mais os nomes, usam-se as chaves abaixo:
 - official_name** ou nome oficial
 - loc_name** ou nome comumente utilizado na comunidade
 - int_name** ou nome internacional
 - alt_name** ou nome alternativo (não incluído nos demais tipos)
 - old_name** ou nome antigo ou histórico
- Para o caso do mapeamento dos nomes antigos e históricos, sugerimos ainda, a utilização do OpenHistoricalMap.

PLACE

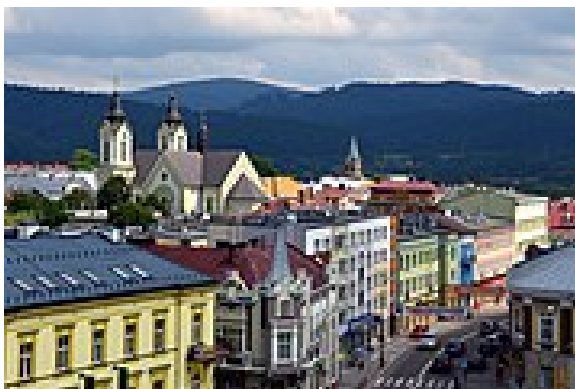
Wiki OSM – Map Features

Etiqueta (tag) genérica
place=*

CASOS ESPECIAIS



place=municipality
Área administrativa
do município
(NODE OU WAY)



Sanok, Polônia

place=town
Centro comercial
(APENAS NODE)
Obs. town tem tamanho
entre vila e cidade



Rio de Janeiro, Brasil

place=city
(Cidade)
(APENAS NODE)

PLACE

Wiki OSM – Map Features

Etiqueta (tag) genérica
place=*

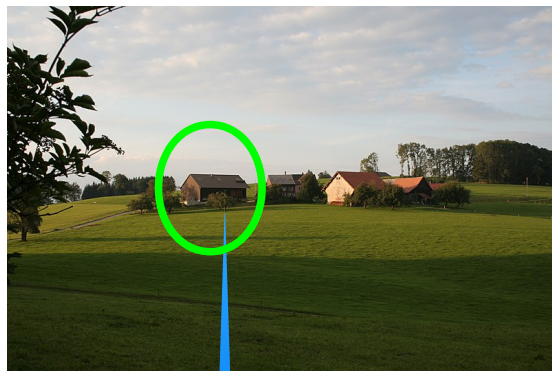
CASOS ESPECIAIS



República Democrática do Congo

Mapeie cada uma e etiqueta: **building=house**
com mais de um cômodo e comumente de alvenaria

Mapeie cada uma e etiqueta: **building=hut** , para habitação
de um só cômodo, construída com materiais locais.



Waldkirch, Alemanha

HAMLET

- ✓ Mapeie a área e etiqueta:
landuse=residential
- ✓ Mapeie um ponto (nó)
no centro da área
e etiqueta:
place=hamlet

hamlet é uma aldeia
ou vilarejo, com até 20
agregados familiares,
em áreas rurais.

PLACE

Wiki OSM – Map Features 

Etiqueta (tag) genérica
`place=*`

CASOS ESPECIAIS

ISOLATED_DWELLING



- ✓ Mapeie a área e etiqüete:
`landuse=residential`
- ✓ Mapeie um ponto (nó)
no centro da área
e etiqüete:
`place=isolated_dwelling`

Isolated Dwelling, ou
habitações isoladas,
apresentam até dois
agregados familiares,
em áreas rurais.

EXPRESSION ELEMENTOS EM XML



Expressão dos elementos em XML

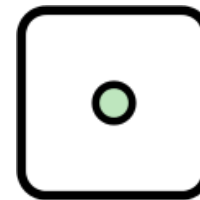


```
<node id="25496583" lat="51.5173639" lon="-0.140043" version="1"
changeset="203496" user="80n" uid="1238" visible="true" timestamp="2007-01-
28T11:40:26Z">
  <tag k="highway" v="traffic_signals"/>
</node>
```

