dns_first

2022-03-05

R Markdown

```
library('RSQLite')
library('ggplot2')
library(DBI)
options("scipen"=100, "digits"=4)


db <- dbConnect(RSQLite::SQLite(), dbname="./dnstor_statistics_dns.sqlite")
dns_data <-dbSendQuery(db, "
  SELECT count(*) as countGrouped, year, period, CAST(CAST(year AS text) || CAST(period AS text) as inte
    FROM DNS_ANALYSIS
   WHERE QTYPE != 0
GROUP BY year_period, year, period, qname, qtype
ORDER BY quantity DESC;
")
dns_data_fetched <- fetch(dns_data)
#dns_data_fetched %>%
 # filter(qtype == 0)
```

```
library(dplyr)
```

```
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(tibble)

dns_data.year_period.ungrouped <- group_split(dns_data_fetched, year_period)

N = 10
dns_data.topNconsultas <- head(dns_data.year_period.ungrouped[[1]], N)
dns_data.year_period.ungrouped.len = length(dns_data.year_period.ungrouped)

select(dns_data.topNconsultas, c('year_period', 'qtype', 'quantity', 'qname'))
```

```
## # A tibble: 10 x 4
##    year_period qtype quantity qname
##          <int> <chr>    <int> <chr>
##  1       20204 ANY   19005578 peacecorps.gov.
##  2       20204 ANY     816242 lavrov.in.
##  3       20204 ANY     779892 sl.
##  4       20204 ANY     652325 irs.gov.
##  5       20204 ANY     569411 fe18.ru.
##  6       20204 ANY      12296 .
##  7       20204 ANY      10248 isc.org.
##  8       20204 A         8467 20200328132334-cq9bm.ldd.sohu.com.
##  9       20204 RRSIG     6176 jp.
## 10       20204 A         4953 500940734da64dde863b257c9c12c03d.apigw.ap-southea~
```

```
select(head(dns_data.year_period.ungrouped[[2]], N), c('year_period', 'qtype', 'quantity', 'qname'))
```

```
## # A tibble: 10 x 4
##    year_period qtype quantity qname
##          <int> <chr>    <int> <chr>
##  1       20211 ANY   32698124 peacecorps.gov.
##  2       20211 ANY    3032399 sl.
##  3       20211 ANY    2418859 isc.org.
##  4       20211 ANY     941083 fe18.ru.
##  5       20211 ANY     463904 wzb.eu.
##  6       20211 ANY     132970 .
##  7       20211 A        20998 mirrorlist.centos.org.
##  8       20211 A        10698 hotspot.accesscam.org.
##  9       20211 MX        8014 pwad.gov.ae.
## 10       20211 A         3882 theguardian.webredirect.org.
```

```
select(head(dns_data.year_period.ungrouped[[3]], N), c('year_period', 'qtype', 'quantity', 'qname'))
```

```
## # A tibble: 10 x 4
##    year_period qtype quantity qname
##          <int> <chr>    <int> <chr>
##  1       20212 ANY   13183512 peacecorps.gov.
##  2       20212 ANY    1337802 sl.
##  3       20212 ANY     534815 irs.gov.
##  4       20212 ANY     220674 isc.org.
##  5       20212 ANY     124579 fe18.ru.
##  6       20212 ANY      90999 .
##  7       20212 MX       21895 dpc.ae.
##  8       20212 ANY      11229 hcc.nl.
##  9       20212 A        10965 dji.gov.ae.
## 10       20212 A         9144 emaratalyoum.com.
```

```
select(head(dns_data.year_period.ungrouped[[4]], N), c('year_period', 'qtype', 'quantity', 'qname'))
```

```
## # A tibble: 10 x 4
##    year_period qtype quantity qname
##          <int> <chr>    <int> <chr>
##  1       20213 RRSIG   324789 pizzaseo.com.
## 2        20213 ANY     178363 sl.
## 3        20213 ANY     165932 .
## 4        20213 A         5925 www.ac.my.blastodermic-swimmable.info.
## 5        20213 A         5291 tmall.com.
## 6        20213 A         4848 www.ac.my.superability-kooka.info.
## 7        20213 A         4655 2015annualreport.bloomberg.org.
## 8        20213 A         2794 lpnkuearwljpqwbwz.tmall.com.
## 9        20213 MX        1915 rt.com.
## 10       20213 MX        1888 nawahprogram.ae.
```

```
select(head(dns_data.year_period.ungrouped[[5]], N), c('year_period', 'qtype', 'quantity', 'qname'))
```

```
## # A tibble: 10 x 4
##    year_period qtype quantity qname
##          <int> <chr>    <int> <chr>
## 1        20214 ANY    4844082 peacecorps.gov.
## 2        20214 ANY     620249 sl.
## 3        20214 A        19541 www.ac.my.blastodermic-swimmable.info.
## 4        20214 A        17848 www.ac.my.superability-kooka.info.
## 5        20214 A        13595 www.ndnslab.com.
## 6        20214 ANY      11073 .
## 7        20214 RRSIG     8499 pizzaseo.com.
## 8        20214 MX        6670 nih.gov.
## 9        20214 A         5932 2015annualreport.bloomberg.org.
## 10       20214 MX        4680 nawahprogram.ae.
```

