RIPE NCC
RIPE NETWORK COORDINATION CENTRE

Study of the routing activity of Central Asian operators using RIPEstat and Routing Information Service (RIS)

Alex Semenyaka
Ralph Smit

Intro

RIPE RIS and RIPEStat

Routing Information Service (RIS)

With the help of network operators all over the world, our Routing Information Service (RIS) employs a globally distributed set of Remote Route Collectors (RRCs), typically located at Internet Exchange Points, to collect and store Internet routing data. Volunteers peer with the RRCs using the BGP protocol and RIS stores the update and withdraw messages.

RIS data can be accessed via RIPEstat, our “one-stop shop” for all available information about Internet number resources. RIPEstat uses individual widgets to display routing and other information.

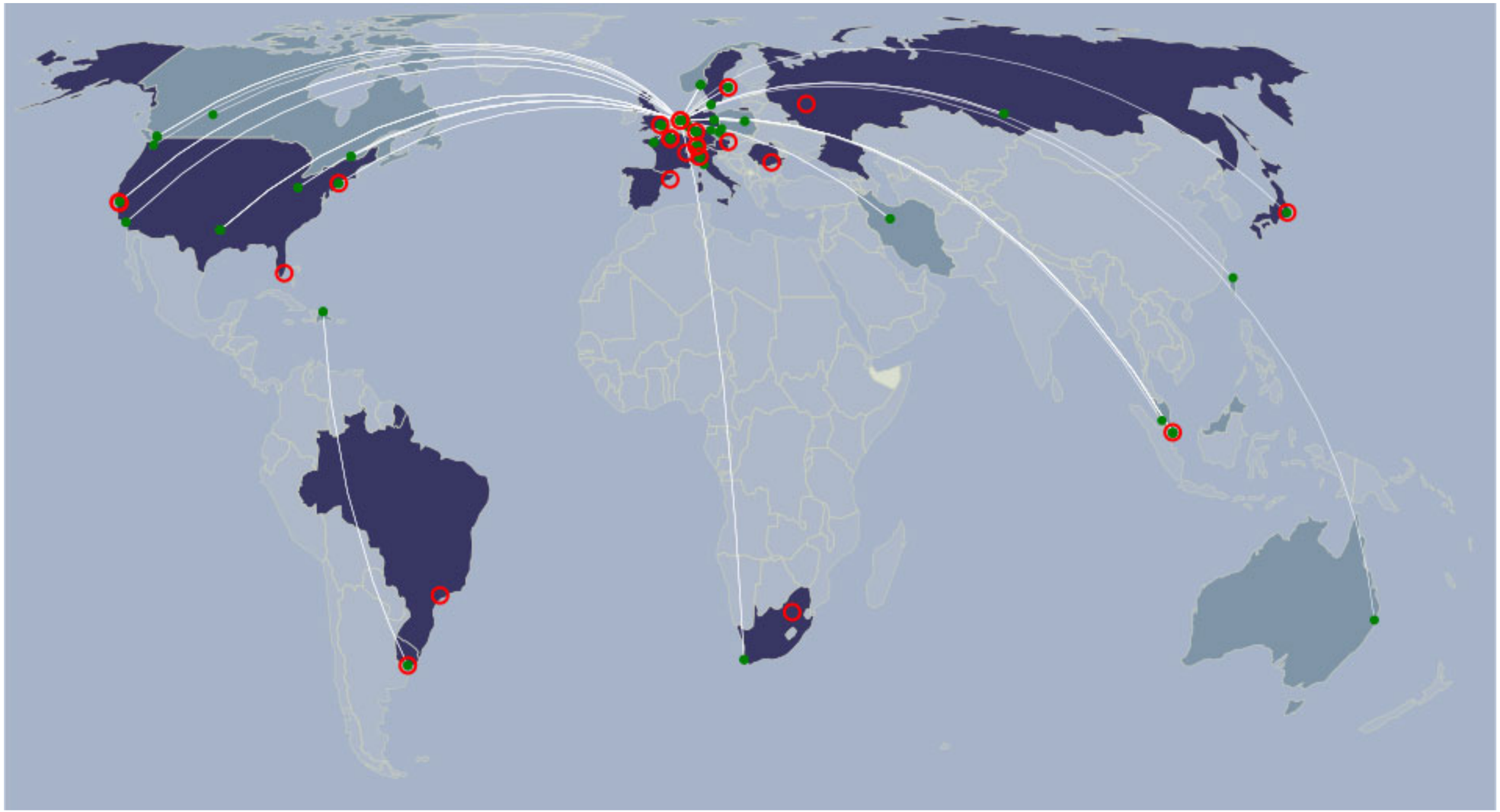
What is RIPE RIS?

- One of RIPE Tools
- Collecting BGP events from October 1999
- 26 collectors over the world
- 1300+ simultaneous routing sessions
- Provides stored or live data from the global Internet routing system

What are RIPE RIS Collectors?

- Servers with our software
  - Work as “almost-mute” BGP speakers
- They announce several small prefixes
- Save/translate **all BGP events** they see into the publicly accessible storage

Where are the collectors located?



Do we really need that many?

- In short: yes.

That’s why:

- Some events have limited visibility
  - IXP
  - Summarisation
  - Absorption by another BGP announcement (at the best path selection process)
- It is better to be close to events
- Many sessions

Ask us if we need your BGP speaker as our peer!

How to access data?

- Direct access to MRT files in our storage
- Websocket API to live stream from RIS Live
- RISWhois
- References for further reading:
  - https://ris.ripe.net/docs/
  - https://www.ripe.net/analyse/internet-measurements/routing-information-service-ris/

However…

- RIPE RIS is not an end-user product but rather a technology
- Raw data must be processed for further use
- RIPE RIS is not the only source of raw data
  - There is also RIPE Atlas, RIPE Database etc.
- It makes sense to create a primary data processing tool…
- …And this is how the **RIPEStat project** came into being

What is RIPEstat?

RIPEstat is a web-based interface that provides everything you ever wanted to know about IP address space, Autonomous System Numbers (ASNs), and related information for hostnames and countries in one place.

It presents registration and routing data, DNS data, geographical information, abuse contacts and more from the RIPE NCC's internal data sets as well as from external sources, such as other Regional Internet Registries and IANA. RIPEstat's main web-based interface presents this information in the form of widgets that can be embedded on any webpage. It also provides an API to access the raw data for use in advanced applications.

Our goal is to provide useful data to our members and the Internet community at large, with a focus on data related to routing and the RIPE Database. We are currently in the process of consolidating all of the RIPE NCC's public data sets into RIPEstat, so that RIPEstat will eventually become the sole interface for users accessing any of the RIPE NCC's publicly available data, making it easier for our users to retrieve this data using one consolidated, consistent and well-organised interface.

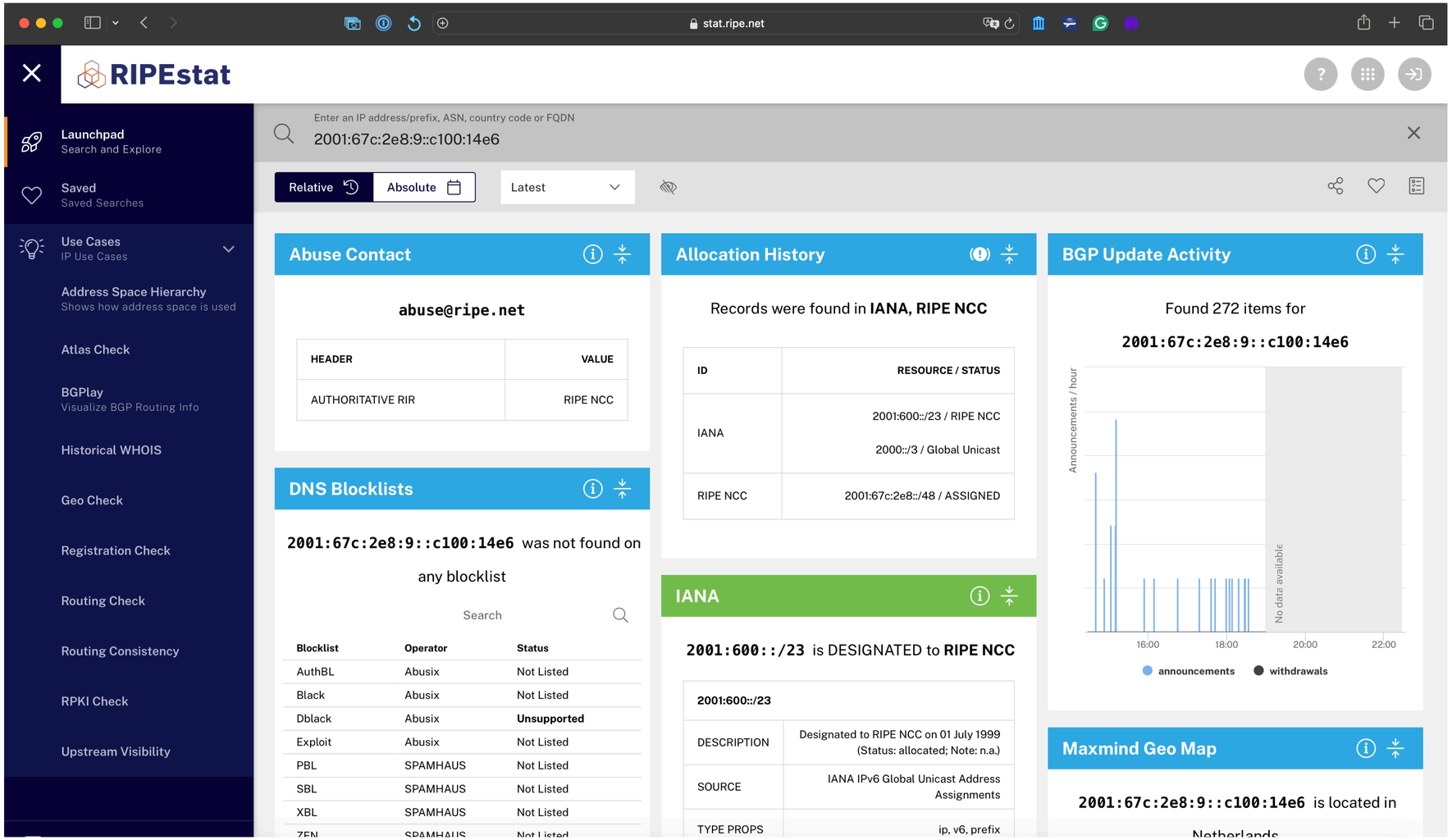
What is RIPEStat?

