The RPKI Wayback Machine

(or: Ziggy says there's a 50% chance we'll end up in 2011)

Roland van Rijswijk-Deij

NLNETLABS

What we wanted to do

- At NLnet Labs, **we make RPKI Relying Party software** called Routinator
- **Routinator** has seen a **lot of uptake in production** (**thank you!**)
- We want to **test our software** to ensure it is robust
- **Enter:**
  8 years of RPKI ROA data for all the RIRs provided by RIPE NCC!

How we processed the data

- **RIPE NCC archived all RPKI repositories** pretty much **since RPKI day zero**
- We got **dumps in .tar.gz files** with all RPKI objects, but no historic TALs
- So **we wrote a tool we called "Ziggy"** to transport us **back in RPKI time**

Interlude: Ziggy!

- Remember Quantum Leap? I do :-)

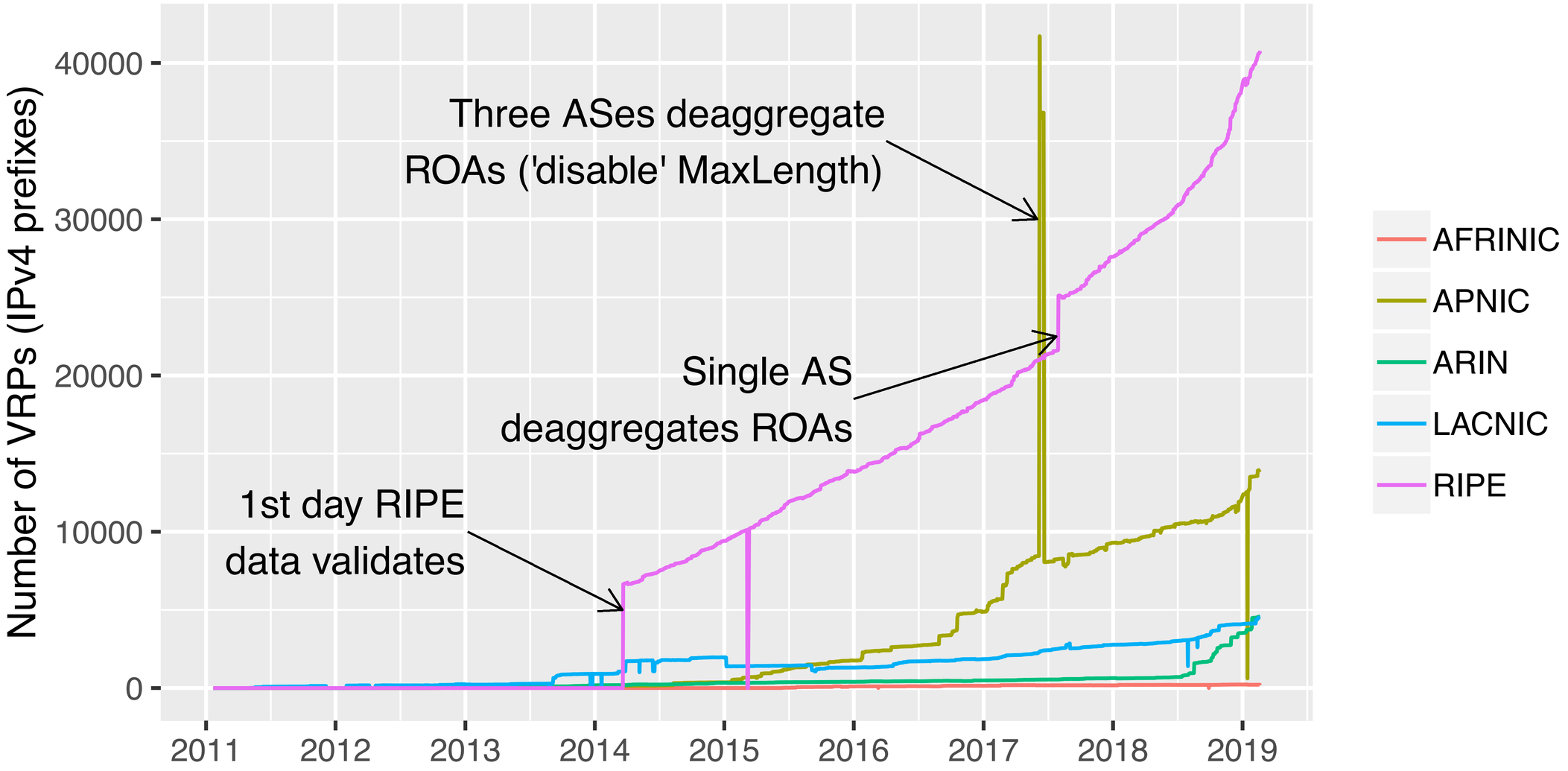
What does Ziggy do?

- You can **give Ziggy** (our Python script) **a date**, and it will then:
  - **Find and unpack all .tar.gz files** for that date, in a Routinator-friendly structure
  - **Recreate TALs** based on the trust anchors from the archives
  - **Run Routinator using "faketime"** for the specified date
- We did this from **January 2011 to February 2019**