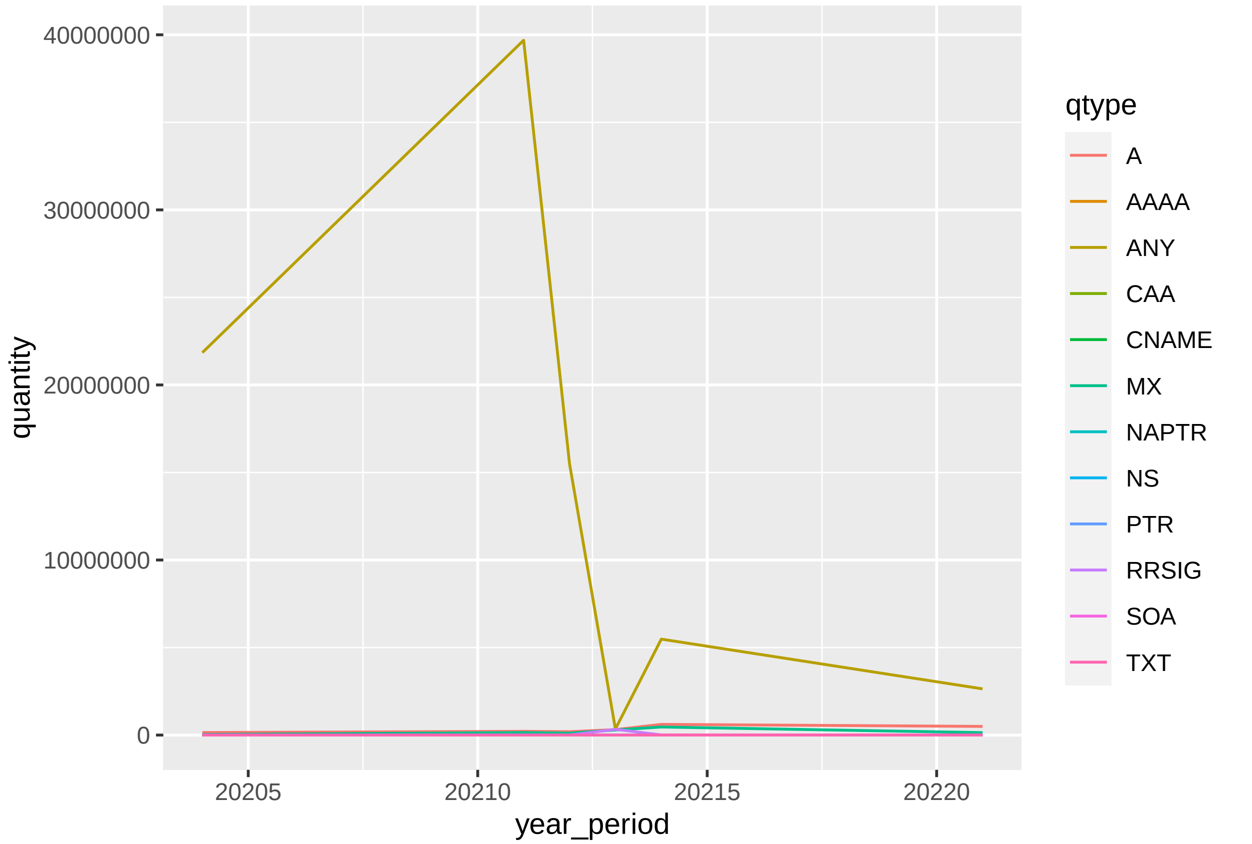
```
select(head(dns_data.year_period.ungrouped[[6]], N), c('year_period', 'qtype', 'quantity', 'qname'))
```

```
## # A tibble: 10 x 4
##    year_period qtype quantity qname
##          <int> <chr>    <int> <chr>
## 1        20221 ANY    2614699 peacecorps.gov.
## 2        20221 A        21200 admin.asry.net.
## 3        20221 ANY      19737 sl.
## 4        20221 A        18629 www.ndnslab.com.
## 5        20221 A        11635 ftp.ebisb.com.
## 6        20221 MX        7821 bankfab.com.
## 7        20221 A         6091 vpn.qatarsteel.com.qa.
## 8        20221 MX        6025 zayed.org.ae.
## 9        20221 A         5766 moi.gov.kw.
## 10       20221 MX        5077 mopa.ae.
```

```
for (i in c(2:dns_data.year_period.ungrouped.len)) {
  dns_data.topNconsultas <- rbind(dns_data.topNconsultas, head(dns_data.year_period.ungrouped[[i]], N))
}




#print(select(dns_data.topNconsultas, c('year_period', 'qtype', 'quantity', 'qname')), nrow = length(dn
## ------------ Quantos ataques com cada tipo de qtype foi utilizado, por trimestre ? ------------
#dns_data_fetched

dns_data_fetched.quarter_type_quantity = select(dns_data_fetched, c('year_period', 'qtype', 'quantity')

dns_data_fetched.sum_attacks_quarterly = dns_data_fetched.quarter_type_quantity %>%
  group_by(qtype, year_period) %>%
  summarise(quantity = sum(quantity))
```

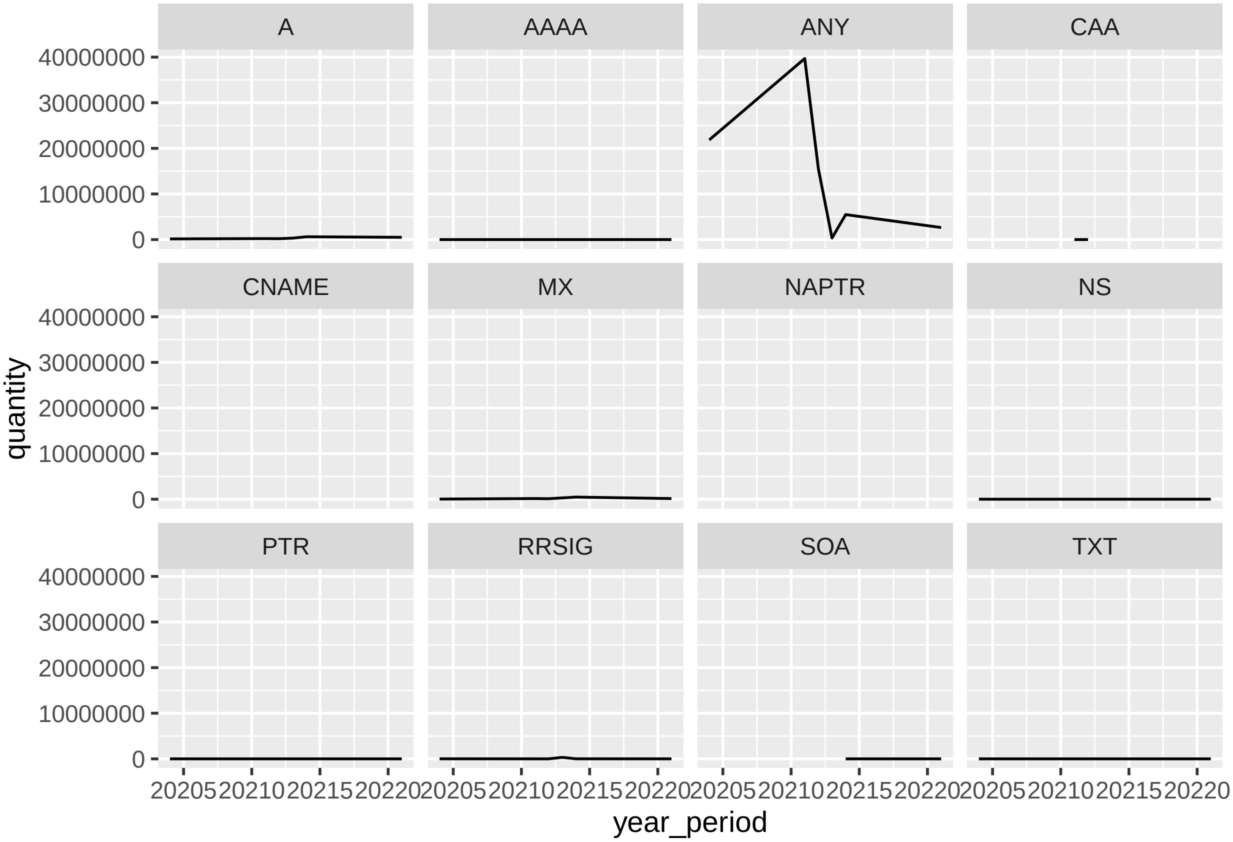
```
## `summarise()` has grouped output by 'qtype'. You can override using the
## `.groups` argument.
```

```
dns_data_fetched.sum_attacks_quarterly %>%
#  mutate(year_period=as.factor(year_period)) %>%
  ggplot(aes(x = year_period, y = quantity, color = qtype)) +
  geom_line()
```