Exemplo: `highway=traffic_signals`



NODE





Expressão dos elementos em XML



```
<way id="5090250" visible="true" timestamp="2009-01-19T19:07:25Z" version="8"
changeset="816806" user="Blumpsy" uid="64226">
```

```
<nd ref="822403"/>
```

```
<nd ref="21533912"/>
```

```
<nd ref="821601"/>
```

```
<nd ref="21533910"/>
```

```
<nd ref="135791608"/>
```

```
<nd ref="333725784"/>
```

```
<nd ref="333725781"/>
```

```
<nd ref="333725774"/>
```

```
<nd ref="333725776"/>
```

```
<nd ref="823771"/>
```

```
<tag k="highway" v="residential"/>
```

```
<tag k="name" v="Clipstone Street"/>
```

```
<tag k="oneway" v="yes"/>
```

```
</way>
```

Exemplo: **highway=residential**



WAY





Expressão dos elementos em XML



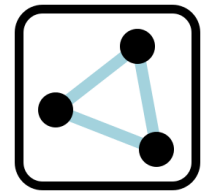
```
<way id="1" version="1" user="test" uid="1" changeset="1" timestamp="...">  
  <nd ref="1" />  
  <nd ref="2" />  
  <nd ref="3" />  
  <nd ref="1" />  
  <tag k="building" v="yes" />  
</way>
```

Exemplo 1. Polígono fechado, representando um triângulo.

Exemplo 2. Limite administrativo do Estado do Rio de Janeiro.
boundary=administrative
osm.org



CLOSED WAY



Nó inicial = Nó final





Expressão dos elementos em XML

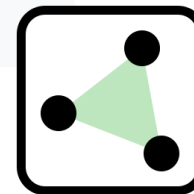


```
<way id="4876027" timestamp="2008-03-12T07:59:11Z" user="MichaelCollinson">  
  <nd ref="31492372" />  
  <nd ref="31492338" />  
  <nd ref="31492370" />  
  <nd ref="31492371" />  
  <nd ref="31492372" />  
  <tag k="natural" v="water" />  
  <tag k="name" v="Spegeldammen" />  
</way>
```

Exemplo: natural=water



AREA





Expressão dos elementos em XML



```
<relation id="12" timestamp="2008-12-21T19:31:43Z"
user="kevjs1982" uid="84075">
  <member type="way" ref="2878061" role="outer"/> <!-- picture
ref="1" -->
  <member type="way" ref="8125153" role="inner"/> <!-- picture
ref="2" -->
  <member type="way" ref="8125154" role="inner"/> <!-- picture
ref="3" -->
```

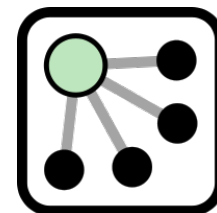
```
<member type="way" ref="3811966" role="" /> <!-- empty role
produces
  a warning; avoid this; most software works around it by
computing
  a role, which is more expensive than having one set
explicitly;
  not shown in the sample pictures to the right -->
```

```
<tag k="type" v="multipolygon"/>
</relation>
```

Exemplo: **multipolígonos**



RELATION





GRATA!

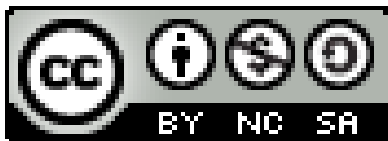
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Parte do material do curso “Capacitação em mapeamento com OpenStreetMap”, iniciativa do Instituto Virtual para o Desenvolvimento Sustentável – IVIDES.org, para o capítulo YouthMappers UFRJ. Curso de 60h, ministrado entre os dias 20 de julho e 24 de agosto de 2023, remotamente – <https://ivides.org/curso-osm-2023>.



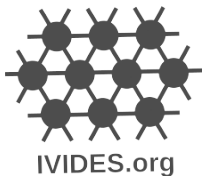
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COMO CITAR: Souto, Raquel Dezidério. **Capacitação em mapeamento com OpenStreetMap.** 60h. 20 jul. -24 ago. 2023. <https://ivides.org/curso-osm-2023>.

Créditos dos mapas e fotografias utilizados nesta apresentação: Wiki OSM, Wikipedia e Contribuidores do OpenStreetMap.

Realização
IVIDES.org



Apoio



teach 