- Another fixture in the RIPE toolbox
- Medium- and high-level view on objects of interest
- Project was started in 2010
  - And continue developing
- Consists of **thematic** widgets/info-cards with API
  - Each info-card answers specific question
- Processes **all** available RIPE NCC data:
  - aggregates and summarizes them
  - performs statistical processing

What are those info-cards?

- Separate sub-tools, each of which solves a strictly specific task
- widgets can be divided into several groups
  - IP space management and RIR databases
  - Routing
  - DNS
  - Anti-abuse
  - Geo data
  - Activity
- There are widgets with historical data
-

Check https://stat.ripe.net/



RIPEStat may be not the evolution pinnacle

- But our tasks and your systems are
- So you create something valuable for us on top of it
- RIPEStat is open for all users
- RIPEStat provides the REST API to make its integration to your systems as smooth as possible
- And now, we will see an example using RIPE RIS and RIPEStat for the research of the regional Internet segment

Routing activity

Studying the BGP announcements duration

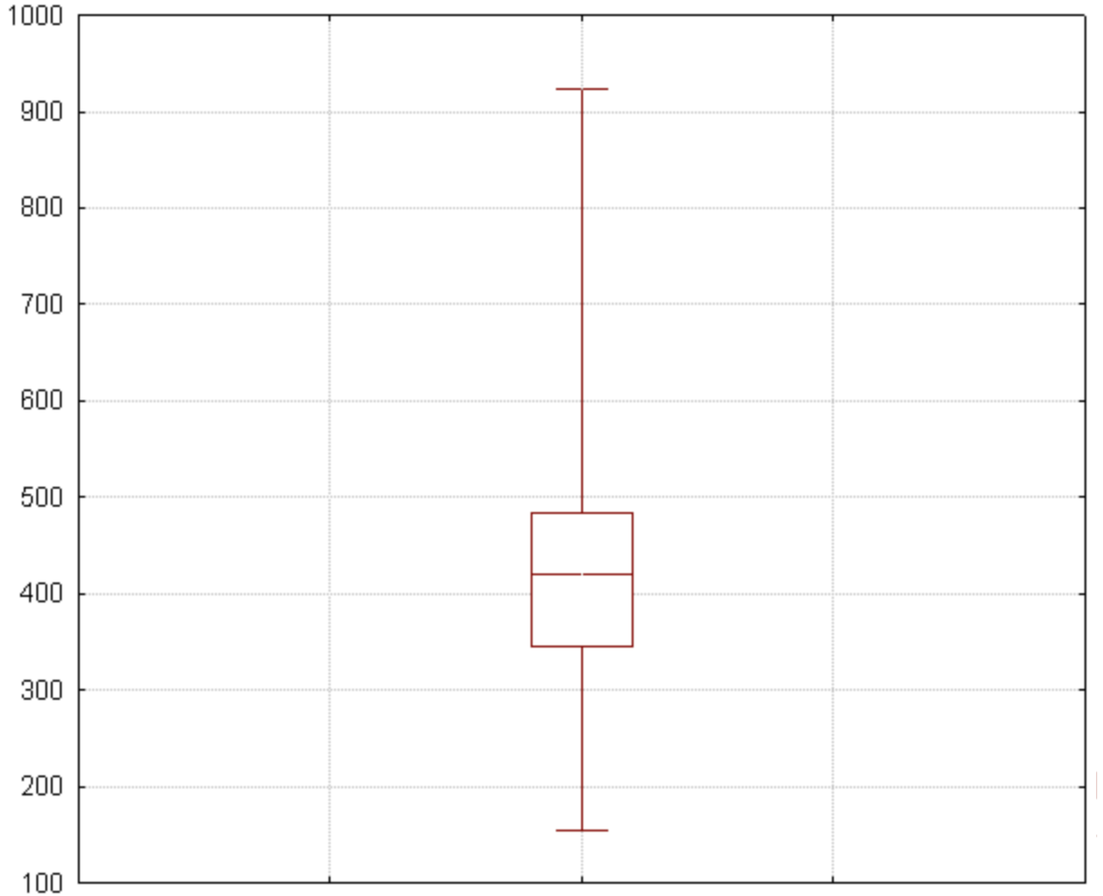
Sources of data

- Primary information source: RIPE RIS
- Access to processed and prepared data: RIPEStat
  - Country Resource List: https://stat.ripe.net/docs/data_api#country-resource-list
  - Announced Prefixes: https://stat.ripe.net/docs/data_api#announced-prefixes

- Using the Python code, we will:
  - collect data on BGP announcements in different countries
  - filter out “testing announcements”
  - calculate the durations of others
  - visualize the results

“Box and whisker” plot

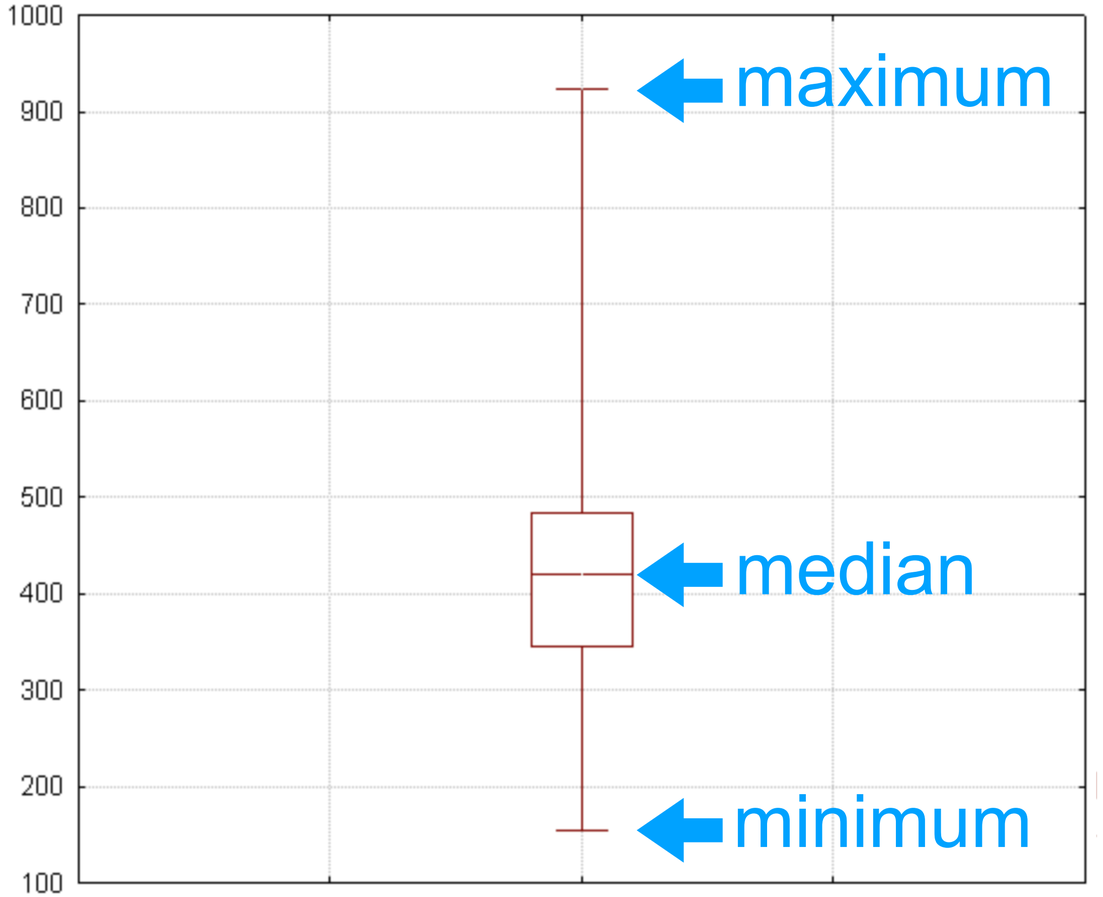
- A short recap!
- This beast shows some statistical properties of the dataset
- We will use it to visualise some data