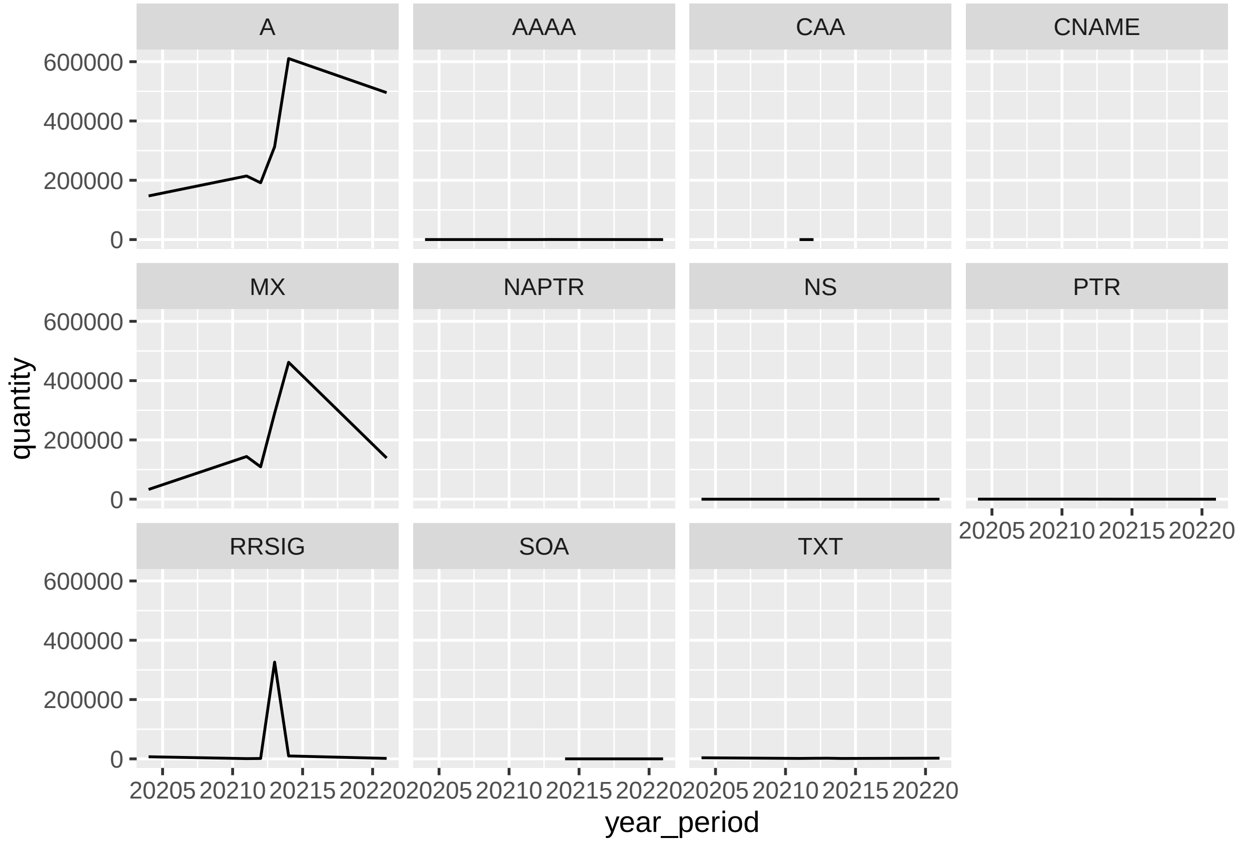
```
ggplot(data = dns_data_fetched.sum_attacks_quarterly, aes(x = year_period, y = quantity)) +
    geom_line() +
    facet_wrap(facets = vars(qtype))
```

```
## geom_path: Each group consists of only one observation. Do you need to adjust
## the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to adjust
## the group aesthetic?
```



```
dns_data_fetched.sum_attacks_quarterly %>%
  filter(qtype != "ANY") %>%
  ggplot(aes(x = year_period, y = quantity)) +
    geom_line() +
    facet_wrap(facets = vars(qtype))
```

```
## geom_path: Each group consists of only one observation. Do you need to adjust
## the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to adjust
## the group aesthetic?
```

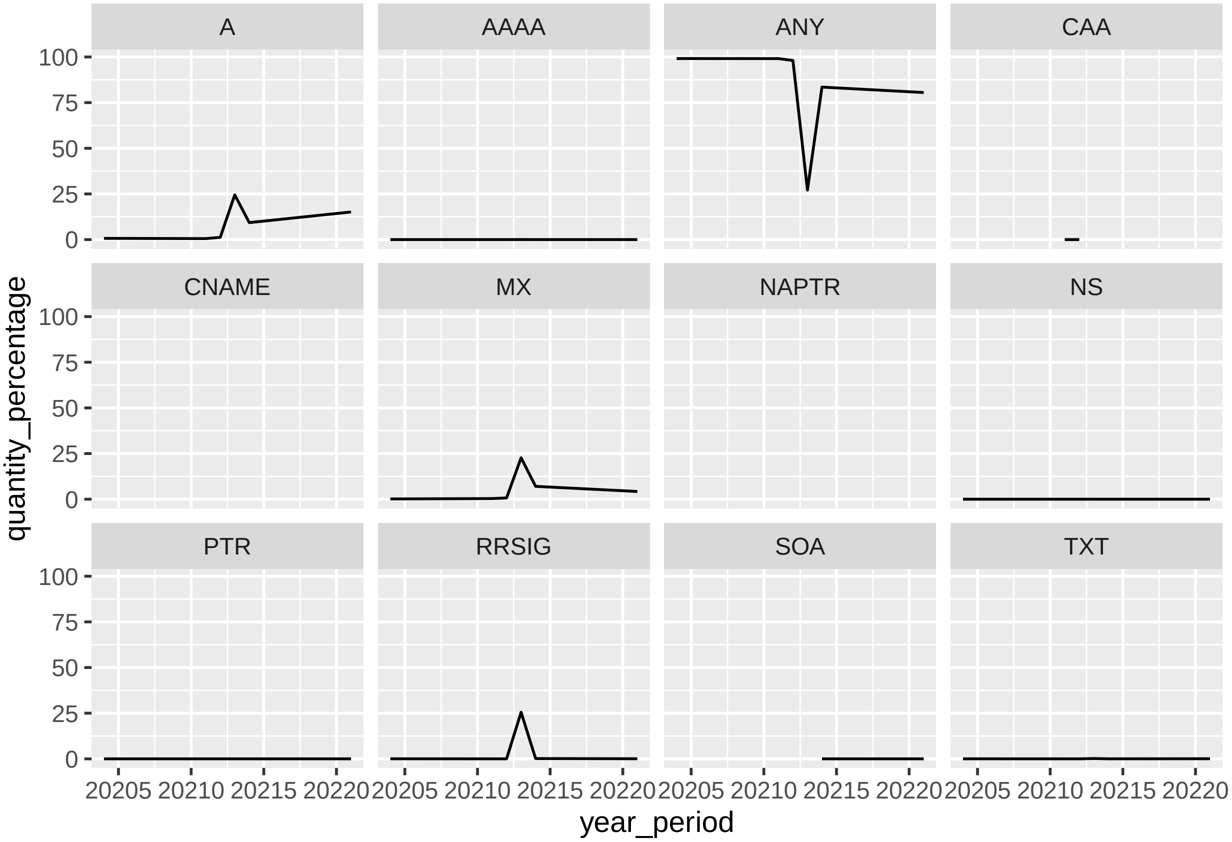


```
# ------------------------------------------ quantity with percentage

dns_data_fetched.sum_attacks_quarterly.sum_period_quantity = dns_data_fetched.sum_attacks_quarterly %>%
  group_by(year_period) %>%
  summarise(sum_period_quantity = sum(quantity), qtype=qtype, quantity=quantity)
```

```
## `summarise()` has grouped output by 'year_period'. You can override using the
## `.groups` argument.
```

