B3 Die OSM main api

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OSM Ausschnitte herunterladen

<www.openstreetmap.org/export>

Figure 1: osm export

Das R-Paket XML - Gaston Sanchez

```
library("XML")
```

Gaston Sanchez - Dataflow

Das Arbeiten mit XML Daten

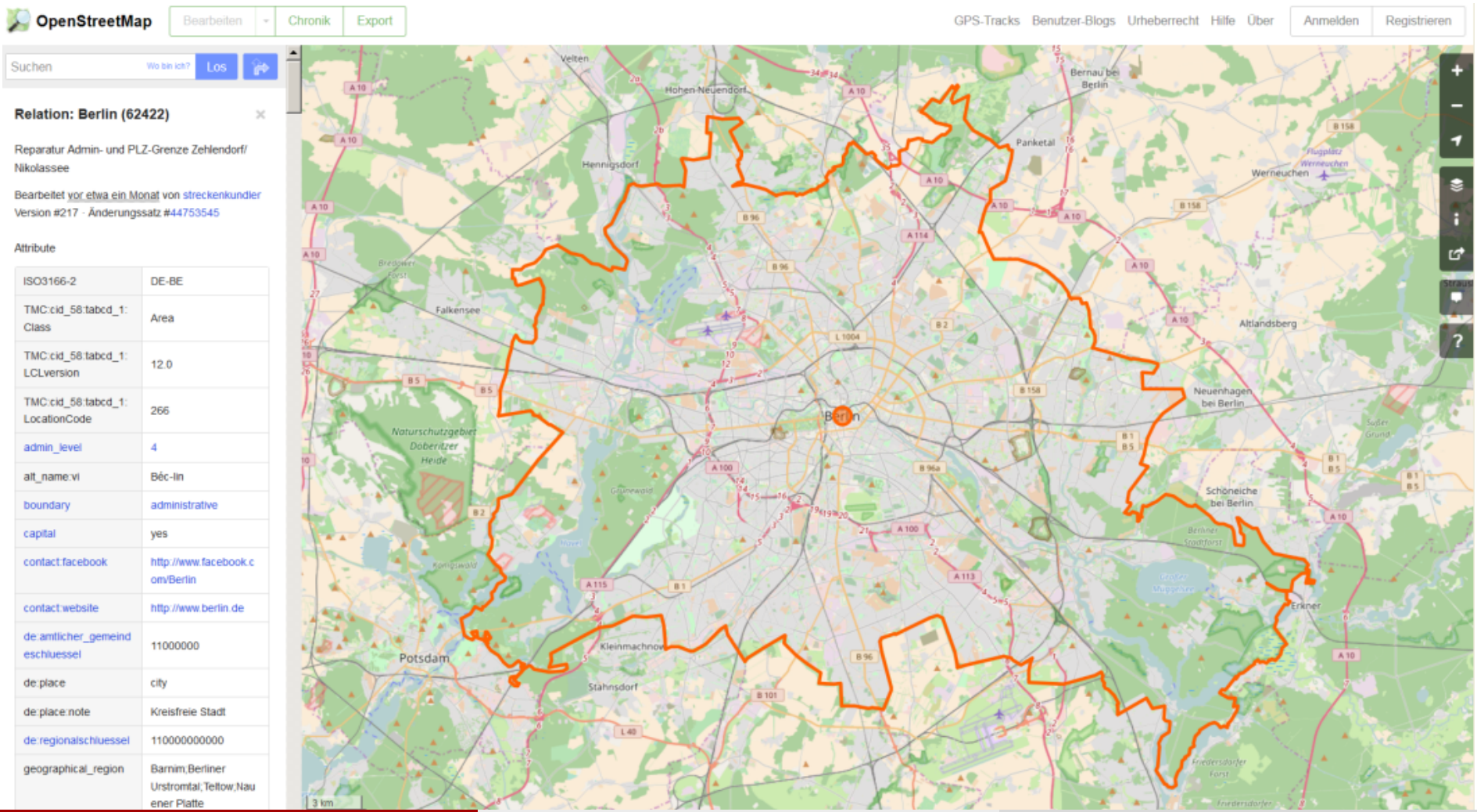
Figure 2: Gaston Sanchez - Webdaten bekommen