(A picture from Wikipedia)

“Box and whisker” plot

- It shows some statistical properties of the dataset:
  - Median value (same number of values in the dataset are higher and lower this value)
  - The minimal and maximal values



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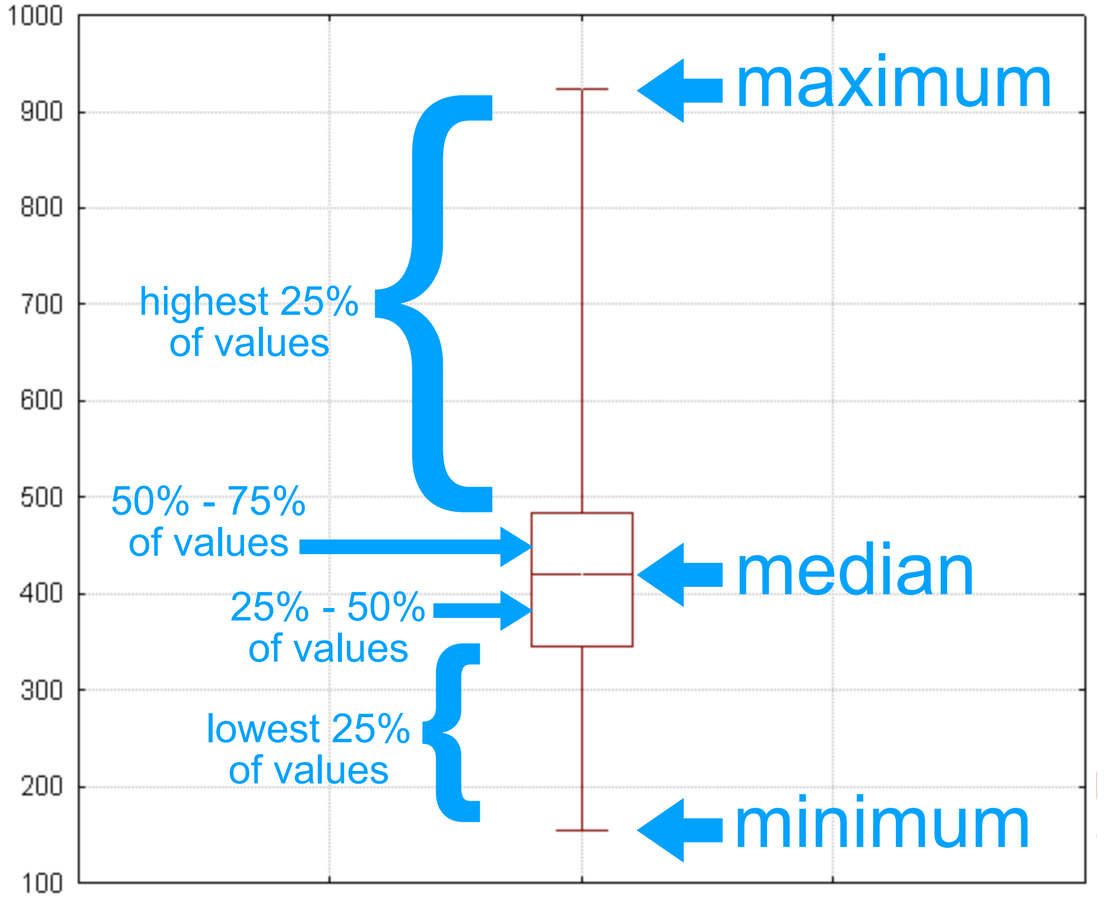
“Box and whisker” plot

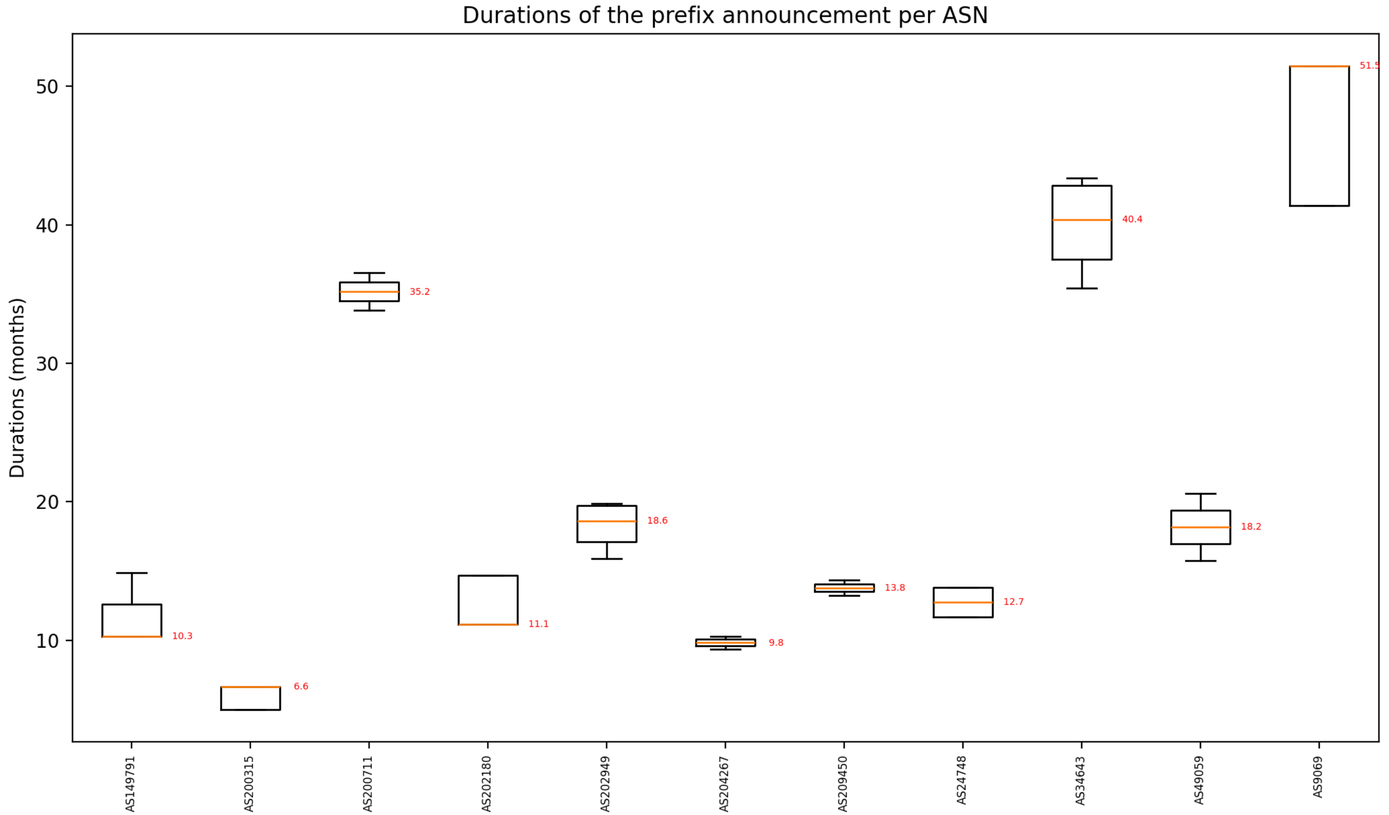
- A short recap!
- It shows some statistical properties of the dataset:
  - Median value (same number of values in the dataset are higher and lower this value)
  - The minimal and maximal values
  - Ranges where are:
    - the lowest 25% of values (bottom whisker)
    - the “second quarter” (25-50% of values)
    - the “second quarter” (50-75% of values)
    - the highest 25% of values (top whisker)



(A picture from Wikipedia)