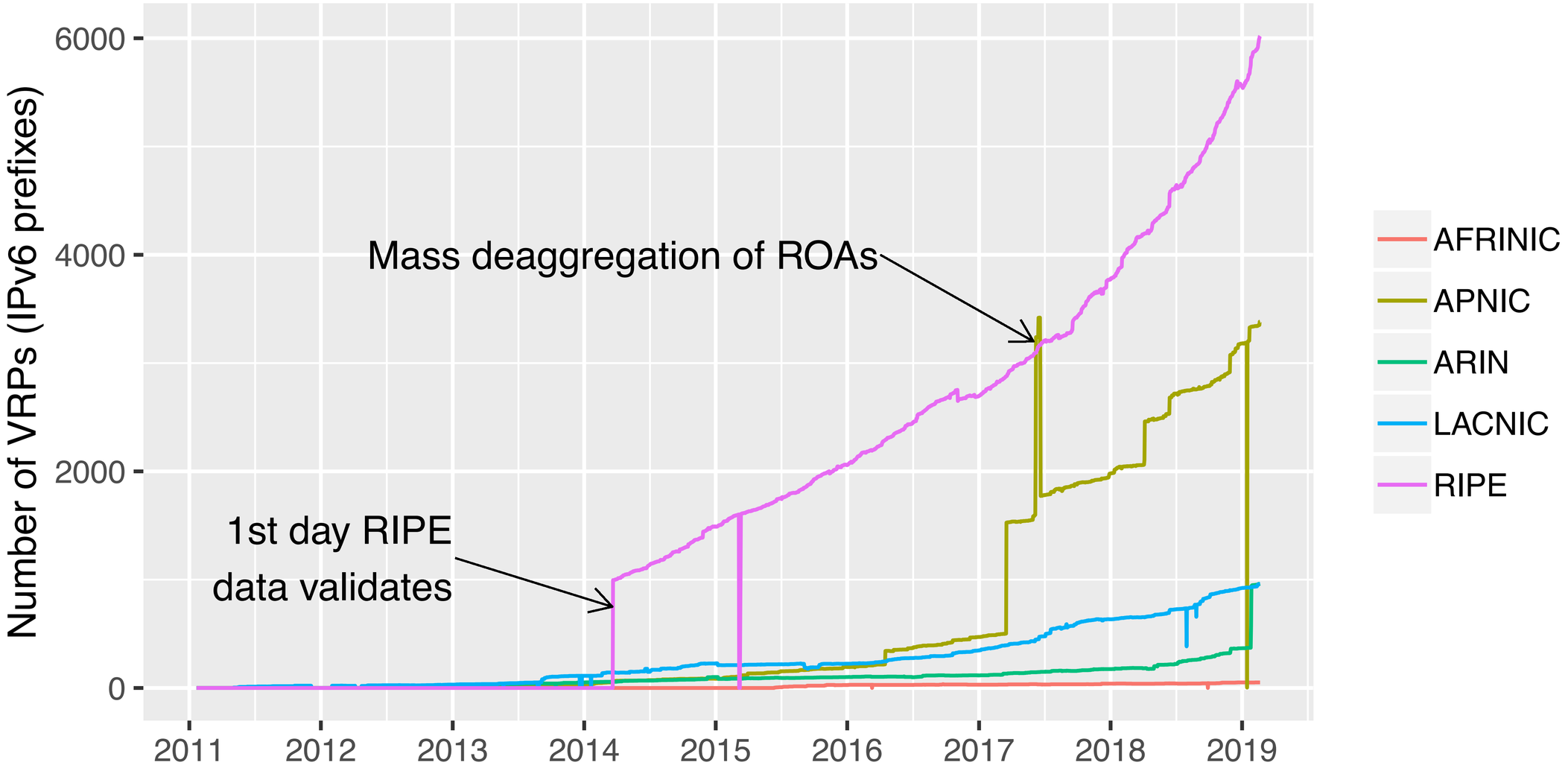
Quick recap: jargon

- Reminder (also if you read the slides later):
- **RPKI** **R**esource **P**ublic **K**ey **I**nfrastructure
- **ROA** **R**oute **O**rigin **A**uthorisation
  (authorises a certain AS to announce certain prefixes)
- **VRP** **V**erified **R**OA **P**ayload (yes, acronym in acronym...)
  (a cryptographically valid statement about a prefix from a ROA)