Funktionen im XML Paket

Function	Description
xmlName()	name of the node
xmlSize()	number of subnodes
xmlAttrs()	named character vector of all attributes
xmlGetAttr()	value of a single attribute
xmlValue()	contents of a leaf node
xmlParent()	name of parent node
xmlAncestors()	name of ancestor nodes
getSibling()	siblings to the right or to the left
xmlNamespace()	the namespace (if there's one)

Einzelne Objekte finden

<www.openstreetmap.org/export>



Beispiel: administrative Grenzen Berlin

Administrative Grenzen für Deutschland

```
url <- "https://api.openstreetmap.org/api/0.6/relation/62422"
```

```
BE <- xmlParse(url)
```

```
BE <- xmlParse("../data/62422.xml")
```

Figure 4: Administrative Grenzen Berlin

Das XML analysieren

- Tobi Bosede - Working with XML Data in R

```
xmltop = xmlRoot(BE)
class(xmltop)
```

```
## [1] "XMLInternalElementNode" "XMLInternalNode"
## [3] "XMLAbstractNode"
```

```
xmlSize(xmltop)
```

```
## [1] 1
```

```
xmlSize(xmltop[[1]])
```

```
## [1] 337
```

Nutzung von Xpath

Xpath, the XML Path Language, is a query language for selecting nodes from an XML document.

```
xpathApply(BE,"//tag[@k = 'population']")
```

```
## [[1]]
## <tag k="population" v="3440441"/>
##
## attr(,"class")
## [1] "XMLNodeSet"
```

Quelle für die Bevölkerungsgröße

```
xpathApply(BE,"//tag[@k = 'source:population']")
```

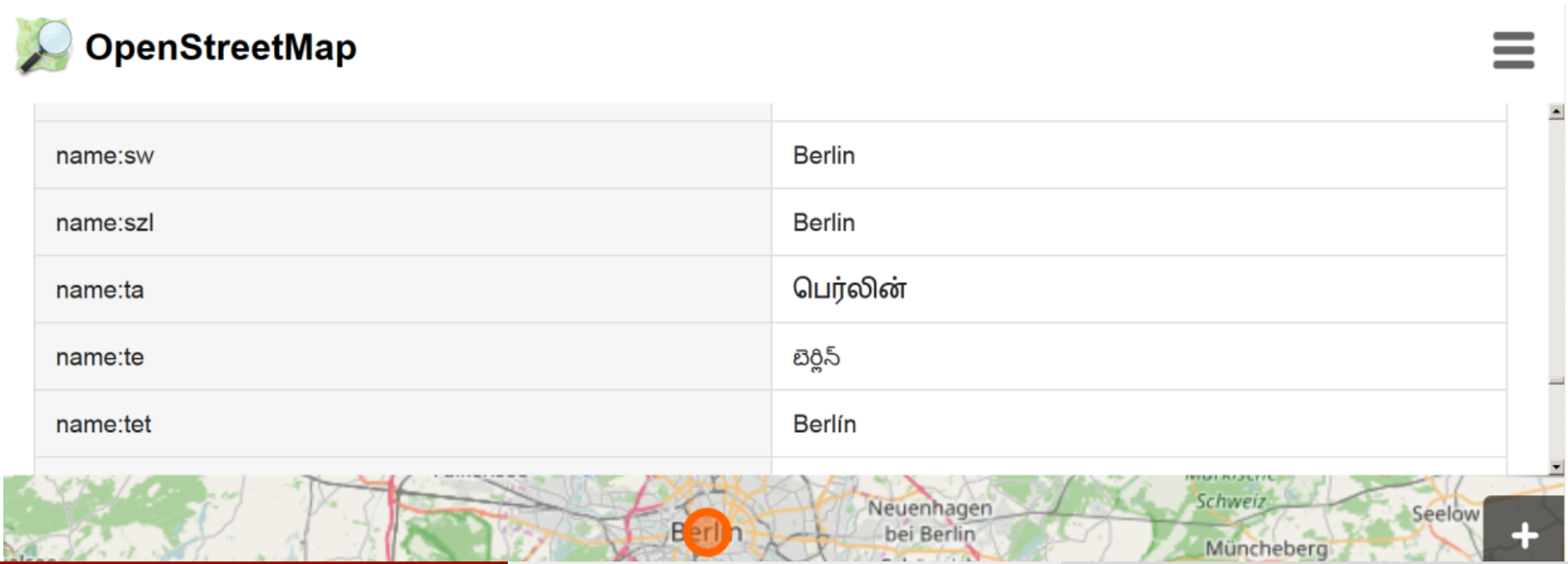
```
## [[1]]
## <tag k="source:population" v="http://www.statistik-berlin-b
##
## attr(,"class")
## [1] "XMLNodeSet"
```