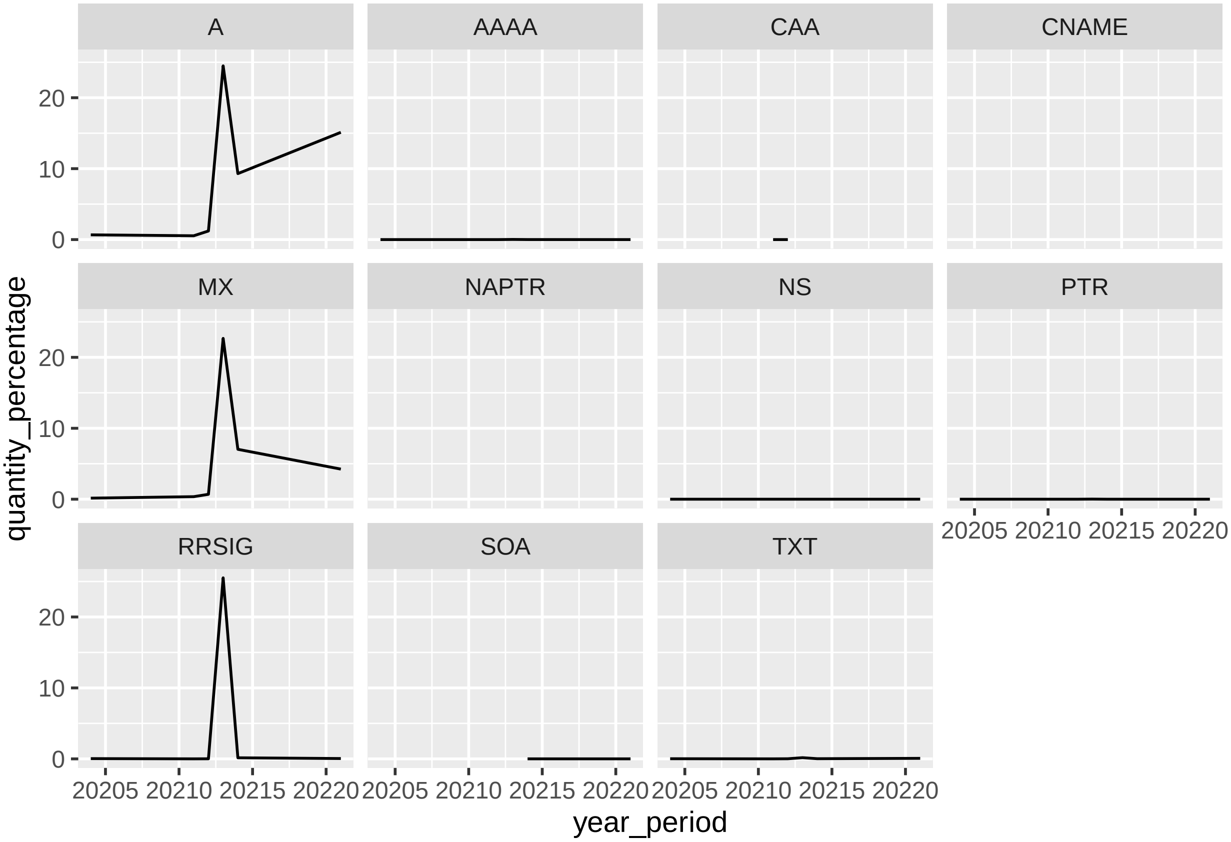
```
dns_data_fetched.sum_attacks_quarterly.sum_period_quantity['quantity_percentage'] = (dns_data_fetched.su

dns_data_fetched.sum_attacks_quarterly.sum_period_quantity %>%
  ggplot(aes(x = year_period, y = quantity_percentage)) +
    geom_line() +
    facet_wrap(facets = vars(qtype))
```

```
## geom_path: Each group consists of only one observation. Do you need to adjust
## the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to adjust
## the group aesthetic?
```



```
dns_data_fetched.sum_attacks_quarterly.sum_period_quantity %>%
  filter(qtype != "ANY") %>%
  ggplot(aes(x = year_period, y = quantity_percentage)) +
    geom_line() +
    facet_wrap(facets = vars(qtype))
```

```
## geom_path: Each group consists of only one observation. Do you need to adjust
## the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to adjust
## the group aesthetic?
```