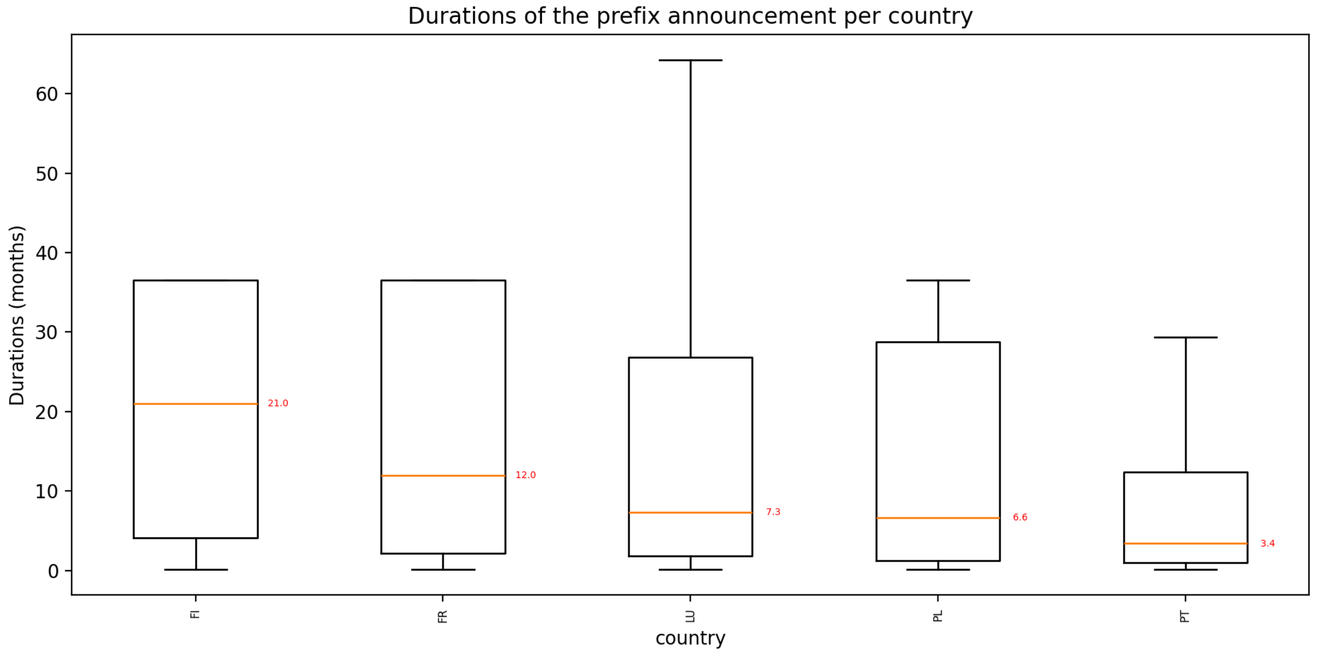
What's the stable announcement?

- Let's look at a few ASes with really stable announcements
- Data taken over a 10-year interval
- Observations:
  - Little variation
  - Sometimes there is not even a “whisker"
  - From this plot we can easily foretell the routine maintenance frequency in these companies!



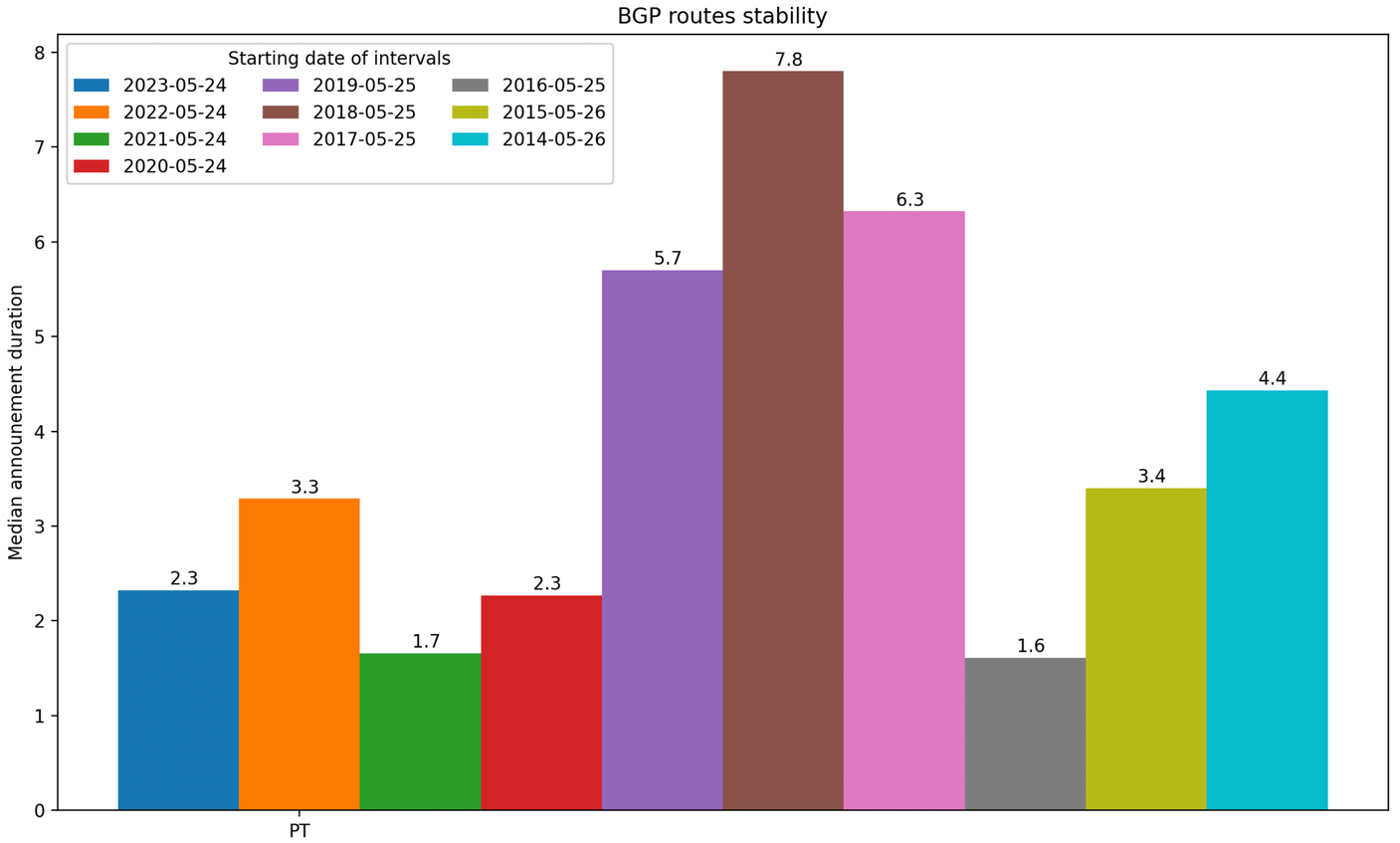
Europe

- Lets take a look on a country level
- Europe looks stable on average
- Finland:
  - champion in terms of density of communication cables per unit area
  - high connectivity
  - stable service market
  - very high median duration per an announcement



Portugal's relative stability

- Among developed European countries, Portugal is at the bottom of the list in terms of median duration of announcements
- Let's take a look at the median announcement duration histogram per year
- The median rarely falls below 2 months
- Max/Min = 4.9