-**Statistik Berlin Brandenburg**

Etwas überraschend:

```
xpathApply(BE,"//tag[@k = 'name:ta']")
```

```
## [[1]]
## <tag k="name:ta" v="<U+0BAA><U+0BC6><U+0BB0><U+0BCD><U+0BB2
##
## attr(,"class")
## [1] "XMLNodeSet"
```



Geographische Region

```
region <- xpathApply(BE,
  "//tag[@k = 'geographical_region']")
# regular expressions
region[[1]]
```

```
## <tag k="geographical_region" v="Barnim;Berliner Urstromtal;
```

```
<tag k="geographical_region"
  v="Barnim;Berliner Urstromtal;
  Teltow;Nauener Platte"/>
```

Landkreis

Weiteres Beispiel

```
url2<-"http://api.openstreetmap.org/api/0.6/node/25113879"
obj2<-xmlParse(url2)
obj_amenity<-xpathApply(obj2,"//tag[@k = 'amenity']")[[1]]
obj_amenity
```

```
## <tag k="amenity" v="university"/>
```

Wikipedia Artikel

```
xpathApply(obj2,"//tag[@k = 'wikipedia']")[[1]]
```

```
## <tag k="wikipedia" v="de:Universität Mannheim"/>
```

```
xpathApply(obj2,"//tag[@k = 'wheelchair']")[[1]]
```

```
xpathApply(obj2,"//tag[@k = 'name']")[[1]]
```

Das C und das A

```
url3<-"http://api.openstreetmap.org/api/0.6/node/303550876"
obj3 <- xmlParse(url3)
xpathApply(obj3,"//tag[@k = 'opening_hours']")[[1]]
```

```
## <tag k="opening_hours" v="Mo-Sa 09:00-20:00; Su,PH off"/>
```

Hin und weg

```
url4<-"http://api.openstreetmap.org/api/0.6/node/25439439"
obj4 <- xmlParse(url4)
xpathApply(obj4,"//tag[@k = 'railway:station_category']")[[1]]
```

```
## <tag k="railway:station_category" v="2"/>
```

- **Wikipedia Artikel Bahnhofskategorien**

Stufe	Bahnsteigkanten	Bahnsteiglänge	Reisende/Tag	Zughalte/Tag
6	1	bis 90 m	bis 49	bis 10
5	2	> 90 bis 140 m	50 bis 299	11 bis 50
4	3 bis 4	> 140 bis 170 m	300 bis 999	51 bis 100
3	5 bis 9	> 170 bis 210 m	1000 bis 9999	101 bis 500
2	10 bis 14	> 210 bis 280 m	10.000 bis 49.999	501 bis 1000
1	ab 15	> 280 m	ab 50.000	ab 1001

Prozent	Kategorie
> 90 %	1
> 80 bis 90 %	2
> 60 bis 80 %	3
> 50 bis 60 %	4
> 40 bis 50 %	5
> 25 bis 40 %	6
bis 25 %	7