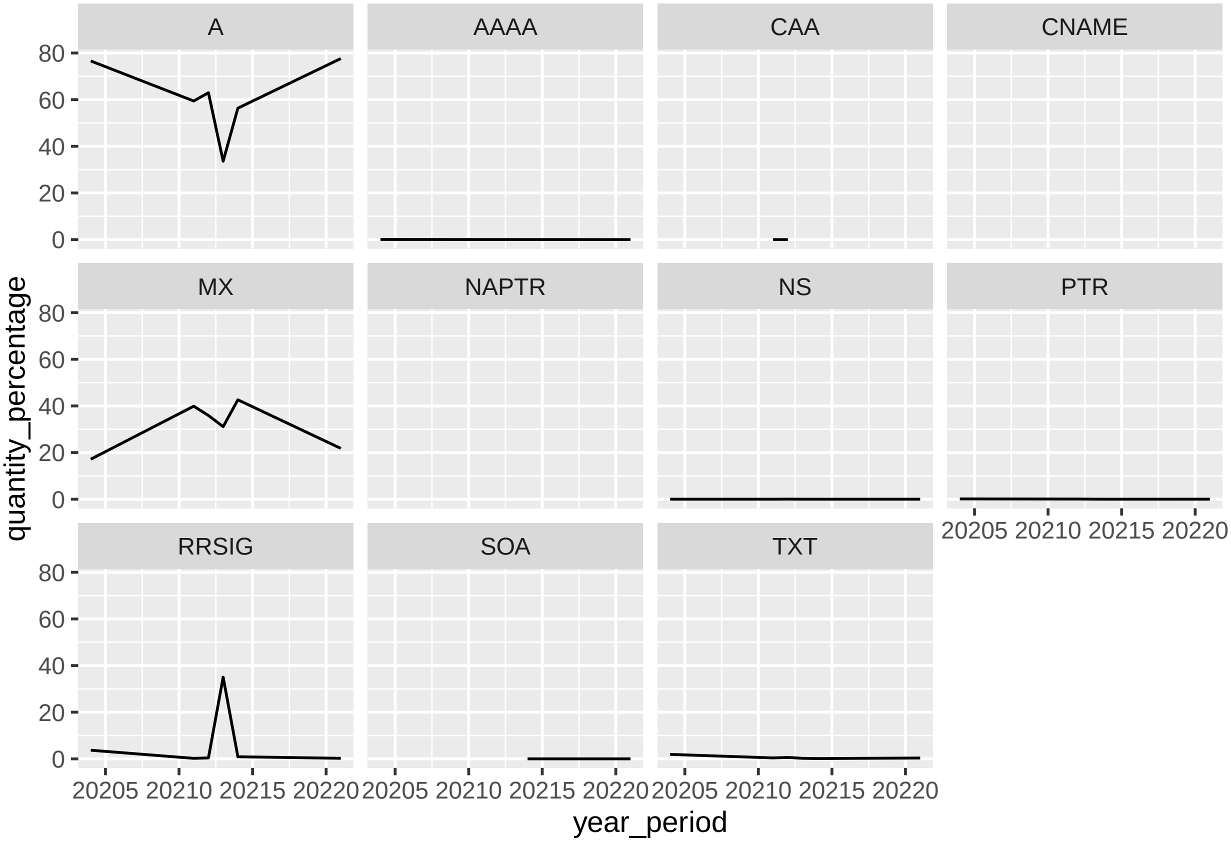


```
# ------------------------------------------- filter any

dns_data_fetched.sum_attacks_quarterly.sum_period_quantity.filter_any = dns_data_fetched.sum_attacks_qua
  group_by(year_period) %>%
  filter(qtype != "ANY") %>%
  summarise(sum_period_quantity = sum(quantity), qtype=qtype, quantity=quantity)
```

```
## ‘summarise()‘ has grouped output by ’year_period’. You can override using the
## ‘.groups‘ argument.
```

```
dns_data_fetched.sum_attacks_quarterly.sum_period_quantity.filter_any['quantity_percentage'] = (dns_data

dns_data_fetched.sum_attacks_quarterly.sum_period_quantity.filter_any %>%
  ggplot(aes(x = year_period, y = quantity_percentage)) +
    geom_line() +
    facet_wrap(facets = vars(qtype))
```

```
## geom_path: Each group consists of only one observation. Do you need to adjust
## the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to adjust
## the group aesthetic?
```



```
# Tiago
# - A e MX devem ser olhados junto com o ANY pra ver se existe alguma relação com esse crescimento
# - RRSIG tem um pico legal (descobrir qual ataque/relação pra tentar entender seria interessante)
# - todos os outros qtype deveriam ser gerados em outro grafico pra ver se o padrão d RRSIG n aparece t
```

```
# ------------ Quantos qtypes novos aprecem em cada trimestre ------------
# > Diferenças percentuais são mais relevantes que absolutas

quarter_qtype_aux = dns_data.year_period.ungrouped[[1]] %>%
  group_by(qtype) %>%
  summarise(quantity = sum(quantity))

#quarter_qtype_2 = dns_data.year_period.ungrouped[[2]] %>%
#  group_by(qtype) %>%
#  summarise(quantity = sum(quantity))

#quarter_qtype_2
#merged = merge(x = quarter_qtype_aux, y = quarter_qtype_2, by = "qtype", all = TRUE)
#merged.new_quantity = merged$quantity.x - merged$quantity.y
#merged




quarter_new_qtype = data.frame()
```

```
for (i in c(2:dns_data.year_period.ungrouped.len)) {
  quarter_qtype = dns_data.year_period.ungrouped[[i]] %>%
    group_by(qtype) %>%
    summarise(quantity = sum(quantity))

  merged = merge(x = quarter_qtype_aux, y = quarter_qtype, by = "qtype", all = TRUE)
  merged.new_quantity = merged$quantity.x - merged$quantity.y

  perio_to_period = paste(head(dns_data.year_period.ungrouped[[i - 1]]['year'], 1), '.',  head(dns_data
  quarter_new_qtype <- rbind(quarter_new_qtype, data.frame(quarter_to_quarter=perio_to_period, merged$q

  quarter_qtype_aux = quarter_qtype
}

#quarter_new_qtype
head(na.omit(quarter_new_qtype[order(-quarter_new_qtype$quantity_percentage),]))
```

```
##      quarter_to_quarter merged.qtype sum_quantity quantity_percentage
## 28 2021 . 2 -> 2021 . 3        RRSIG       325120             26803.0
## 17 2021 . 1 -> 2021 . 2           NS          119              2975.0
## 32 2021 . 3 -> 2021 . 4          ANY      5133467              1480.4
## 22 2021 . 2 -> 2021 . 3         AAAA          195               367.9
## 6  2020 . 4 -> 2021 . 1           MX       111066               336.9
## 43 2021 . 4 -> 2022 . 1           NS            2               200.0
##    merged.quantity.x merged.quantity.y
## 28              1213            326333
## 17                 4               123
## 32            346754           5480221
## 22                53               248
## 6              32964            144030
## 43                 1                 3
```

```
# ------------ Quantos qname novos aprecem em cada trimestre ------------

quarter_qname_aux = dns_data.year_period.ungrouped[[1]] %>%
  group_by(qname) %>%
  summarise(quantity = sum(quantity))

quarter_new_qname = data.frame()
for (i in c(2:dns_data.year_period.ungrouped.len)) {
  quarter_qname = dns_data.year_period.ungrouped[[i]] %>%
    group_by(qname) %>%
    summarise(quantity = sum(quantity))

  merged = merge(x = quarter_qname_aux, y = quarter_qname, by = "qname", all = TRUE)
  merged.new_quantity = merged$quantity.x - merged$quantity.y

  period_to_period = paste(head(dns_data.year_period.ungrouped[[i - 1]]['year'], 1), '.',  head(dns_data
  quarter_new_qname <- rbind(quarter_new_qname, data.frame(quarter_to_quarter=period_to_period, merged$

  quarter_qname_aux = quarter_qname
}
```

```
#quarter_new_qname
head(na.omit(quarter_new_qname[-order(quarter_new_qname$quantity_percentage_diff),]))
```

```
## [1] quarter_to_quarter       merged.qname             sum_quantity
## [4] quantity_percentage_diff merged.quantity.x        merged.quantity.y
## <0 rows> (or 0-length row.names)
```

```
# @todo
#1- olhar a longo prazo, o timelapse dos qnames
#2- qual a frequencia d qnames novos nesses períodos
 #   2.1 olhar em detalhes as variações dos qnames (pq geralmente eles acabam sendo um grupo)
```

