

Nó Inicial de uma Rede

A partir da camada de hidrografia encontrar os nós iniciais da rede

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Pacotes

```
library(dplyr)
library(sf)
library(lwgeom)
```

Área de Interesse

```
# Subset da area - Limite exemplo
# xmin      ymin      xmax      ymax
# -52.45996 -20.05684 -51.66483 -19.57295

pts <- st_sf(pt = 1:2,
             geom = st_sfc(st_point(c(
               -52.45996, -20.05684
             )), st_point(c(
               -51.66483, -19.57296
             ))),
             crs = 4326)

pol <- pts %>% st_bbox() %>% st_as_sfc(., crs = 4326)

mask <- st_as_text(st_geometry(pol))
```

Base Cartográfica IBGE 1:250.000

```
bc_250 <- "/home/vinicio/Documentos/bc250_ibge.gpkg" #
```

```
sf::st_layers(bc_250) # layers do gdb
```

```
## Driver: GPKG
```

```
## Available layers:
```

| ## | layer_name | geometry_type | features | fields | crs_name |
|-------|--|---------------|----------|--------|-------------|
| ## 1 | enc_est_gerad_energia_eletrica_p | Point | 404 | 7 | SIRGAS 2000 |
| ## 2 | enc_hidreletrica_p | Point | 341 | 8 | SIRGAS 2000 |
| ## 3 | enc_subest_transm_distrib_energia_eletrica_p | Point | 397 | 4 | SIRGAS 2000 |
| ## 4 | enc_termeletrica_p | Point | 63 | 8 | SIRGAS 2000 |
| ## 5 | enc_trecho_energia_l | Line String | 3807 | 8 | SIRGAS 2000 |
| ## 6 | eco_ext_mineral_p | Point | 3043 | 12 | SIRGAS 2000 |
| ## 7 | eco_ext_mineral_a | Polygon | 619 | 12 | SIRGAS 2000 |
| ## 8 | hid_banco_areia_a | Polygon | 3181 | 5 | SIRGAS 2000 |
| ## 9 | hid_barragem_p | Point | 478 | 6 | SIRGAS 2000 |
| ## 10 | hid_barragem_l | Line String | 9096 | 6 | SIRGAS 2000 |
| ## 11 | hid_canal_vala_l | Line String | 1128 | 8 | SIRGAS 2000 |
| ## 12 | hid_canal_vala_a | Polygon | 139 | 8 | SIRGAS 2000 |
| ## 13 | hid_foz_maritima_p | Point | 1716 | 2 | SIRGAS 2000 |
| ## 14 | hid_foz_maritima_l | Line String | 153 | 2 | SIRGAS 2000 |
| ## 15 | hid_foz_maritima_a | Polygon | 6 | 2 | SIRGAS 2000 |
| ## 16 | hid_ilha_a | Polygon | 13211 | 4 | SIRGAS 2000 |
| ## 17 | hid_massa_dagua_a | Polygon | 46507 | 8 | SIRGAS 2000 |
| ## 18 | hid_recife_a | Polygon | 68 | 5 | SIRGAS 2000 |
| ## 19 | hid_terreno_sujeito_inundacao_a | Polygon | 232 | 3 | SIRGAS 2000 |
| ## 20 | hid_trecho_drenagem_l | Line String | 1599240 | 7 | SIRGAS 2000 |
| ## 21 | lml_aglomerado_rural_p | Point | 13577 | 3 | SIRGAS 2000 |
| ## 22 | lml_aglomerado_rural_isolado_p | Point | 13577 | 4 | SIRGAS 2000 |
| ## 23 | lml_area_densamente_edificada_a | Multi Polygon | 8391 | 2 | SIRGAS 2000 |
| ## 24 | lml_area_politico_administrativa_a | Multi Polygon | 5612 | 2 | SIRGAS 2000 |
| ## 25 | lml_capital_p | Point | 27 | 4 | SIRGAS 2000 |
| ## 26 | lml_cidade_p | Point | 5570 | 3 | SIRGAS 2000 |
| ## 27 | lml_municipio_a | Multi Polygon | 5570 | 4 | SIRGAS 2000 |
| ## 28 | lml_pais_a | Multi Polygon | 15 | 4 | SIRGAS 2000 |
| ## 29 | lml_posic_geo_localidade_p | Point | 24252 | 8 | SIRGAS 2000 |
| ## 30 | lml_unidade_federacao_a | Multi Polygon | 27 | 4 | SIRGAS 2000 |
| ## 31 | lml_vila_p | Point | 4741 | 3 | SIRGAS 2000 |
| ## 32 | rel_alteracao_fisiografica_antropica_p | Point | 3043 | 3 | SIRGAS 2000 |