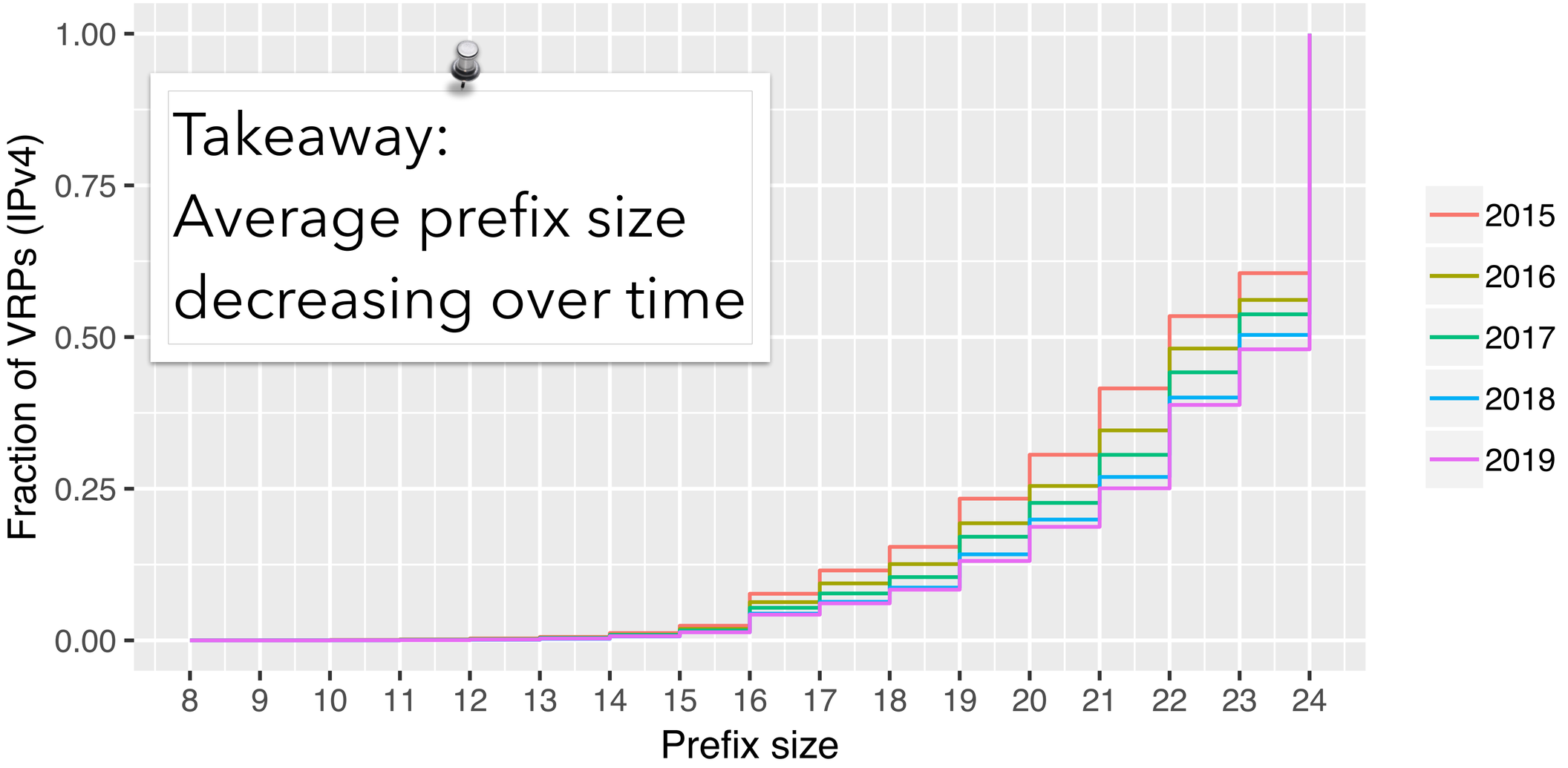
Growth of VRPs over time



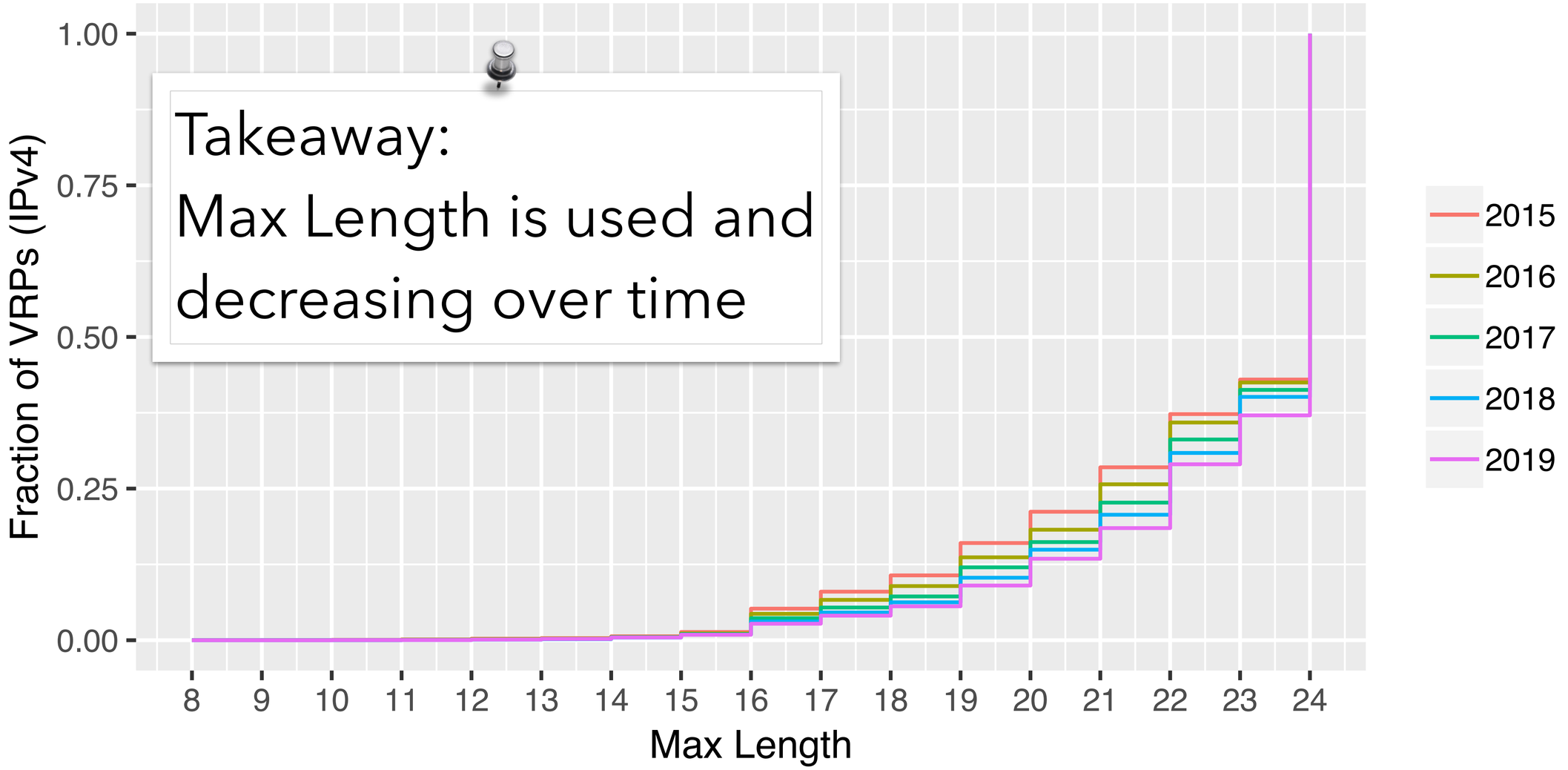
Of course *also* for IPv6 ;-)



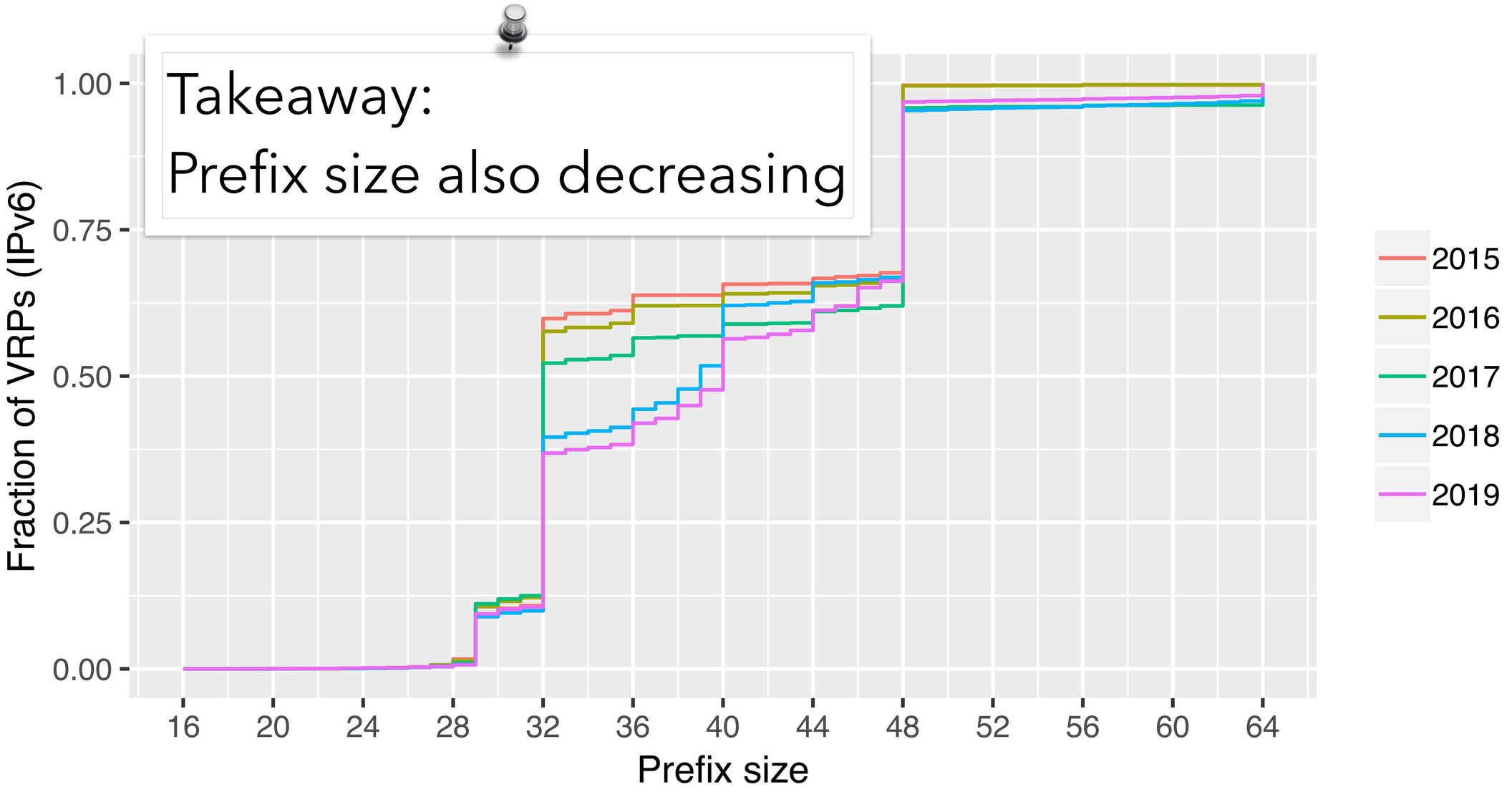
Prefix size in VRPs over time (IPv4)



Max Length in VRPs over time (IPv4)