Exkurs: Bahnhofskategorien

- **rvest: Easily Harvest (Scrape) Web Pages**

```
library(rvest)
```

```
## Loading required package: xml2
```

```
##
## Attaching package: 'rvest'
```

```
## The following object is masked from 'package:XML':
##
##     xml
```

```
bhfkat<-read_html(
  "https://de.wikipedia.org/wiki/Bahnhofskategorie")
df_html_bhfkat<-html_table(
  html_nodes(bhfkat, "table")[[2]],fill = TRUE)
```

Bahnhofskategorien Übersicht

Stufe	Bahnsteigkanten	Bahnsteiglänge[Anm 1]	Reisende/Tag
(0)	—	—	—
1	01	> 000 bis 090 m	00.000 bis 00.049
2	02	> 090 bis 140 m	00.050 bis 00.299
3	03 bis 04	> 140 bis 170 m	00.300 bis 0.0999
4	05 bis 09	> 170 bis 210 m	01.000 bis 09.999
5	10 bis 14	> 210 bis 280 m	10.000 bis 49.999
6	00i ab 15	> 280 m bis 000	000000 ab 50.000
Gewichtung	20 %	20 %	20 %

Nur fliegen ist schöner

```
url5<-"http://api.openstreetmap.org/api/0.6/way/162149882"
obj5<-xmlParse(url5)
xpathApply(obj5,"//tag[@k = 'name']")[[1]]
```

```
## <tag k="name" v="City-Airport Mannheim"/>
```

```
xpathApply(obj5,"//tag[@k = 'website']")[[1]]
```

```
## <tag k="website" v="http://www.flugplatz-mannheim.de/"/>
```

```
xpathApply(obj5,"//tag[@k = 'iata']")[[1]]
```

```
## <tag k="iata" v="MHG"/>
```

Das Paket osmar benutzen

```
library("osmar")
```

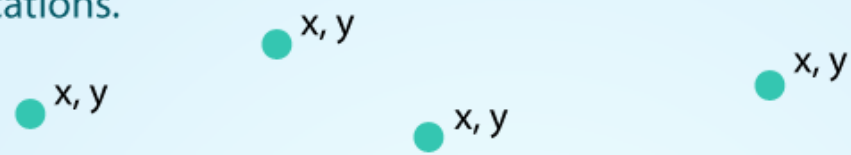
```
## Loading required package: RCurl

## Loading required package: bitops

## Loading required package: geosphere

##
## Attaching package: 'osmar'

## The following object is masked from 'package:utils':
##
##     find
```

```
node_ <- xmlParse("../data/162149882.xml")
node_osmar <- as_osmar(node_)
node_osmar
```

Drei Typen von Vektorobjekten

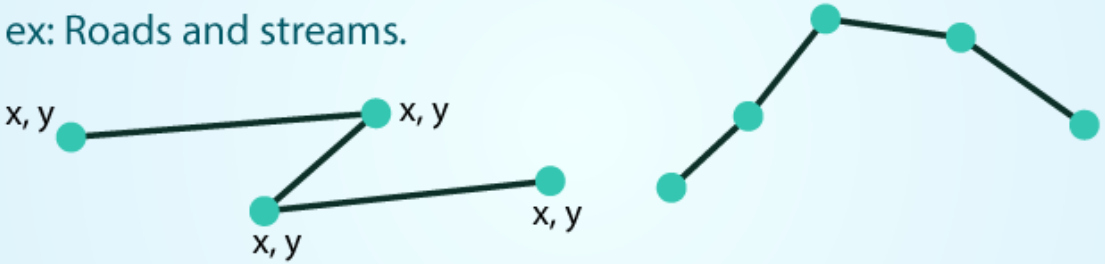
POINTS: Individual **x, y** locations.

ex: Center point of plot locations, tower locations, sampling locations.