| ## 33 | rel_alteracao_fisiografica_antropica_l | Line String | 1128 | 3 | SIRGAS 2000 |
| ## 34 | rel_alteracao_fisiografica_antropica_a | Polygon | 619 | 3 | SIRGAS 2000 |
| ## 35 | rel_elemento_fisiografico_natural_p | Point | 1205 | 3 | SIRGAS 2000 |
| ## 36 | rel_elemento_fisiografico_natural_l | Line String | 2196 | 3 | SIRGAS 2000 |
| ## 37 | rel_elemento_fisiografico_natural_a | Polygon | 100 | 3 | SIRGAS 2000 |
| ## 38 | rel_pico_p | Point | 97 | 3 | SIRGAS 2000 |
| ## 39 | rel_ponto_cotado_altimetrico_p | Point | 127 | 3 | SIRGAS 2000 |
| ## 40 | rel_ponto_hipsometrico_p | Point | 127 | 1 | SIRGAS 2000 |
| ## 41 | tra_estrut_transporte_p | Point | 103 | 7 | SIRGAS 2000 |
| ## 42 | tra_obra_de_arte_viaria_p | Point | 834 | 13 | SIRGAS 2000 |
| ## 43 | tra_obra_de_arte_viaria_l | Line String | 812 | 13 | SIRGAS 2000 |
| ## 44 | tra_passagem_elevada_viaduto_p | Point | 810 | 19 | SIRGAS 2000 |
| ## 45 | tra_passagem_elevada_viaduto_l | Line String | 13 | 19 | SIRGAS 2000 |

```
## 46          tra_passagem_nivel_p      Point      1587      2 SIRGAS 2000
## 47          tra_ponte_p              Point      6248     17 SIRGAS 2000
## 48          tra_ponte_l              Line String    733     17 SIRGAS 2000
## 49          tra_travessia_p          Point        146      5 SIRGAS 2000
## 50          tra_travessia_l          Line String    376      5 SIRGAS 2000
## 51          tra_tunel_p              Point         24     15 SIRGAS 2000
## 52          tra_tunel_l              Line String     66     15 SIRGAS 2000
## 53          aer_complexo_aeroporto_p Point        104     14 SIRGAS 2000
## 54          aer_pista_ponto_pouso_p Point       1914     11 SIRGAS 2000
## 55          aer_pista_ponto_pouso_l Line String   2035     11 SIRGAS 2000
## 56          dut_trecho_duto_l         Line String    108     11 SIRGAS 2000
## 57          fer_trecho_ferrovuario_l Line String    683     15 SIRGAS 2000
## 58          hdv_atracadouro_terminal_l Line String     16      8 SIRGAS 2000
## 59          hdv_complexo_portuario_p Point        126     10 SIRGAS 2000
## 60          hdv_eclusa_p              Point         17      9 SIRGAS 2000
## 61          hdv_sinalizacao_p         Point       326      5 SIRGAS 2000
## 62          hdv_trecho_hidrovuario_l Line String     91      7 SIRGAS 2000
## 63          rod_trecho_rodovuario_l   Line String  130242     18 SIRGAS 2000
## 64          rod_via_deslocamento_l   Line String  130242     14 SIRGAS 2000
## 65          lml_outros_limite_oficiais_l Line String     18      5 SIRGAS 2000
## 66          cbge_cemiterio_p          Point      18300      6 SIRGAS 2000
## 67          laz_complexo_desportivo_lazer_p Point         4      6 SIRGAS 2000
## 68          indice_dos_nomes          Point    622161      6 SIRGAS 2000
```

Hidrografia

```
hid <- st_read(bc_250, layer = "hid_trecho_drenagem_l",
               wkt_filter = mask) # Evita carregar a layer BR
```

```
## Reading layer `hid_trecho_drenagem_l' from data source `/home/vinicio/Documentos/bc250_ibge.gpkg' us
## Simple feature collection with 534 features and 7 fields
## Geometry type: LINESTRING
## Dimension: XY
## Bounding box: xmin: -52.51712 ymin: -20.08 xmax: -51.6387 ymax: -19.51563
## Geodetic CRS: SIRGAS 2000
```