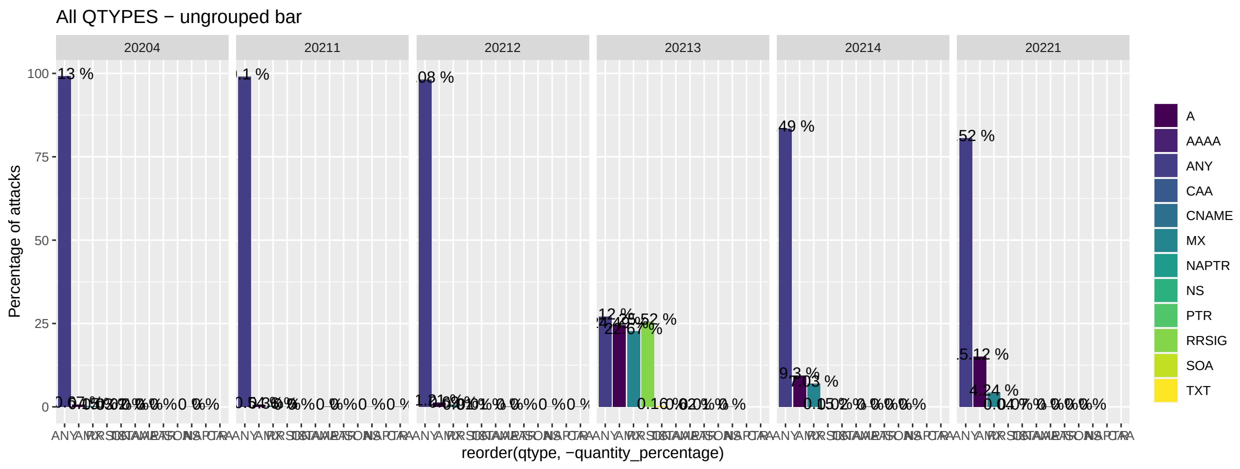
```
# Vale um gráfico de barras (dois, um agrupado e outro empilhado) da porcentagem de QTYPEs por período
# https://www.data-to-viz.com/graph/barplot.html
# Libraries
library(viridis)
```

```
## Loading required package: viridisLite
```

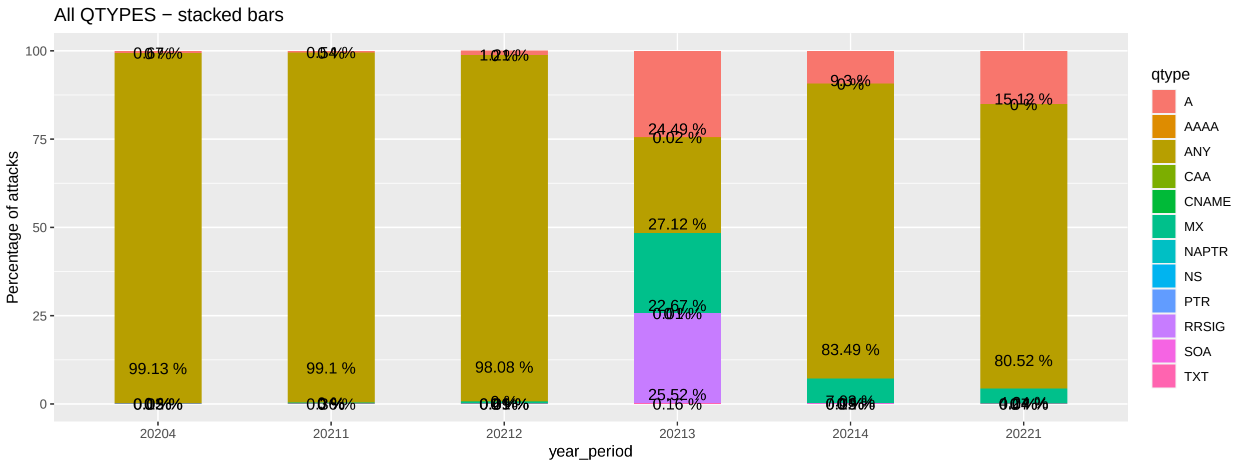
```
dns_data_fetched.sum_attacks_quarterly.sum_period = dns_data_fetched.sum_attacks_quarterly %>%
  group_by(year_period) %>%
  summarise(period_quantity = sum(quantity), qtype=qtype, quantity=quantity)
```

```
## ‘summarise()‘ has grouped output by ’year_period’. You can override using the
## ‘.groups‘ argument.
```

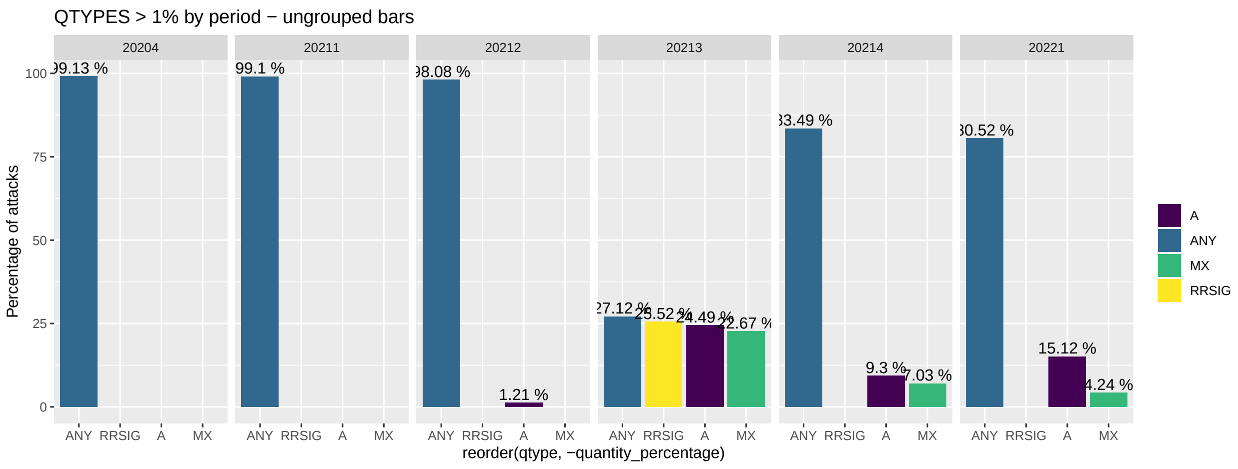
```
dns_data_fetched.sum_attacks_quarterly.sum_period['quantity_percentage'] = (dns_data_fetched.sum_attacks

dns_data_fetched.sum_attacks_quarterly.sum_period %>%
  mutate(year_period=as.factor(year_period)) %>%
  ggplot( aes(x=reorder(qtype, -quantity_percentage), y=quantity_percentage, fill=qtype)) +
    geom_bar(stat="identity", position="dodge") +
    scale_fill_viridis(discrete=TRUE, name="") +
    geom_text(aes(label = paste(round(quantity_percentage, 2), "%")), vjust = +0.25, ) +
    facet_grid(~year_period) +
    ylab("Percentage of attacks") +
    ggtitle("All QTYPES - ungrouped bar")
```