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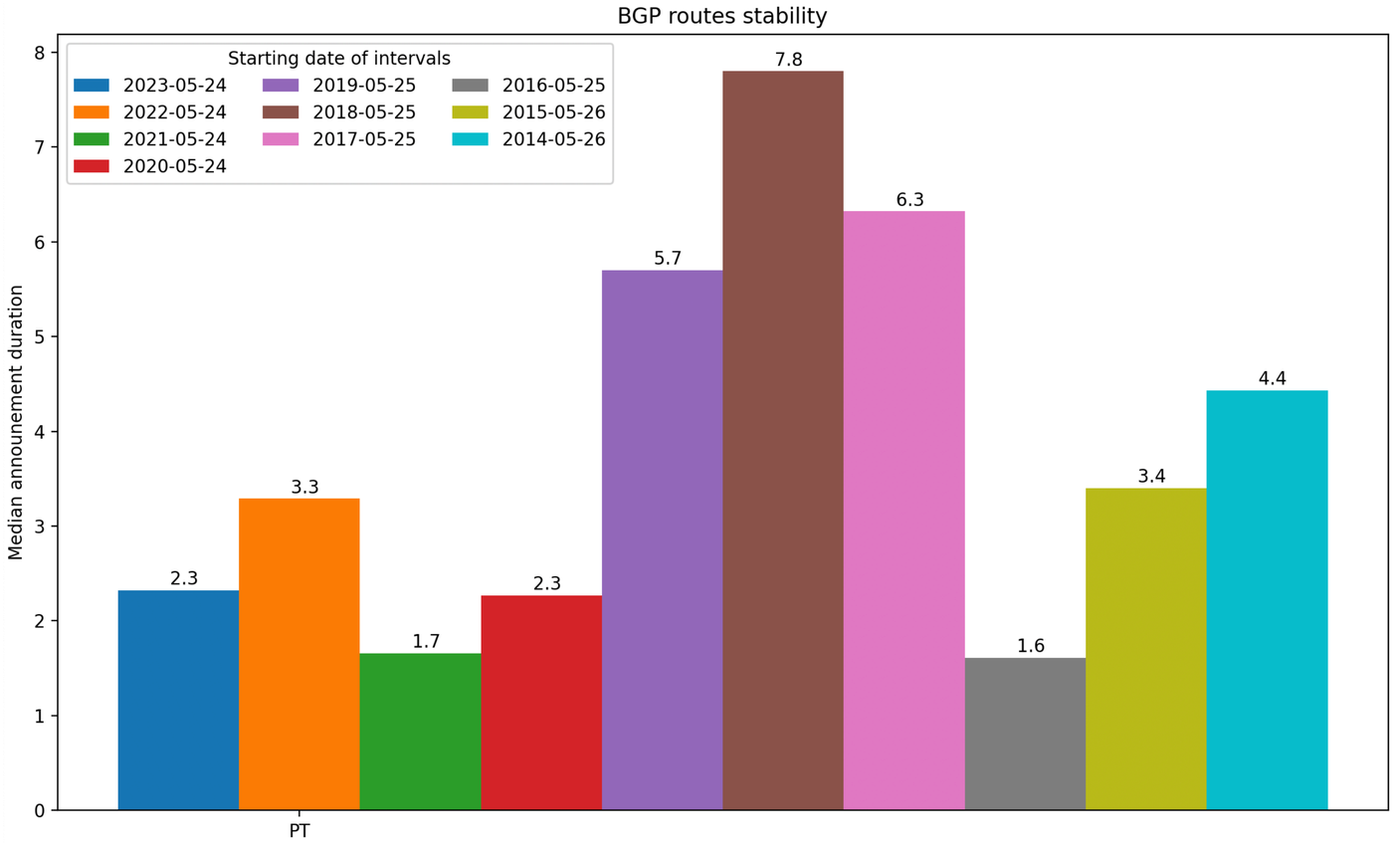
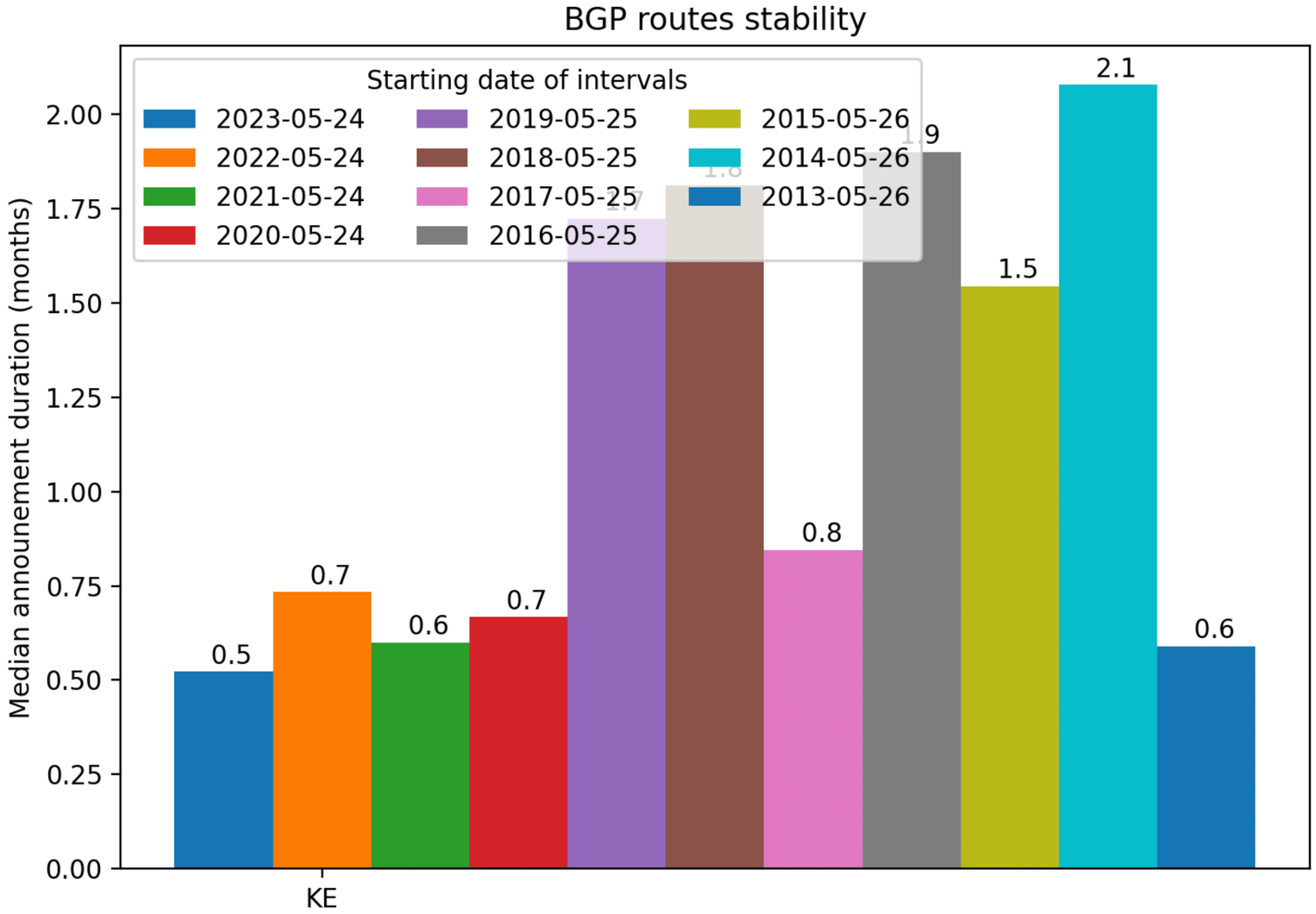
will use as thresholds