Nó inicial

```
start <- lwgeom::st_startpoint(hid) %>% st_difference() %>% st_as_sf()
```

```
## although coordinates are longitude/latitude, st_difference assumes that they are planar
```

Nó final

```
end <- lwgeom::st_endpoint(hid) %>% st_difference() %>% st_as_sf()
```

Buffer

```
end_pol <- st_buffer(end, 100)
# mapview::mapview(end_pol)
start_pol <- st_buffer(start, 100)
```

Diferença

```
st_erase = function(x, y) st_difference(x, st_union(st_combine(y)))

no_start <- st_erase(st_union(st_combine(start)), st_union(end_pol))
```

Plot

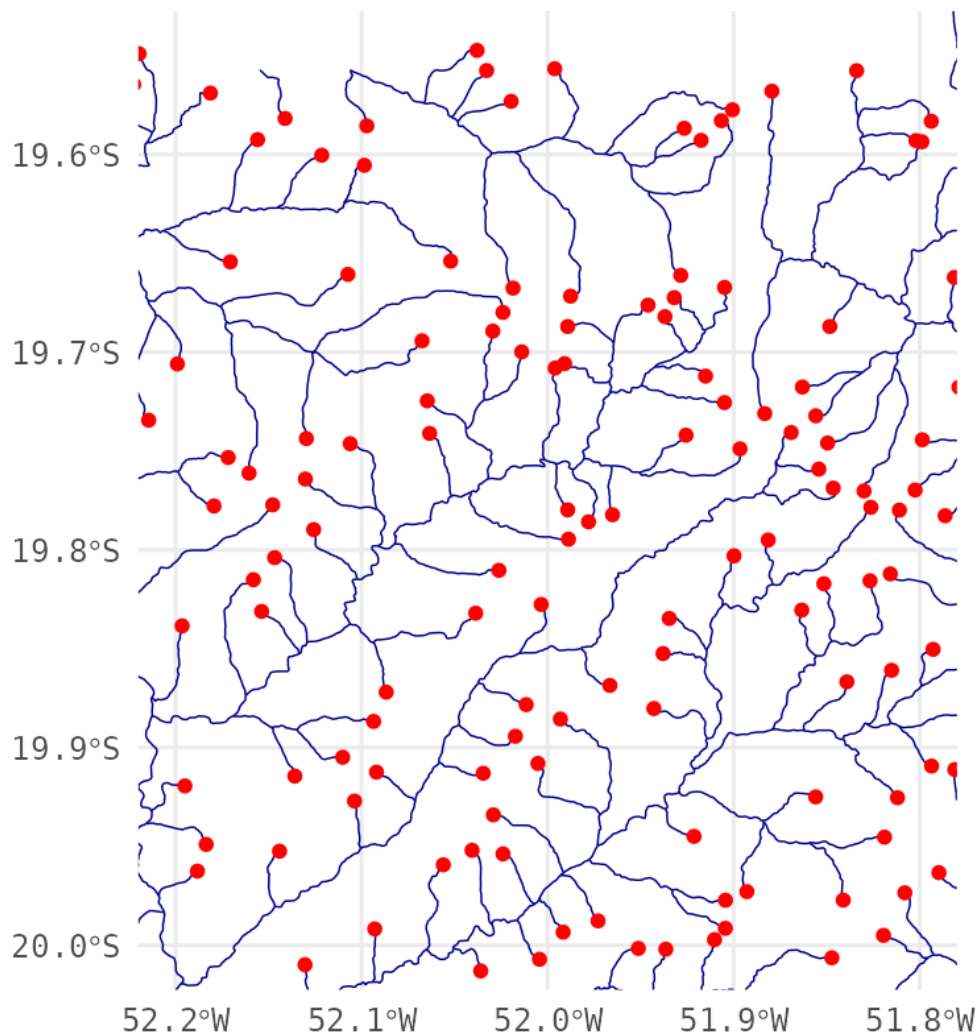
```
library(ggplot2)

ext.mapa <- c(xmin = -51.8, xmax = -52.2, ymin = -19.55, ymax = -20,2)

p <- ggplot() +
  geom_sf(
    data = hid,
    fill = "darkblue",
    color = "darkblue",
    linewidth = .25,
    alpha = 100
  ) +
  geom_sf(data = no_start,
    color = "red",
    size = 1.3) +
  coord_sf(xlim = c(ext.mapa["xmin"], ext.mapa["xmax"]),
    ylim = c(ext.mapa["ymin"], ext.mapa["ymax"])) +
  theme_minimal() +
  labs(
    title = "Nó Inicial da Rede",
    subtitle = "",
    caption = "
    A partir da camada de hidrografia encontrar os nós iniciais da rede."
  ) +
  theme(
    plot.title = element_text(
      size = 14,
      face = "bold",
      family = "serif"
    ),
    plot.subtitle = element_text(
      size = 9,
      face = "plain",
      family = "mono"
    ),
    plot.caption = element_text(
      size = 6,
      face = "plain",
      family = "mono"
    ),
    axis.text = element_text(family = "mono"),
    axis.text.x = element_text(family = "mono"),
    axis.text.y = element_text(family = "mono"),
    legend.key.height = unit(0.10, 'npc'),
    legend.key.width = unit(0.04, 'npc'))
```

```
ggsave(
  plot = p,
  filename = "../figura_no_inicial.png",
  width = 9.5,
  height = 12.5,
  units = "cm",
  device = "png",
  dpi = 200,
  bg = "white")
```