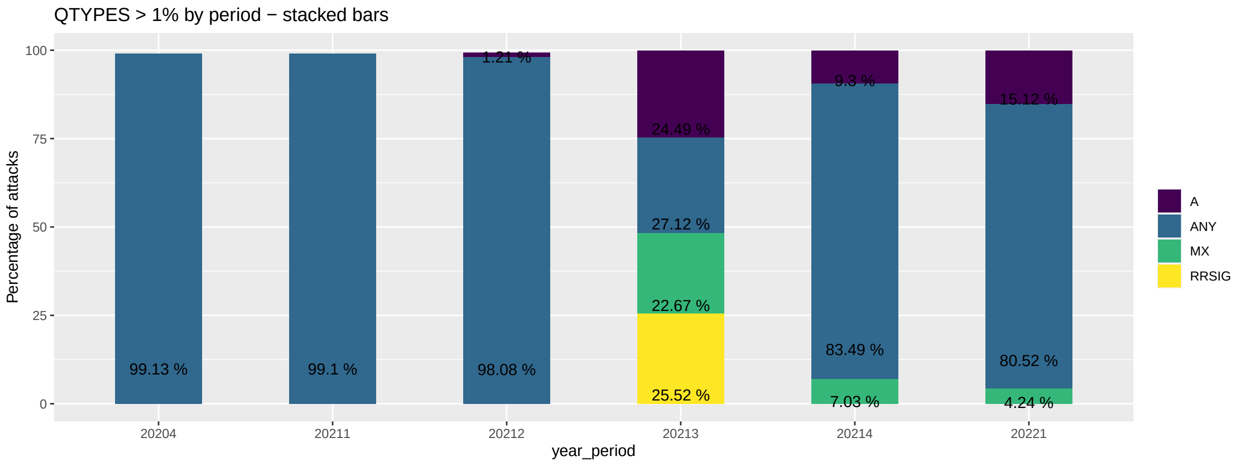
```
dns_data_fetched.sum_attacks_quarterly.sum_period %>%
  mutate(year_period=as.factor(year_period)) %>%
  ggplot( aes(x=year_period, y=quantity_percentage, fill=qtype)) +
    geom_bar(stat="identity", width = 0.5) +
    geom_text(aes(label = paste(round(quantity_percentage, 2), "%")), position = position_stack(vjust =
    #scale_fill_viridis(discrete=TRUE, name="") +
    ylab("Percentage of attacks") +
    ggtitle("All QTYPES - stacked bars")
```



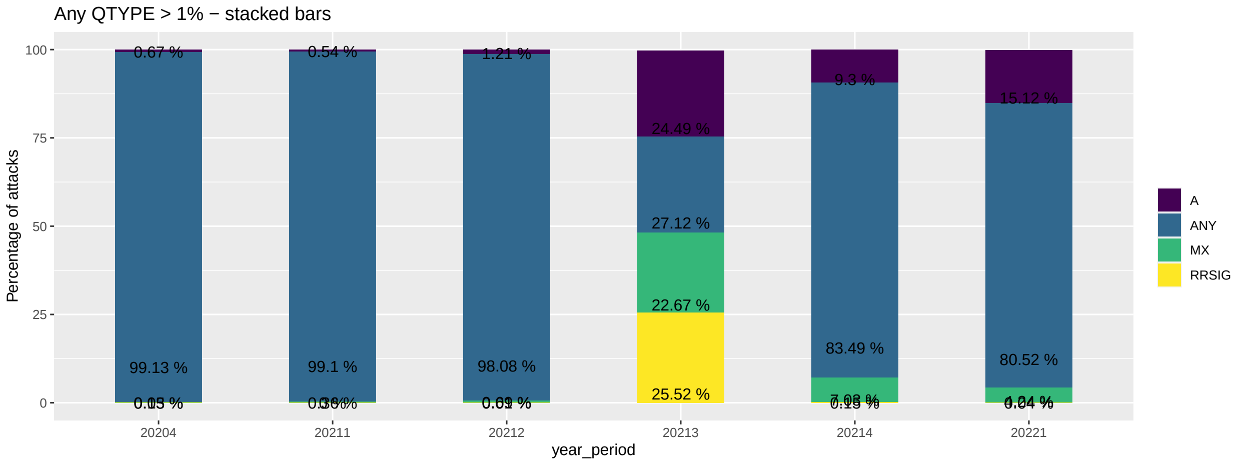
```
## Filter data using qtype quantity percentage bigger than 1

dns_data_fetched.sum_attacks_quarterly.sum_period %>%
  filter(quantity_percentage > 1) %>%
  mutate(year_period=as.factor(year_period)) %>%
  ggplot( aes(x=reorder(qtype, -quantity_percentage), y=quantity_percentage, fill=qtype)) +
    geom_bar(stat="identity", position="dodge") +
    geom_text(aes(label = paste(round(quantity_percentage, 2), "%")), vjust = -0.25) +
    facet_grid(~year_period) +
    scale_fill_viridis(discrete=TRUE, name="") +
    ylab("Percentage of attacks") +
    ggtitle("QTYPES > 1% by period - ungrouped bars")
```



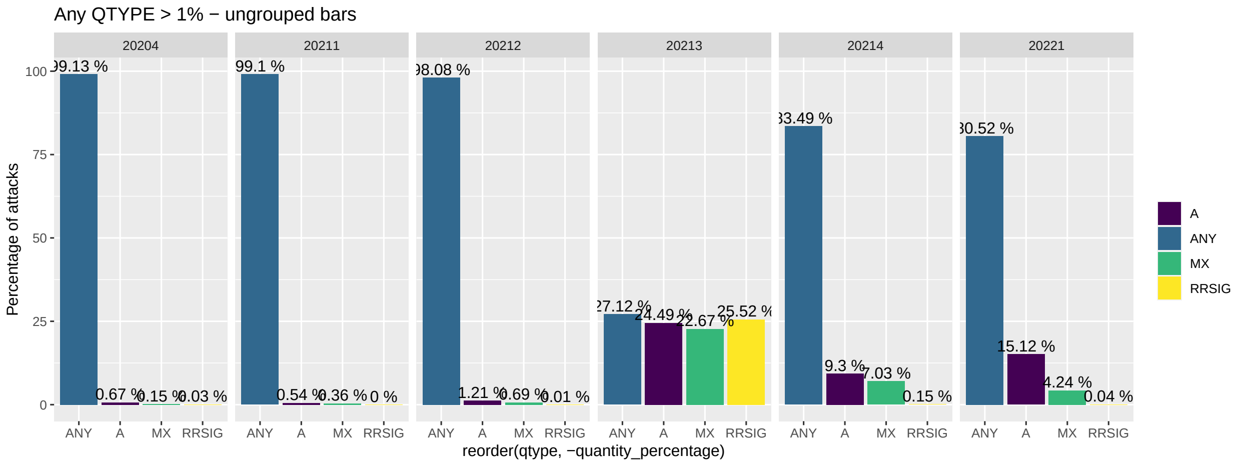
```
dns_data_fetched.sum_attacks_quarterly.sum_period %>%
  filter(quantity_percentage > 1) %>%
  mutate(year_period=as.factor(year_period)) %>%
  ggplot( aes(x=year_period, y=quantity_percentage, fill=qtype)) +
    geom_bar(stat="identity", width = 0.5) +
    geom_text(aes(label = paste(round(quantity_percentage, 2), "%")), position = position_stack(vjust =
    scale_fill_viridis(discrete=TRUE, name="") +
    ylab("Percentage of attacks") +
    ggtitle("QTYPES > 1% by period - stacked bars")
```