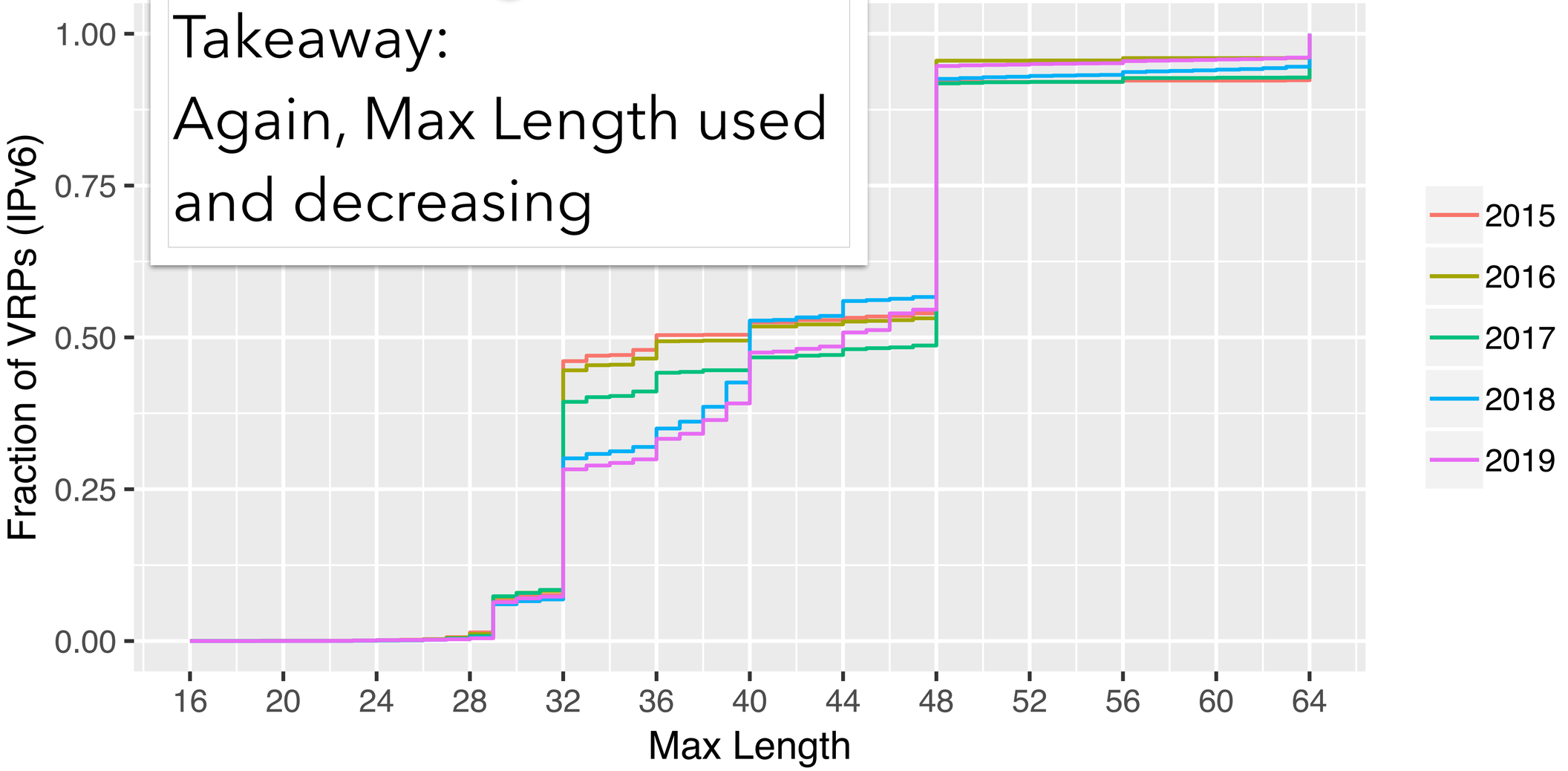


Prefix size in VRPs over time (IPv6)

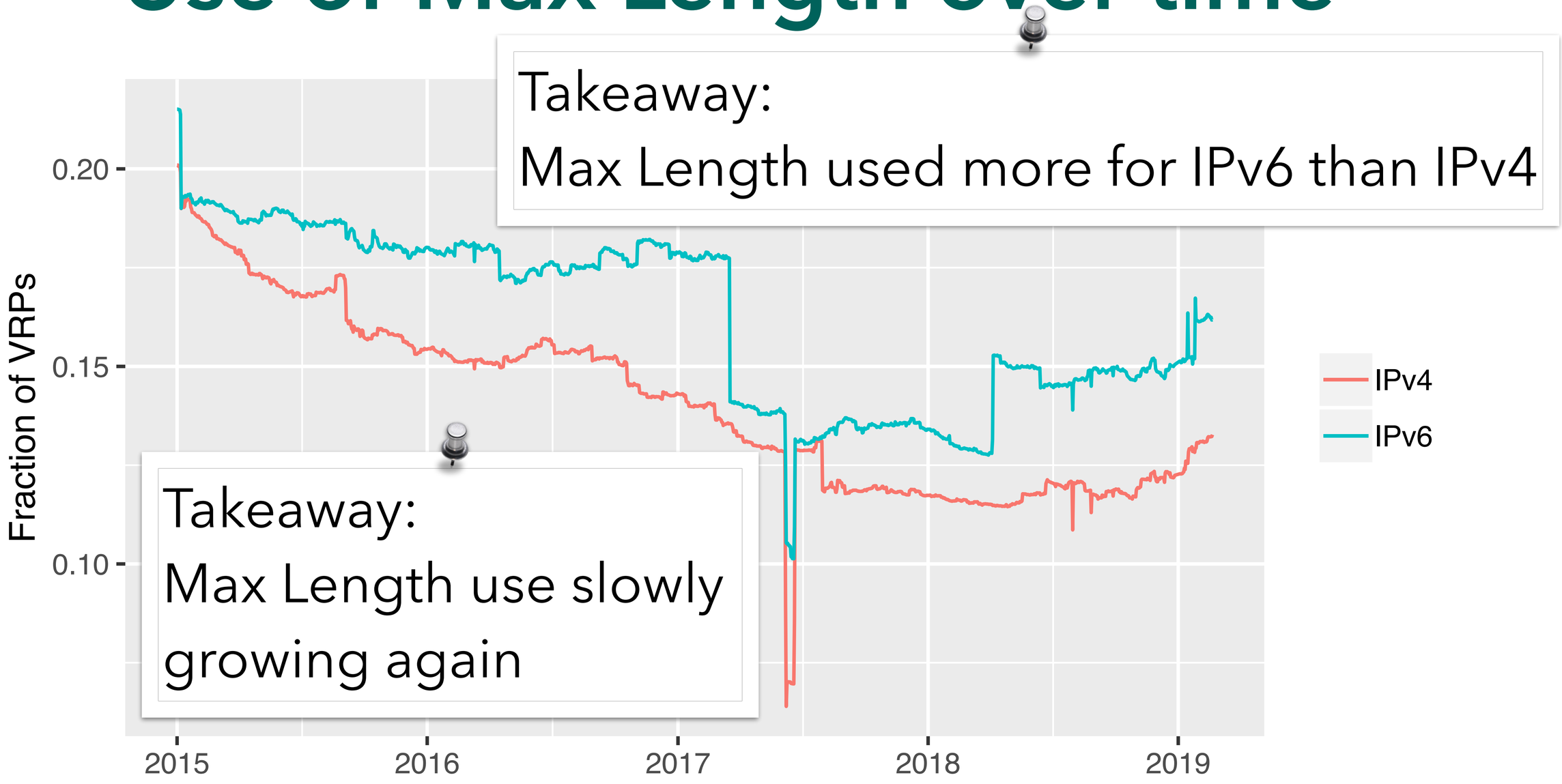


Max Length in VRPs over time (IPv6)