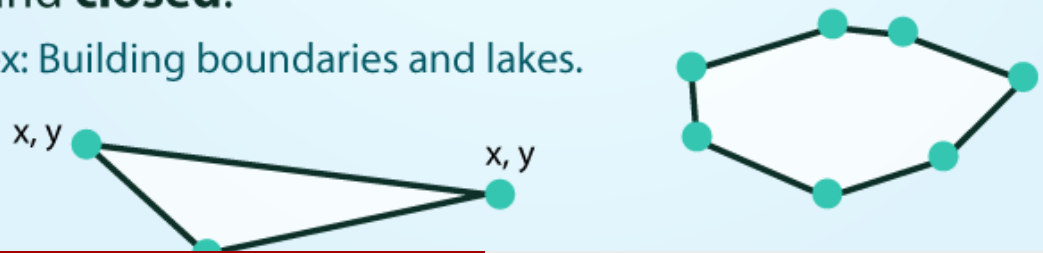
LINES: Composed of many (at least 2) vertices, or points, that are connected.

ex: Roads and streams.

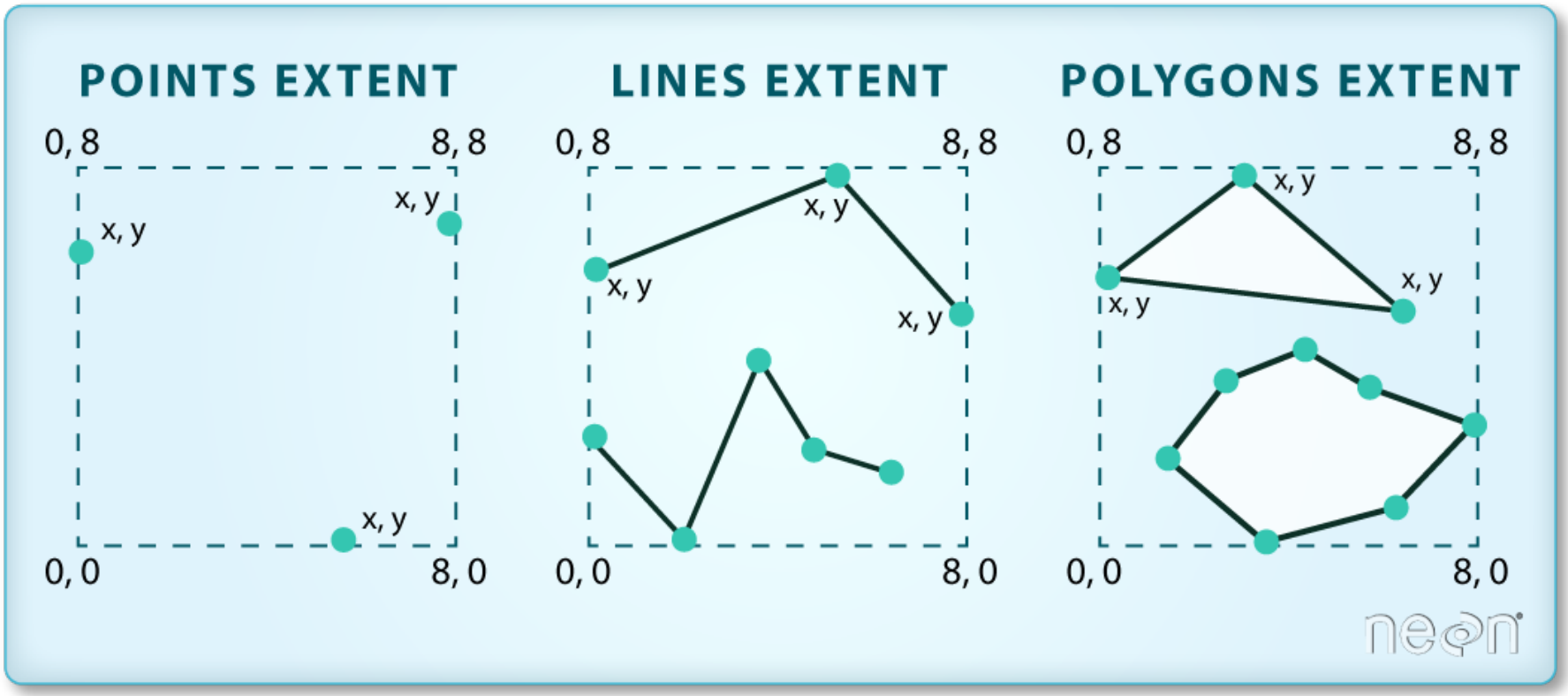


POLYGONS: 3 or more vertices that are connected and **closed**.

ex: Building boundaries and lakes.



Die Ausdehnung



Import mit dem Paket sf

```
library(sf)
```

```
## Linking to GEOS 3.6.1, GDAL 2.2.3, proj.4 4.9.3
```

- Mit dem Befehl st_layers kann man sehen, welche Layer verfügbar sind:

```
st_layers("../data/Amsterdam_highway_primary.osm")
```

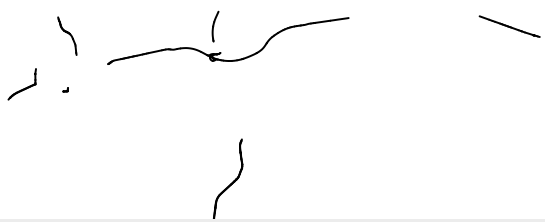
```
## Driver: OSM
## Available layers:
##         layer_name       geometry_type features fields
## 1           points               Point       NA     10
## 2            lines         Line String       NA      9
## 3 multilinestrings   Multi Line String       NA      4
## 4    multipolygons       Multi Polygon       NA     25
## 5  other_relations Geometry Collection       NA      4
```