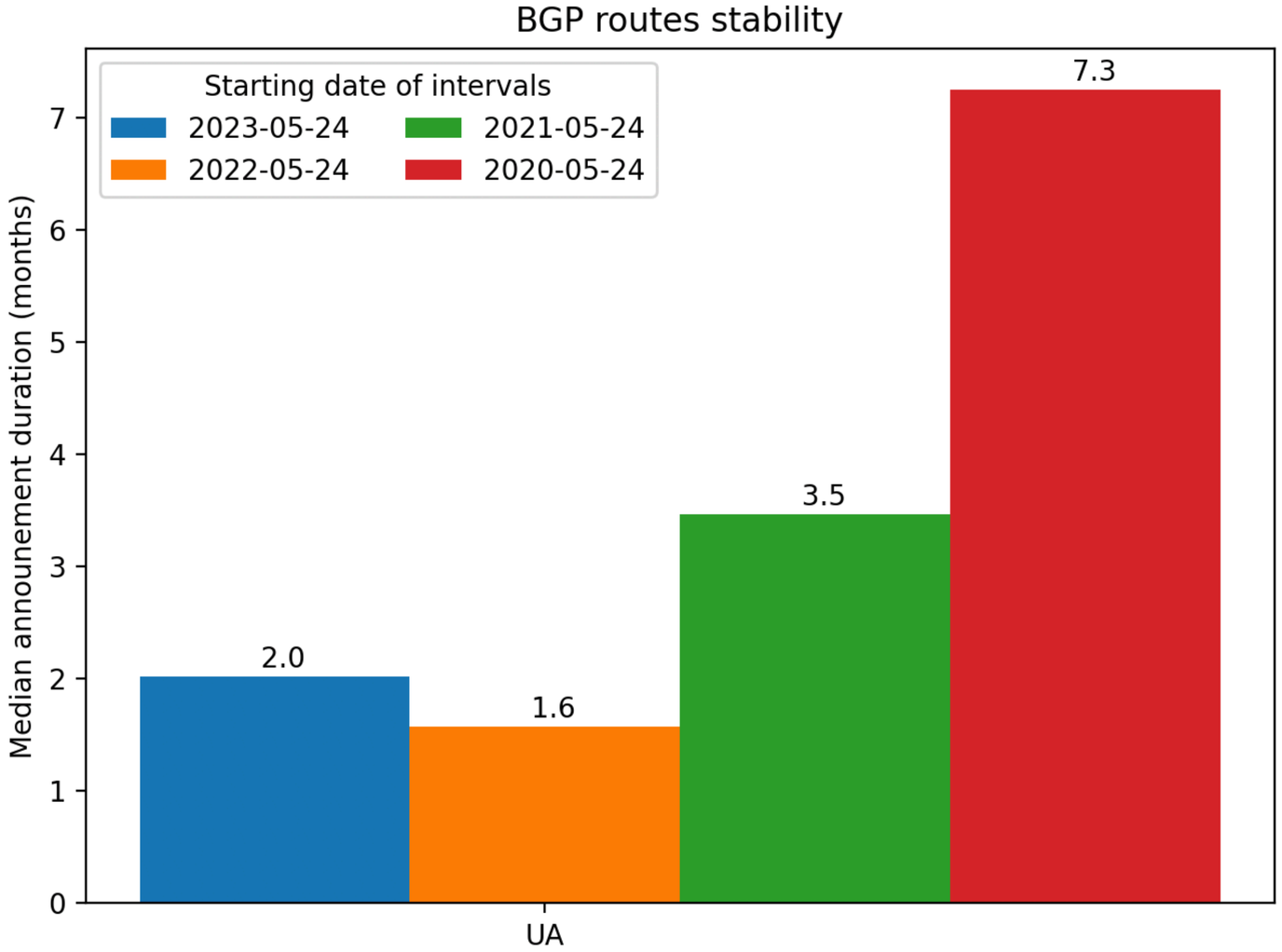
The case of general instability: Kenya



- Instability
  - Economic
  - Social instability
  - Unreliable out-of-country uplinks
- Typical median value is below 2 months

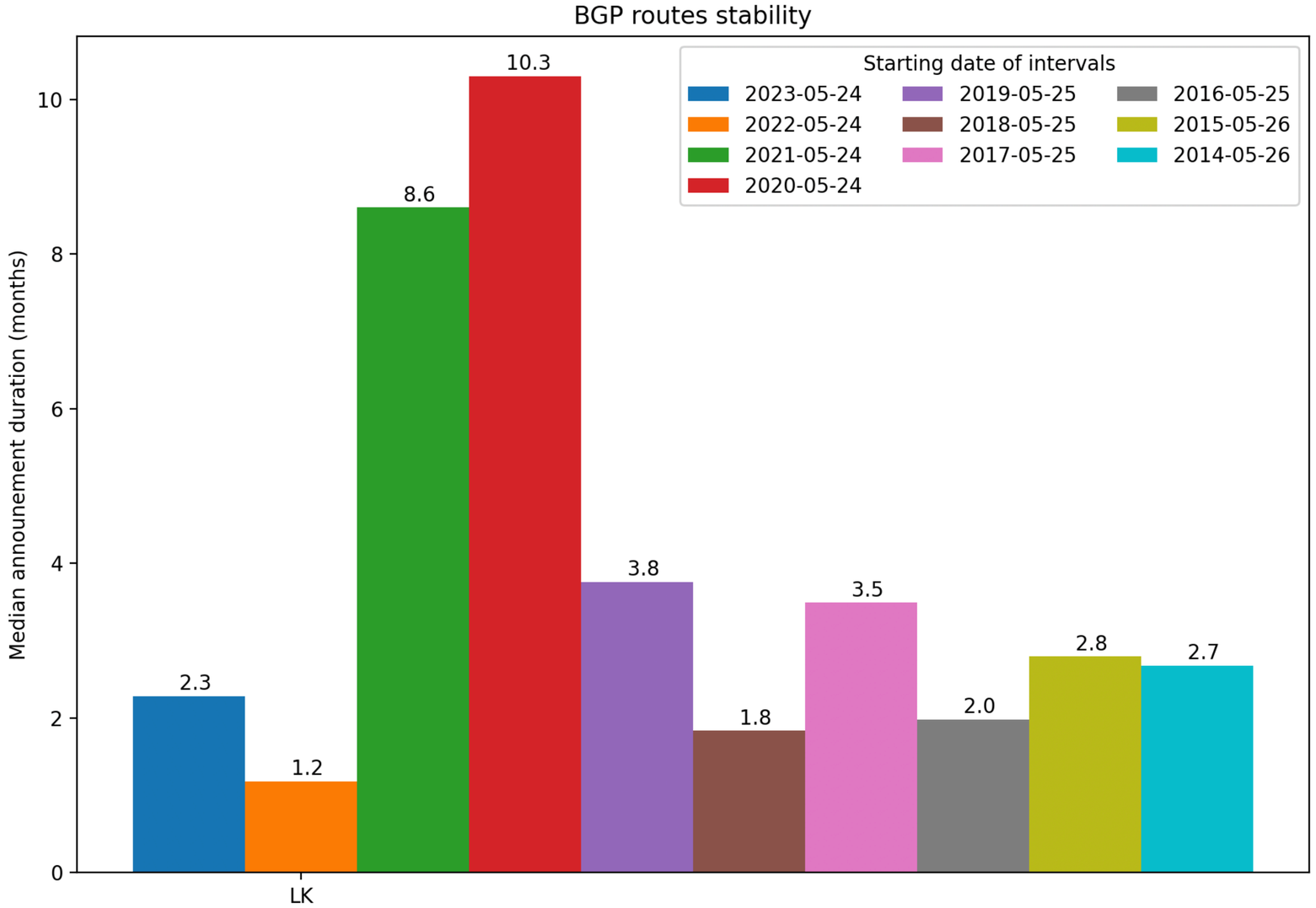
Temporary instability: Ukraine

- The impact of war
  - The first year was bad.
  - Then a gradual slow improvement begins
- The typical median value is still above 2 months
- However, max/min > 12
- 2020: Covid helps



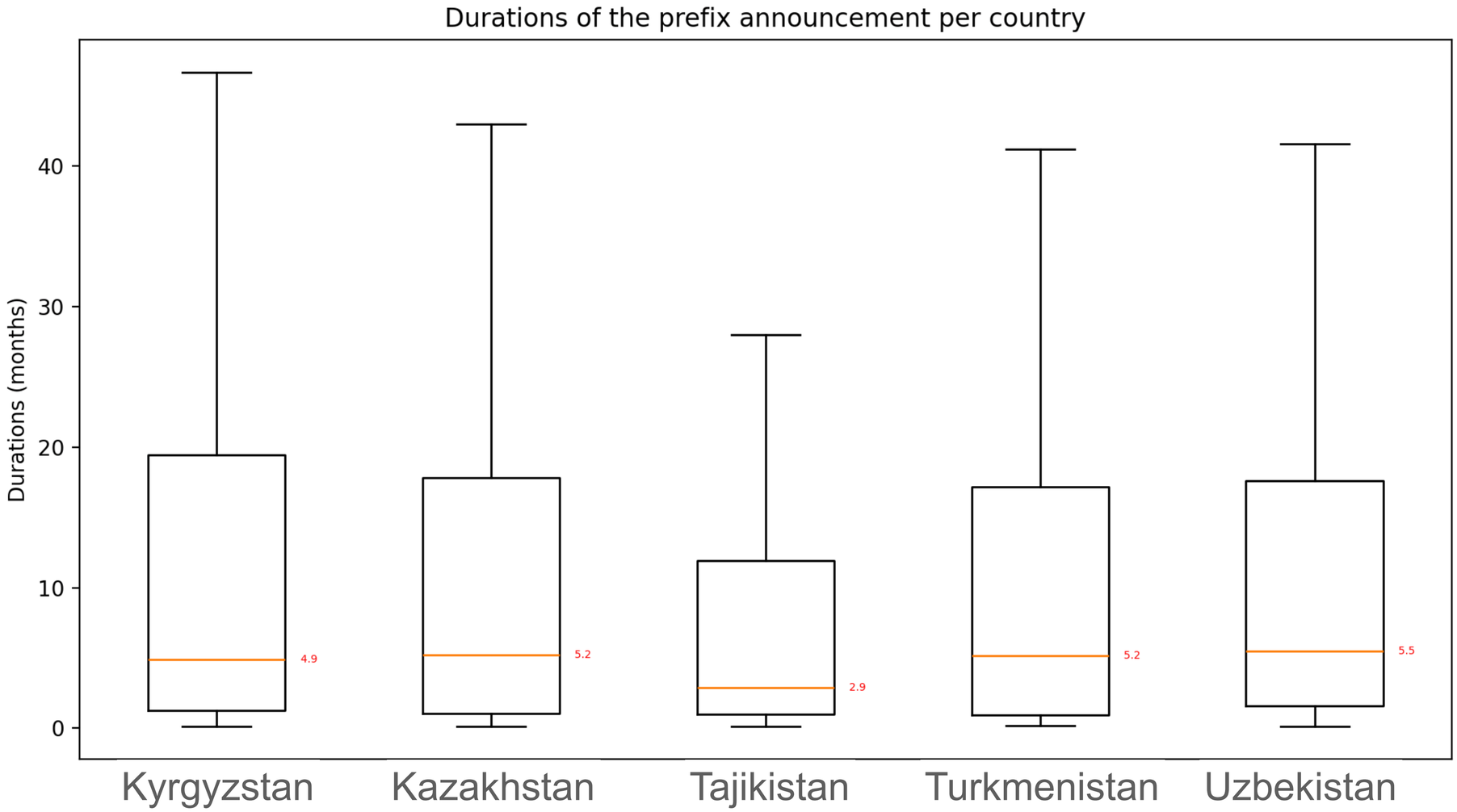
Covid as a stability factor

- Typical for many countries
  - Prohibitions stalled any work
- Sri Lanka case:
  - The typical median value is still above 2
  - But max/min > 8.5
  - And indeed, 2022 was a year of crisis for the country