Nó Inicial da Rede



A partir da camada de hidrografia encontrar os nós iniciais da rede.

Anexo

Sessão R

```
sessioninfo::session_info()
```

```
## - Session info -----
## setting value
## version R version 4.4.2 (2024-10-31)
## os      Ubuntu 20.04.6 LTS
## system  x86_64, linux-gnu
## ui      RStudio
## language pt_BR:pt:en
## collate pt_BR.UTF-8
## ctype   pt_BR.UTF-8
## tz      America/Sao_Paulo
## date    2024-11-25
## rstudio 2024.04.0+735 Chocolate Cosmos (desktop)
## pandoc  3.1.11 @ /usr/lib/rstudio/resources/app/bin/quarto/bin/tools/x86_64/ (via rmarkdown)
##
## - Packages -----
## package      * version date (UTC) lib source
## base64enc     0.1-3   2015-07-28 [1] CRAN (R 4.4.0)
## brew          1.0-10  2023-12-16 [1] CRAN (R 4.4.0)
## class         7.3-22  2023-05-03 [4] CRAN (R 4.3.1)
## classInt      0.4-10  2023-09-05 [1] CRAN (R 4.4.0)
## cli           3.6.2   2023-12-11 [1] CRAN (R 4.4.0)
## codetools     0.2-19  2023-02-01 [4] CRAN (R 4.2.2)
## colorspace    2.1-0   2023-01-23 [1] CRAN (R 4.4.0)
## crosstalk     1.2.1   2023-11-23 [1] CRAN (R 4.4.0)
## data.table    1.15.4  2024-03-30 [1] CRAN (R 4.4.0)
## DBI           1.2.2   2024-02-16 [1] CRAN (R 4.4.0)
## digest        0.6.35  2024-03-11 [1] CRAN (R 4.4.0)
## dplyr         * 1.1.4   2023-11-17 [1] CRAN (R 4.4.0)
## e1071         1.7-14  2023-12-06 [1] CRAN (R 4.4.0)
## evaluate      0.23    2023-11-01 [1] CRAN (R 4.4.0)
## fansi         1.0.6   2023-12-08 [1] CRAN (R 4.4.0)
## farver        2.1.2   2024-05-13 [1] CRAN (R 4.4.0)
## fastmap       1.1.1   2023-02-24 [1] CRAN (R 4.4.0)
## generics      0.1.3   2022-07-05 [1] CRAN (R 4.4.0)
## ggplot2       * 3.5.1   2024-04-23 [1] CRAN (R 4.4.0)
## glue          1.7.0   2024-01-09 [1] CRAN (R 4.4.0)
## gtable        0.3.5   2024-04-22 [1] CRAN (R 4.4.0)
## htmltools     0.5.8.1 2024-04-04 [1] CRAN (R 4.4.0)
## htmlwidgets   1.6.4   2023-12-06 [1] CRAN (R 4.4.0)
## jquerylib     0.1.4   2021-04-26 [1] CRAN (R 4.4.0)
## jsonlite      1.8.8   2023-12-04 [1] CRAN (R 4.4.0)
## KernSmooth    2.23-24 2024-05-17 [4] CRAN (R 4.4.0)
## knitr         1.46    2024-04-06 [1] CRAN (R 4.4.0)
## lattice       0.22-5  2023-10-24 [4] CRAN (R 4.3.1)
## leafem        0.2.3   2023-09-17 [1] CRAN (R 4.4.0)
## leaflet       2.2.2   2024-03-26 [1] CRAN (R 4.4.0)
## leaflet.providers 2.0.0   2023-10-17 [1] CRAN (R 4.4.0)
## leafpop       0.1.0   2021-05-22 [1] CRAN (R 4.4.0)
## lifecycle     1.0.4   2023-11-07 [1] CRAN (R 4.4.0)
```