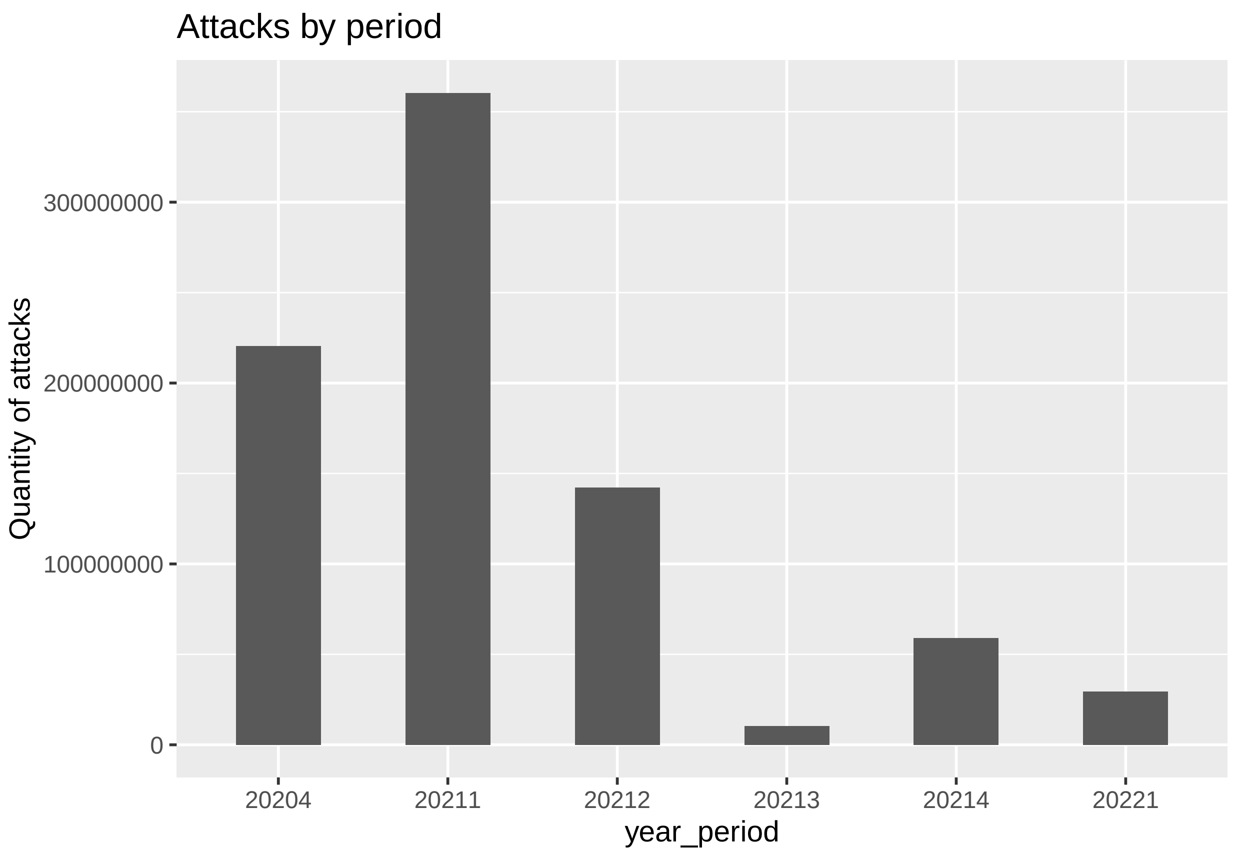
```
#dns_data_fetched.sum_attacks_quarterly.sum_period
dns_data_fetched.sum_attacks_quarterly.sum_period.relevant = dns_data_fetched.sum_attacks_quarterly.sum_
  filter(quantity_percentage > 1)

#dns_data_fetched.sum_attacks_quarterly.sum_period.relevant$qtype
qtypes_bigger_1 = dns_data_fetched.sum_attacks_quarterly.sum_period.relevant$qtype[!duplicated(dns_data_
#qtypes_bigger_1

dns_data_fetched.sum_attacks_quarterly.sum_period %>%
  filter(qtype %in% qtypes_bigger_1) %>%
  mutate(year_period=as.factor(year_period)) %>%
  ggplot( aes(x=year_period, y=quantity_percentage, fill=qtype)) +
    geom_bar(stat="identity", width = 0.5) +
    geom_text(aes(label = paste(round(quantity_percentage, 2), "%")), position = position_stack(vjust =
    scale_fill_viridis(discrete=TRUE, name="") +
    ylab("Percentage of attacks") +
    ggtitle("Any QTYPE > 1% - stacked bars")
```



```
dns_data_fetched.sum_attacks_quarterly.sum_period %>%
  filter(qtype %in% qtypes_bigger_1) %>%
  mutate(year_period=as.factor(year_period)) %>%
  ggplot( aes(x=reorder(qtype, -quantity_percentage), y=quantity_percentage, fill=qtype)) +
    geom_bar(stat="identity", position="dodge") +
    geom_text(aes(label = paste(round(quantity_percentage, 2), "%")), vjust = -0.25) +
    facet_grid(~year_period) +
    scale_fill_viridis(discrete=TRUE, name="") +
    ylab("Percentage of attacks") +
    ggtitle("Any QTYPE > 1% - ungrouped bars")
```



```
dns_data_fetched.sum_attacks_quarterly.sum_period %>%
  mutate(year_period=as.factor(year_period)) %>%
  ggplot( aes(x=year_period, y=period_quantity)) +
    geom_bar(stat="identity", width = 0.5) +
    scale_fill_viridis(discrete=TRUE, name="") +
    ylab("Quantity of attacks") +
    ggtitle("Attacks by period")
```



```
# if each line on db were a request
#dns_data_fetched.quarter_type_count.grouped_qtype_period %>%
#  mutate(year_period=as.factor(year_period)) %>%
#  ggplot( aes(x=year_period, y=count)) +
#    geom_bar(stat="identity", width = 0.5) +
#    scale_fill_viridis(discrete=TRUE, name="") +
#    ylab("Quantity of request") +
#    ggtitle("Request by period")
```