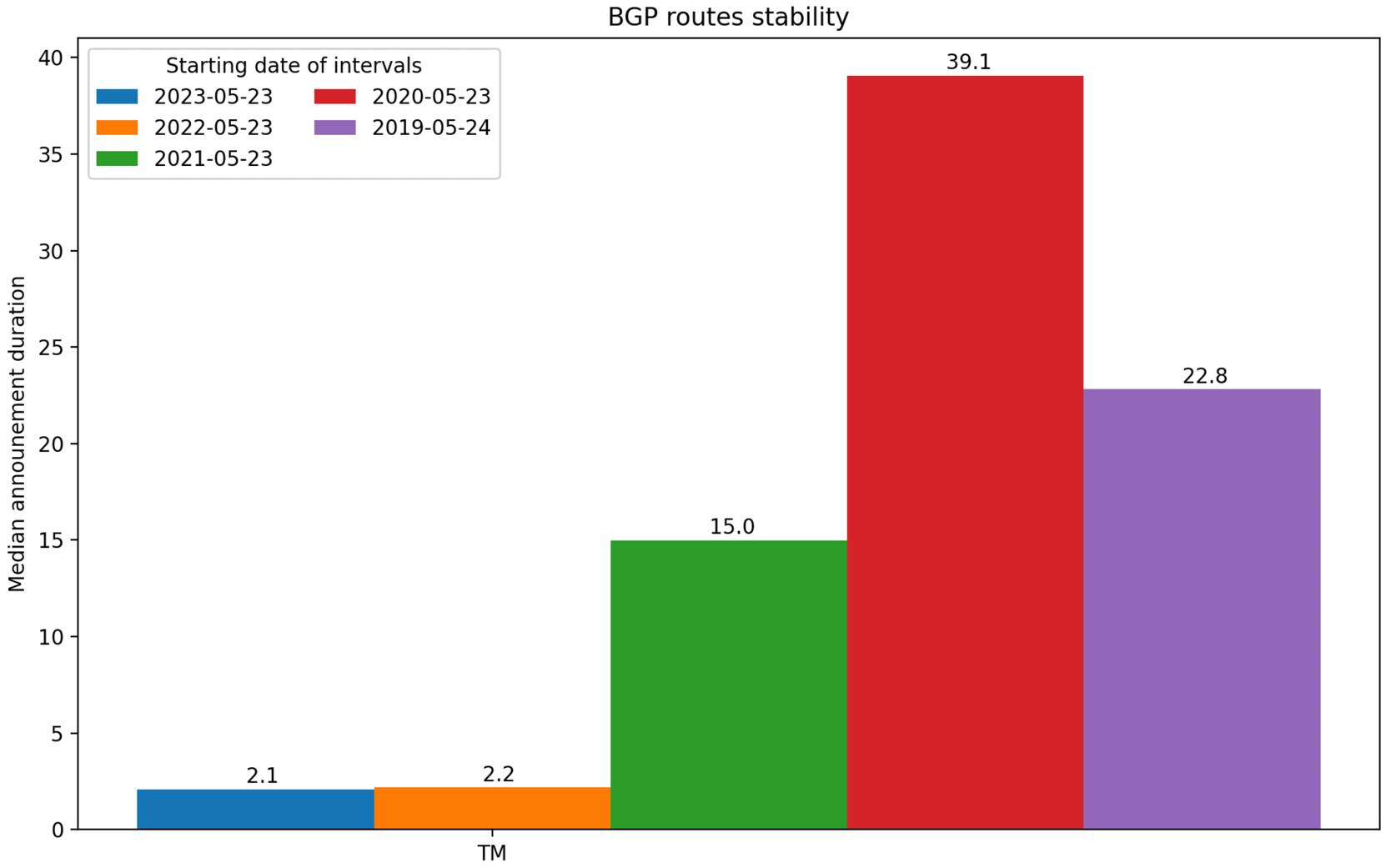
What about the Central Asia?

- High stability is clearly visible
  - At the level of many Western European countries.
- But so far all countries have long whiskers upwards
  - There is still room for improvement



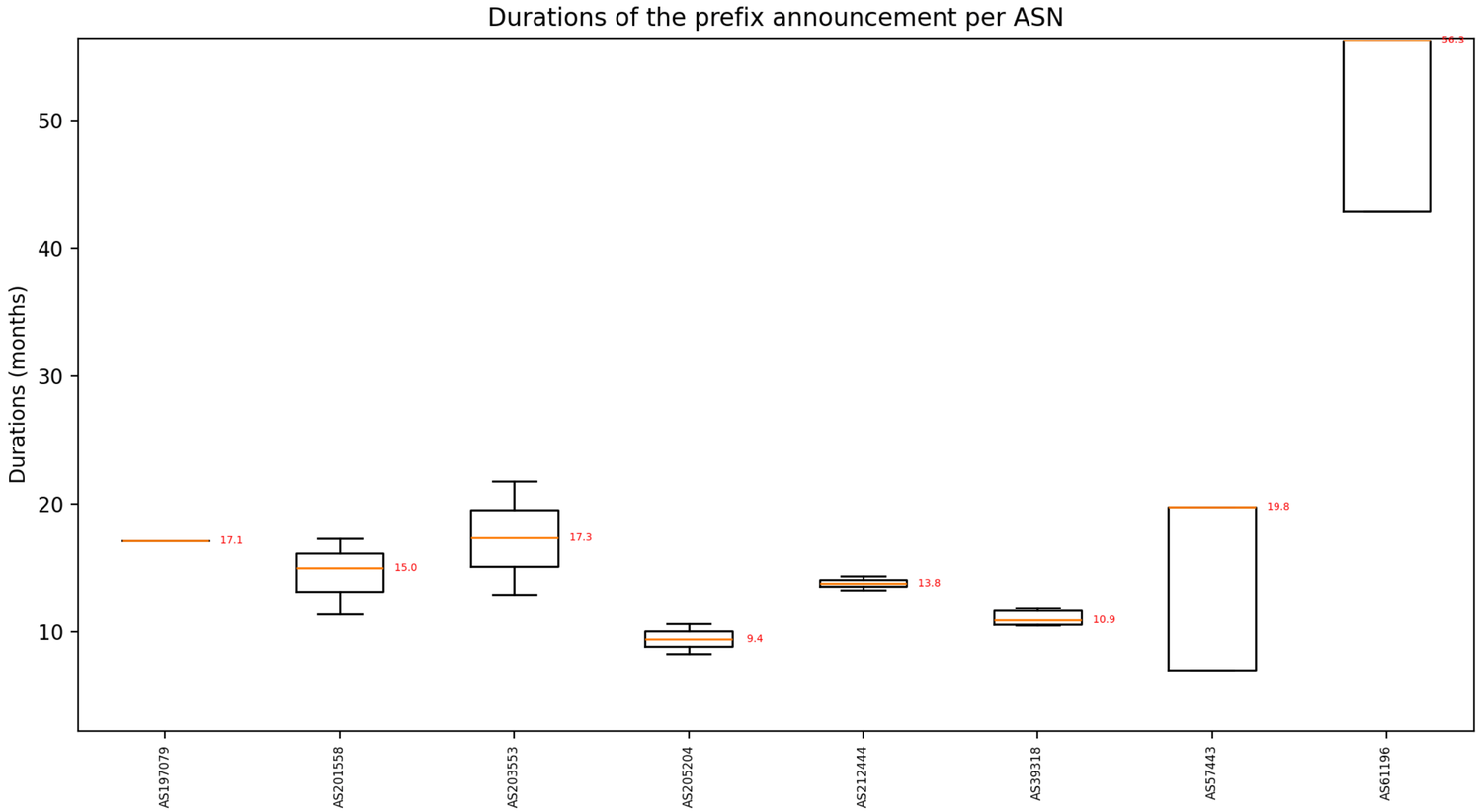
Has there been a "covid effect" in the region?