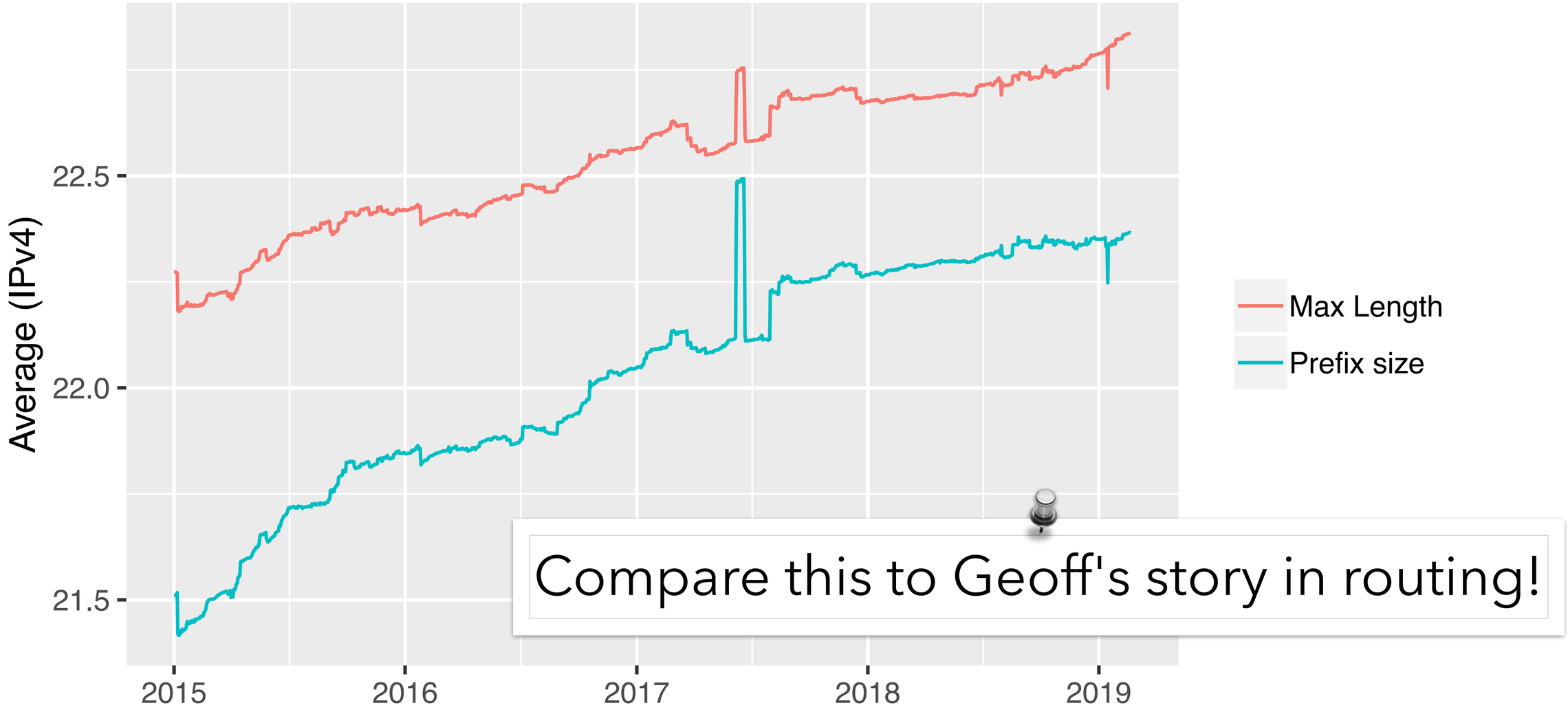
Takeaway:
Again, Max Length used and decreasing