Import von Layer lines

```
dat <- st_read("../data/Amsterdam_highway_primary.osm","lines"
```

```
## Reading layer `lines' from data source `D:\github\geocourse
## Simple feature collection with 1464 features and 9 fields
## geometry type:  LINESTRING
## dimension:      XY
## bbox:           xmin: 8.333102 ymin: 49.32801 xmax: 8.6279
## epsg (SRID):    4326
## proj4string:    +proj=longlat +datum=WGS84 +no_defs
```

```
plot(dat$geometry)
```



Import von Layer points

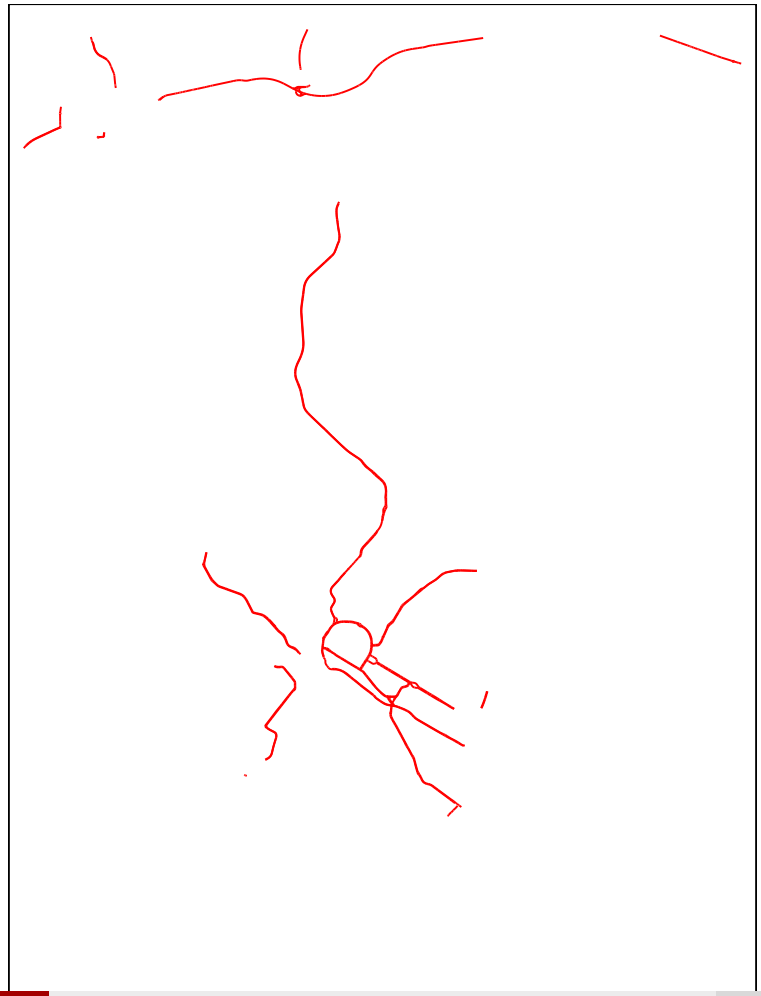
```
datp <- st_read("../data/Amsterdam_highway_primary.osm","point
```

```
## Reading layer `points' from data source `D:\github\geocours
## Simple feature collection with 800 features and 10 fields
## geometry type:  POINT
## dimension:      XY
## bbox:           xmin: 8.33654 ymin: 49.32801 xmax: 8.626969
## epsg (SRID):    4326
## proj4string:    +proj=longlat +datum=WGS84 +no_defs
```

```
plot(dat$geometry,pch=20,col=rgb(0,0,1,.1))
```