- Only in Turkmenistan:
  - Max/Min>18
  - But even in the post-Covid years, the median is still > 2



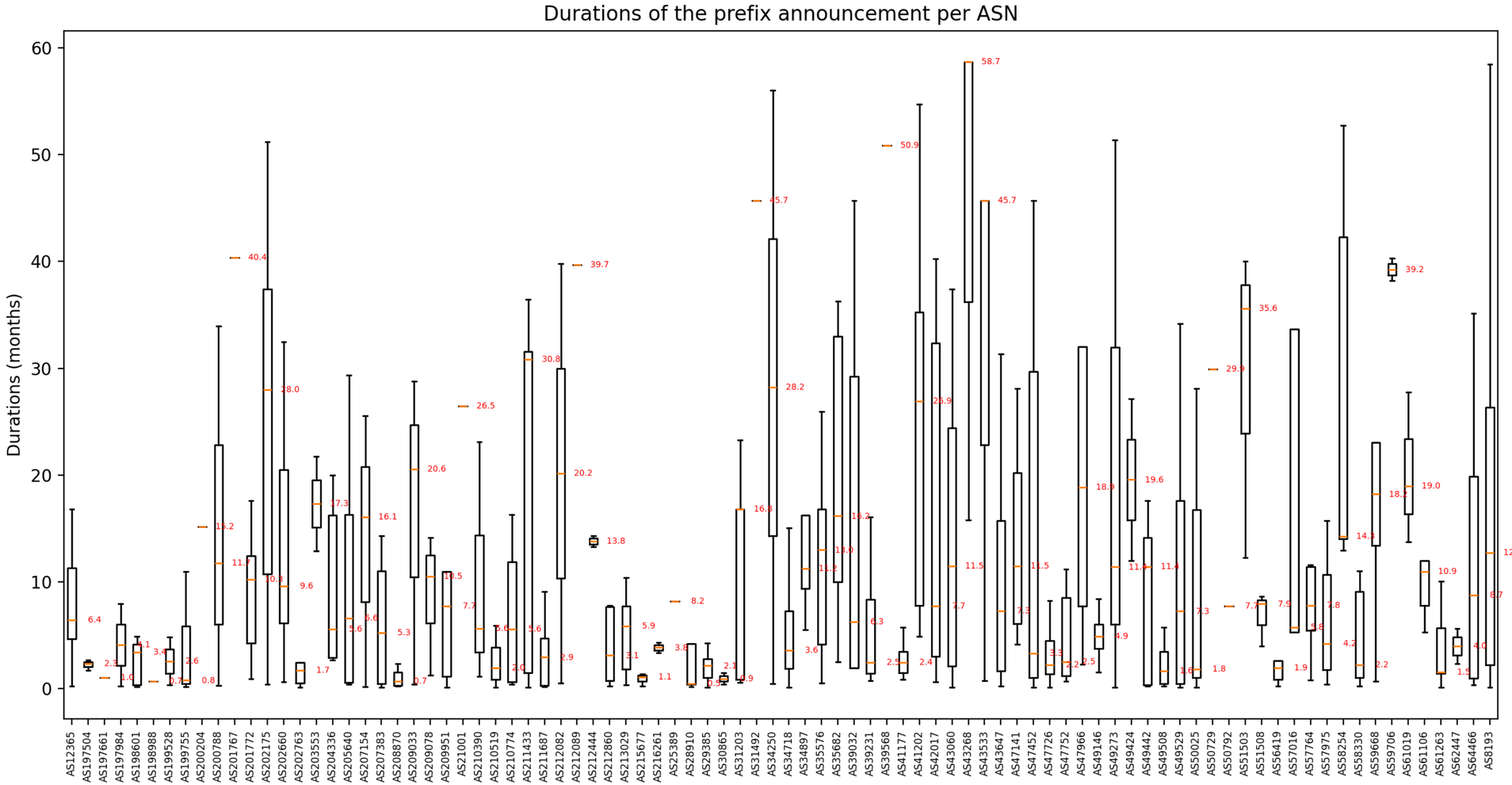
Some most stable ASes in the region

- By country:
  - KG: AS205204, AS61196
  - KZ: AS197079, AS39318
  - TJ: AS57443
  - TM: AS201558
  - UZ: AS203553, AS212444
- No worse than in Europe
  - (slide 21)



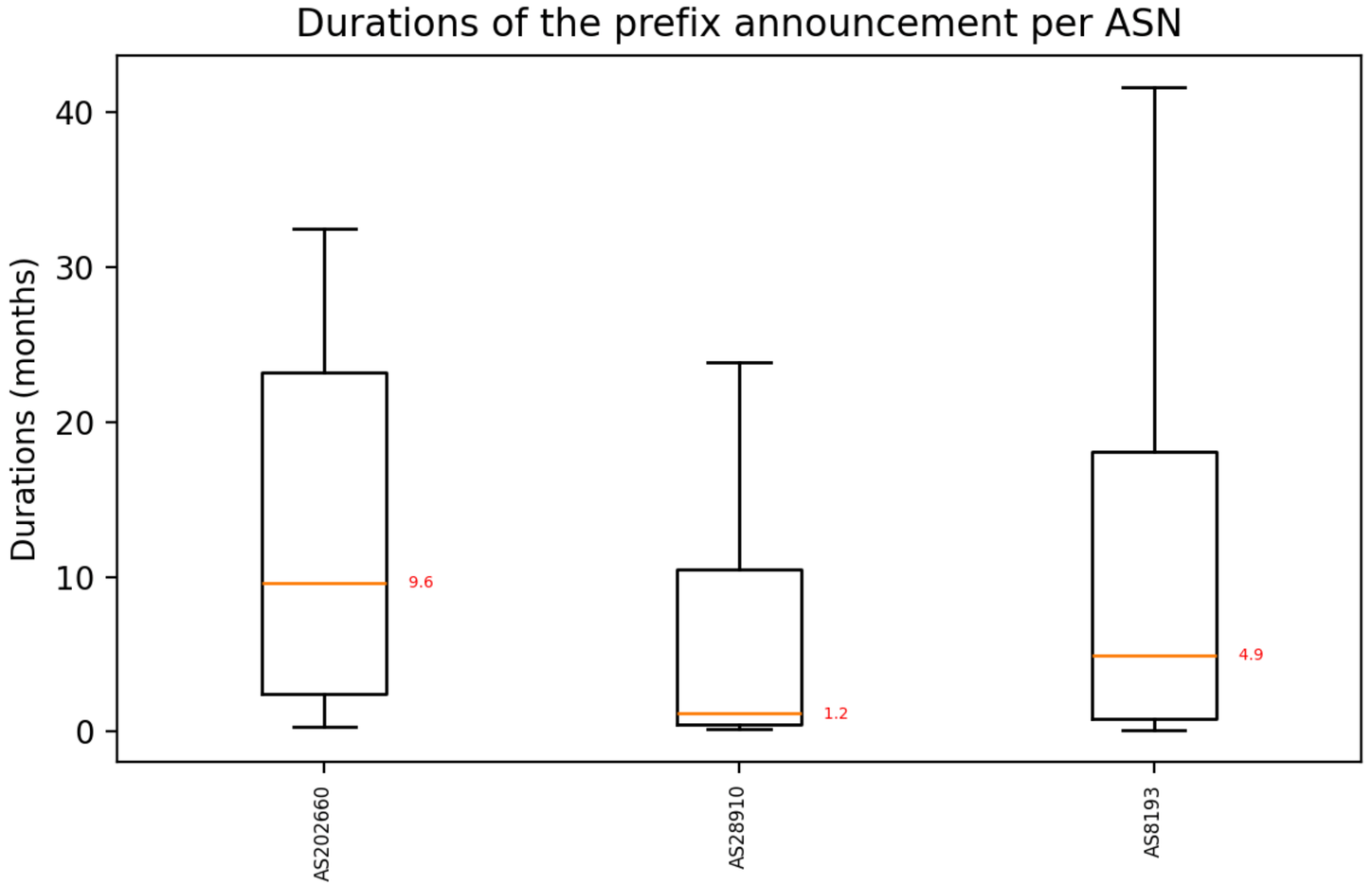
What if we look exactly at some country?

- Uzbekistan:
  - Large share of **stable** announcements
  - The uneven process of growth should be noted
- Can we dive deeper?..



The case of UzTelecom

- AS8193:
  - large spread
  - most variation in values
  - (is there active development going on?)
- AS28910:
  - least stable of the three
- AS202660
  - very good median value
  - high stability of announcements



Even within the same operator, we see that ASes are managed differently (and apparently designed for different purposes)

Conclusions

- Using a simple sub-tool of RIPEStat, we were able to build the set of metrics to detect instability at the countries and AS levels
  - We found correlations between known external factors and these metrics
- We analyzed Uzbekistan and the Central Asian region as a whole using this methodology
  - And we came to the conclusion that the operators in the region perform no worse than their Western European counterparts
- The construction of such metrics may be of interest not only to telecom operators but also to industry analysts, government regulators, and academy
  - **And sure, we are ready to cooperate!**

Questions

asemenyaka@ripe.net