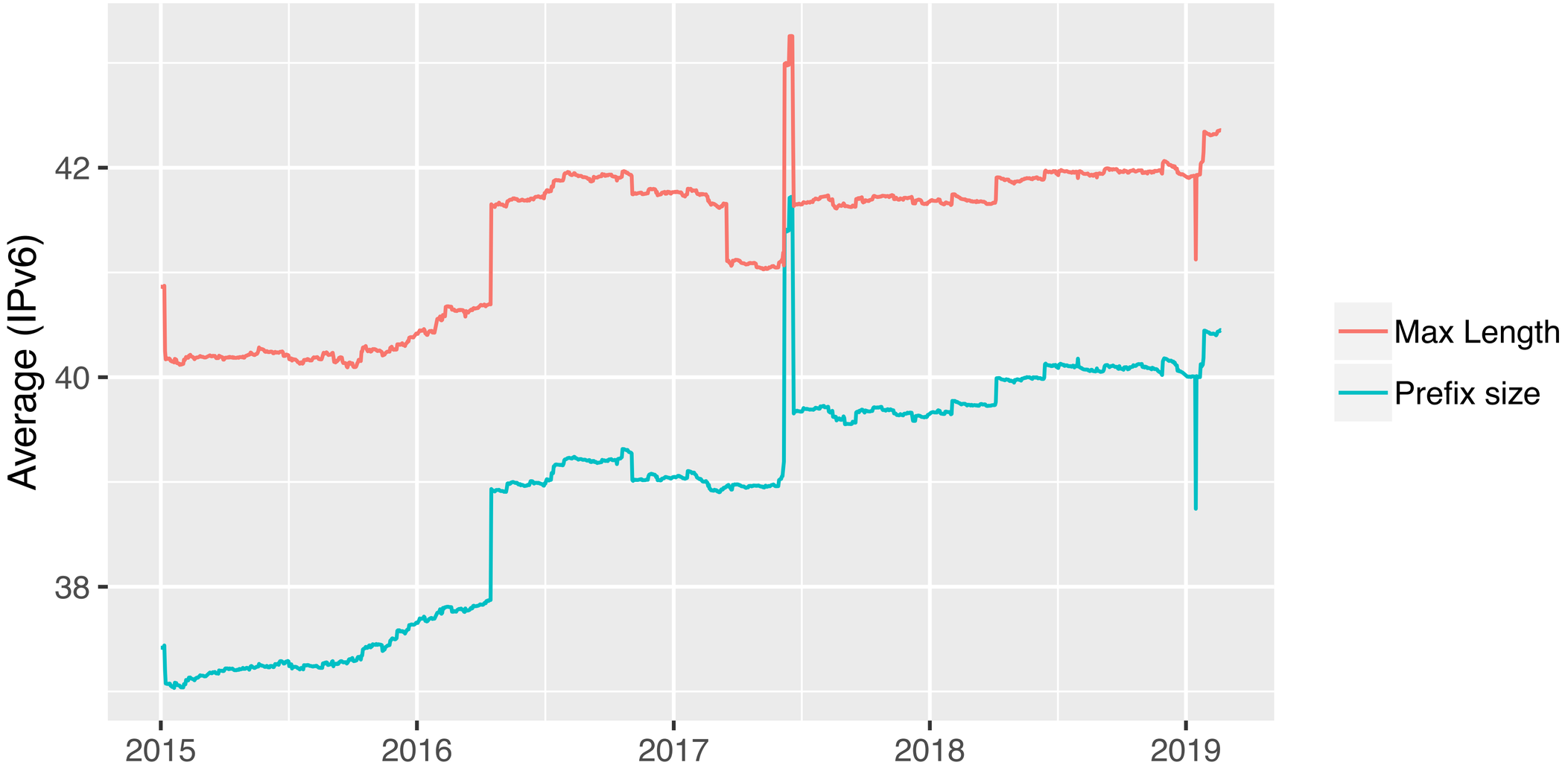
Use of Max Length over time



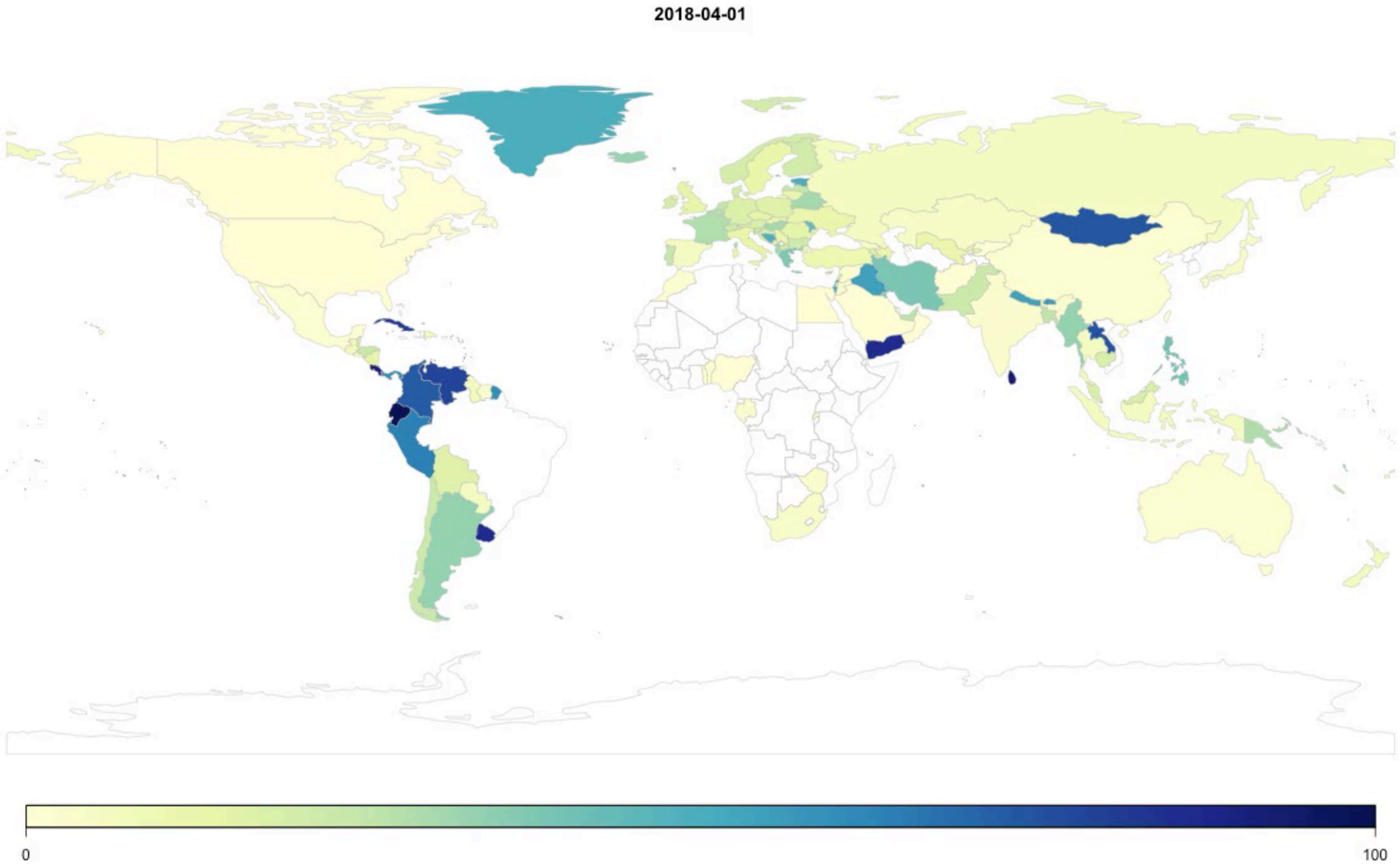
One more thing: average prefix size



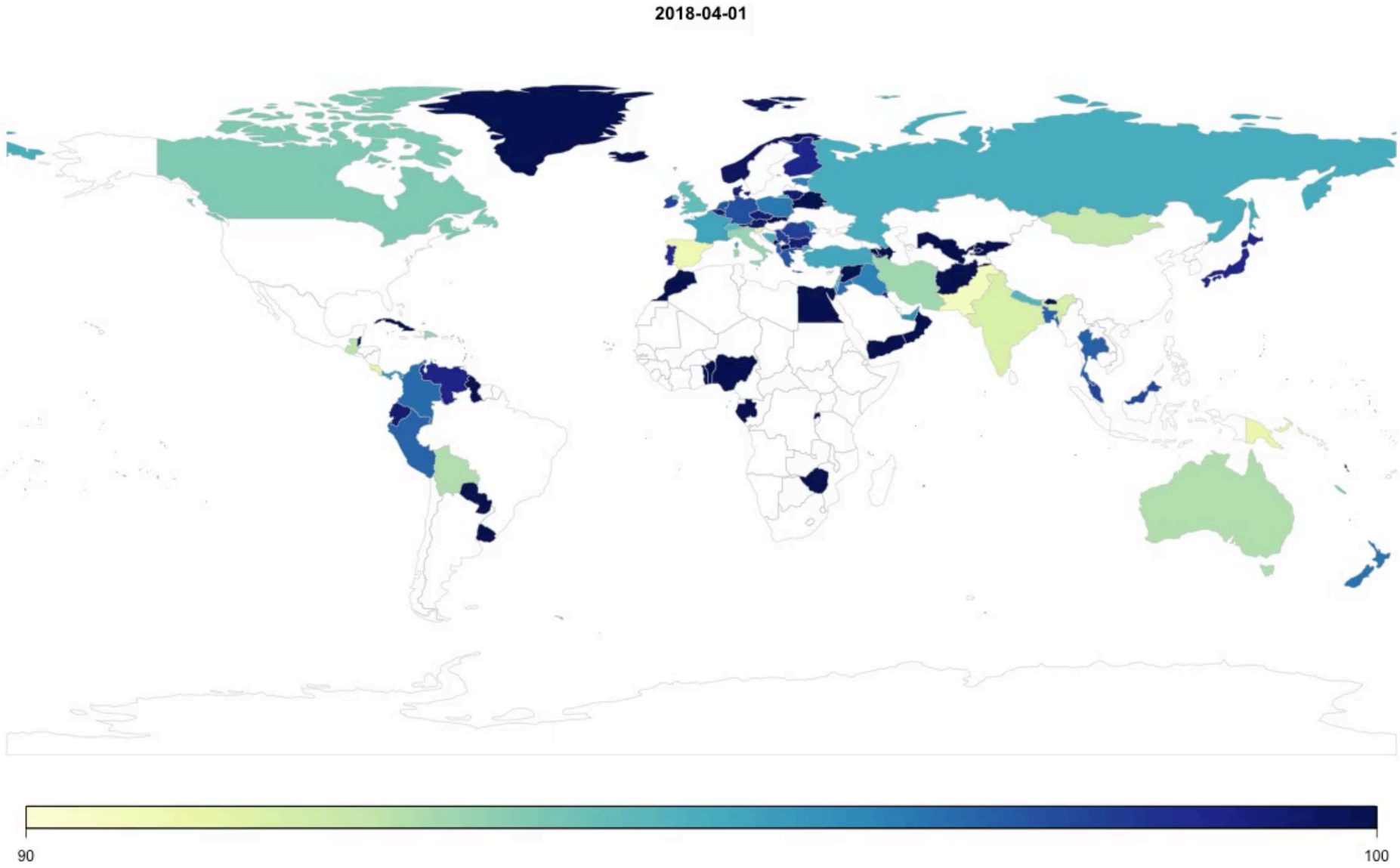
For IPv6 same(-ish) thing



Coverage over time



Accuracy over time



Conclusions

- We wanted to **test Routinator**; turns out **RPKI** use **took** some **time to stabilise to a** well-defined **standard**
  → *Action item: support older standards in Routinator*

- Very **interesting data**, **raises** lots of **questions** and can help **study** how **RPKI** is deployed **in practice**

- **Next step: compare** this **against routing information** over the same period (from RIS, RouteViews, ...)
  → *Paper to be presented at ACM IMC 2019 in Amsterdam, Oct. 21-23*

Open data

- A big **thank you to** the **RIPE NCC and** to **Emile Aben** in particular for providing us with the RPKI dataset!

- The data is now also available as open data: https://ftp.ripe.net/rpki

RIPE NCC

RIPE NETWORK COORDINATION CENTRE

Grab our free OSS tools!

- Routinator:
  https://github.com/NLnetLabs/routinator

- Secure Routing Stats (experimental):
  https://github.com/NLnetLabs/secure-routing-stats
  (produces the graphs with world maps)

- Ziggy:
  https://github.com/NLnetLabs/ziggy

Thank you! Questions?

nl.linkedin.com/in/rolandvanrijswijk

@reseauxsansfil

roland@nlnetlabs.nl

and for "Team RPKI": rpki-team@nlnetlabs.nl

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BONUS SLIDES

Some more graphs we got from Ziggy
that didn't make it to the talk,
because "time" ;-)

