

The data for these exercises is located in `shared-data/bgp`. If you load the data into a `DataFrame` you can convert a column to time using `pd.to_datetime`. `group_by` works on time as well using a `Grouper` object.

1. AS Peers

We want to discover peers of our upstream provider.

Tools: `pandas`, `pysubnettree`¹

Data: RIB from Routeviews route collectors at 4PM on December 6, `ribs.routeviews.06-12-2020.csv`.

- (a) First, find out your public IP address. While this should be easy for our servers, just as a thought experiment consider how you could do the same for your home computer, which is likely behind a NAT.
- (b) `mobi8` should be reachable via `141.22.28.18`. Analyze the table dump noted under *Data*. Explain and implement one approach to figure out to which origin AS this IP address belongs to.
- (c) List the autonomous systems that peer with our ISP (based on your data set). Explain why this view is very likely incomplete.

Note that you can resolve the AS numbers via `whois` or `https://www.potaroo.net/bgp/iana/asn-ctl.txt`.

2. RIPE RIS BGP Beacons Timing

We want to measure the timing behavior of the RIPE RIS BGP beacons².

Tools: `pandas`, `matplotlib`

Data: Updates from RIPE RIS route collectors RRC00 and RRC23 for April 20, 2019 `update.ris.rrc{00,23}.20-04-2019.csv.gz`.

- (a) Visualize the update patterns of the BGP beacons `84.205.64.0/24` and `93.175.151.0/24`.
- (b) Do the update patterns comply with the publicly documented announcement and withdrawal schedule?
- (c) Which time offsets do you observe between updates in the BGP dumps compared to the schedule? (Offsets are peer-specific.)

¹<https://github.com/zeek/pysubnettree>

²<https://www.ripe.net/analyse/internet-measurements/routing-information-service-ris/current-ris-routing-beacons>

3. BGP Zombies

When an IP prefix is withdrawn from its origin AS it should disappear from all routing tables—sooner or later.

Tools: pandas

Data: RIBs from RIPE RIS route collectors on December 6,
`ribs.ris.rrc00.06-12-2020.csv.gz`.

- (a) Explain the term *BGP zombie*.
- (b) Design a measurement method to reveal BGP zombies.
- (c) Apply your measurement methodology on the data set. Do you see BGP zombies for prefix announced by RRC00?