```

## lwgeom          * 0.2-14 2024-02-21 [1] CRAN (R 4.4.0)
## magrittr        2.0.3 2022-03-30 [1] CRAN (R 4.4.0)
## mapview         * 2.11.2 2023-10-13 [1] CRAN (R 4.4.0)
## munsell         0.5.1 2024-04-01 [1] CRAN (R 4.4.0)
## ngeo            0.4.8 2024-04-17 [1] CRAN (R 4.4.0)
## pillar          1.9.0 2023-03-22 [1] CRAN (R 4.4.0)
## pkgconfig       2.0.3 2019-09-22 [1] CRAN (R 4.4.0)
## png             0.1-8 2022-11-29 [1] CRAN (R 4.4.0)
## proxy           0.4-27 2022-06-09 [1] CRAN (R 4.4.0)
## R6              2.5.1 2021-08-19 [1] CRAN (R 4.4.0)
## ragg            1.3.1 2024-05-06 [1] CRAN (R 4.4.0)
## raster          3.6-26 2023-10-14 [1] CRAN (R 4.4.0)
## RColorBrewer    1.1-3 2022-04-03 [1] CRAN (R 4.4.0)
## Rcpp            1.0.12 2024-01-09 [1] CRAN (R 4.4.0)
## rgdal           1.6-7 2023-05-31 [1] url (https://cran.r-project.org/src/contrib/Archive/rgdal/rgdal\_1.6-7.tar.gz)
## rlang           1.1.3 2024-01-10 [1] CRAN (R 4.4.0)
## rmarkdown       2.26 2024-03-05 [1] CRAN (R 4.4.0)
## rstudioapi      0.16.0 2024-03-24 [1] CRAN (R 4.4.0)
## s2              1.1.6 2023-12-19 [1] CRAN (R 4.4.0)
## satellite       1.0.5 2024-02-10 [1] CRAN (R 4.4.0)
## scales          1.3.0 2023-11-28 [1] CRAN (R 4.4.0)
## sessioninfo     1.2.2 2021-12-06 [1] CRAN (R 4.4.0)
## sf              * 1.0-16 2024-03-24 [1] CRAN (R 4.4.0)
## sp              2.1-4 2024-04-30 [1] CRAN (R 4.4.0)
## svglite         2.1.3 2023-12-08 [1] CRAN (R 4.4.0)
## systemfonts     1.0.6 2024-03-07 [1] CRAN (R 4.4.0)
## terra           1.7-78 2024-05-22 [1] CRAN (R 4.4.0)
## textshaping     0.3.7 2023-10-09 [1] CRAN (R 4.4.0)
## tibble          3.2.1 2023-03-20 [1] CRAN (R 4.4.0)
## tidyselect      1.2.1 2024-03-11 [1] CRAN (R 4.4.0)
## tinytex         0.54 2024-11-01 [1] CRAN (R 4.4.2)
## units           0.8-5 2023-11-28 [1] CRAN (R 4.4.0)
## utf8            1.2.4 2023-10-22 [1] CRAN (R 4.4.0)
## uuid            1.2-0 2024-01-14 [1] CRAN (R 4.4.0)
## vctrs           0.6.5 2023-12-01 [1] CRAN (R 4.4.0)
## withr           3.0.0 2024-01-16 [1] CRAN (R 4.4.0)
## wk              0.9.1 2023-11-29 [1] CRAN (R 4.4.0)
## xfun            0.49 2024-10-31 [1] CRAN (R 4.4.2)
## yaml            2.3.8 2023-12-11 [1] CRAN (R 4.4.0)
##
## [1] /home/vinicio/R/x86_64-pc-linux-gnu-library/4.4
## [2] /usr/local/lib/R/site-library
## [3] /usr/lib/R/site-library
## [4] /usr/lib/R/library
##
## -----
rmarkdown::render("no_inicial_rede.R", output_format = "pdf_document")

```