Mit einem anderen Paket plotten

```
library(tmap)
qtm(dat$geometry)
```



```r
st_layers("../data/ams_centraal.osm")
```

```
## Driver: OSM
## Available layers:
##         layer_name       geometry_type features fields
## 1           points               Point       NA     10
## 2            lines         Line String       NA      9
## 3 multilinestrings   Multi Line String       NA      4
## 4    multipolygons       Multi Polygon       NA     25
## 5  other_relations Geometry Collection       NA      4
```

```r
datm <- st_read("../data/ams_centraal.osm","multipolygons")
```

```
## Reading layer `multipolygons' from data source `D:\github\g
## Simple feature collection with 2796 features and 25 fields
## geometry type:  MULTIPOLYGON
## dimension:      XY
## bbox:           xmin: 4.874776 ymin: 52.36088 xmax: 4.92975
## epsg (SRID):    4326
```

Mehr Beispiele, wie man mit XML Daten umgeht:

- Deborah Nolan - **Extracting data from XML**

Noch mehr Informationen

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- Gaston Sanchez - **String Manipulation**
- **Nutzung, Vor- und Nachteile OSM**
- **Forschungsprojekte im Zusammenhang mit OpenStreetMap**

Referenzen

```
citation("XML")
```

```
##
## To cite package 'XML' in publications use:
##
##   Duncan Temple Lang and the CRAN Team (2018). XML: Tools f
##   Parsing and Generating XML Within R and S-Plus. R package
##   version 3.98-1.11. https://CRAN.R-project.org/package=XMl
##
## A BibTeX entry for LaTeX users is
##
##   @Manual{,
##     title = {XML: Tools for Parsing and Generating XML Witl
##     author = {Duncan Temple Lang and the CRAN Team},
##     year = {2018},
##     note = {R package version 3.98-1.11},
##     url = {https://CRAN.R-project.org/package=XML},
```

Das neuere Paket

```
citation("xml2")
```

```
##
## To cite package 'xml2' in publications use:
##
##   Hadley Wickham, James Hester and Jeroen Ooms (2018). xml2
##   XML. R package version 1.2.0.
##   https://CRAN.R-project.org/package=xml2
##
## A BibTeX entry for LaTeX users is
##
##   @Manual{,
##     title = {xml2: Parse XML},
##     author = {Hadley Wickham and James Hester and Jeroen Oo
##     year = {2018},
##     note = {R package version 1.2.0},
##     url = {https://CRAN.R-project.org/package=xml2},
```