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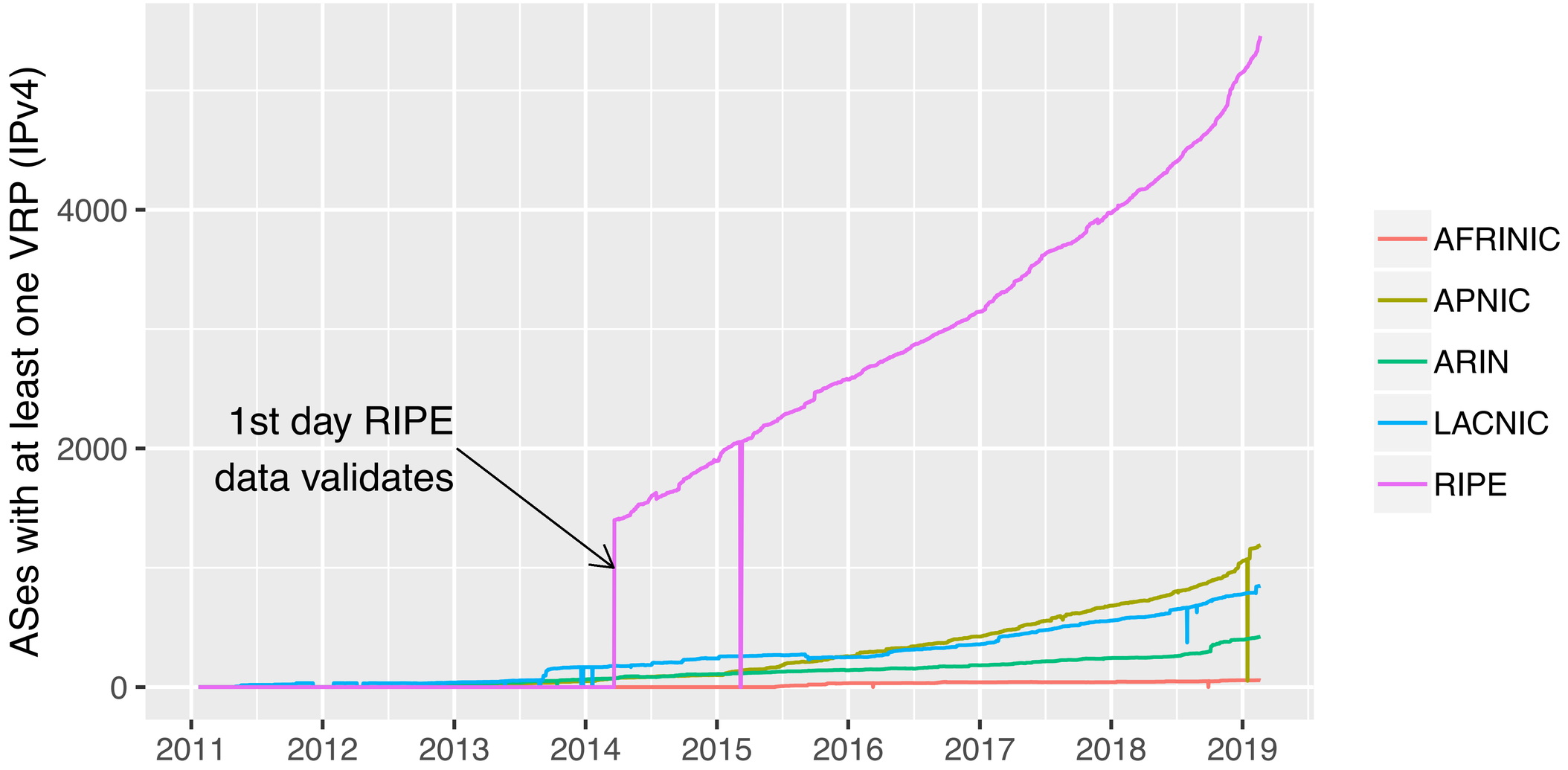
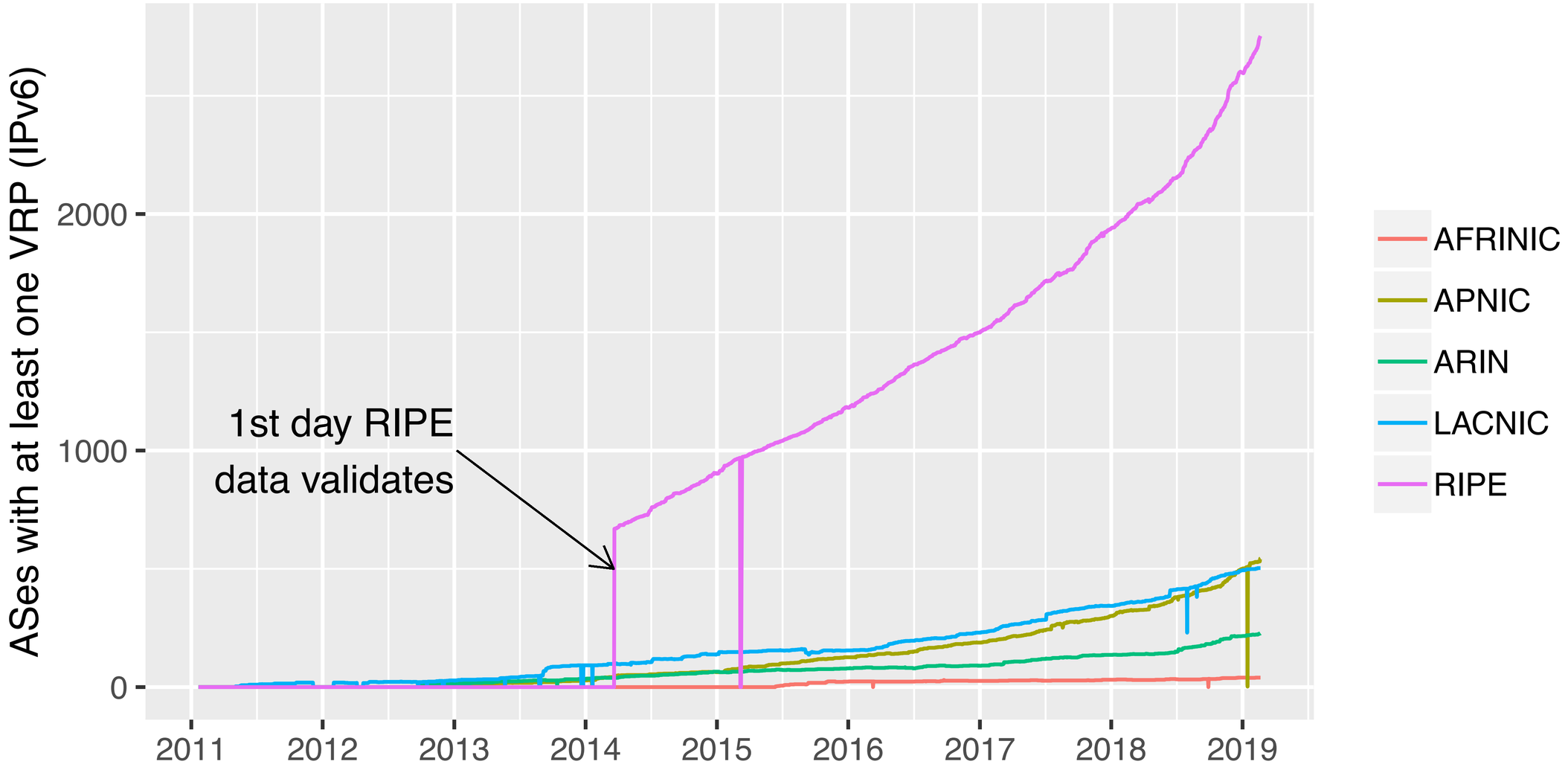
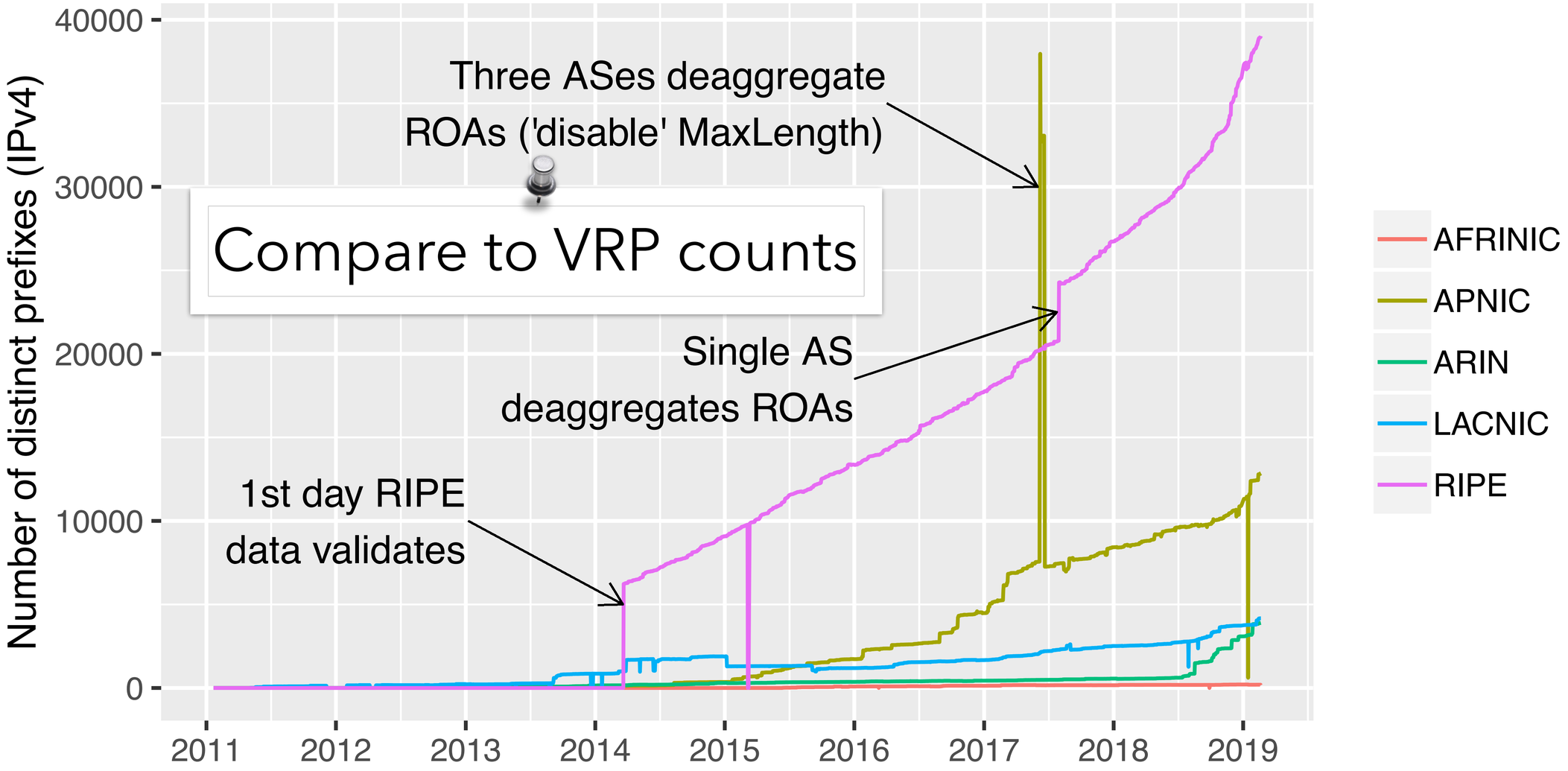
Number of ASes with a VRP (IPv4)



Number of ASes with a VRP (IPv6)



Number of distinct prefixes (IPv4)



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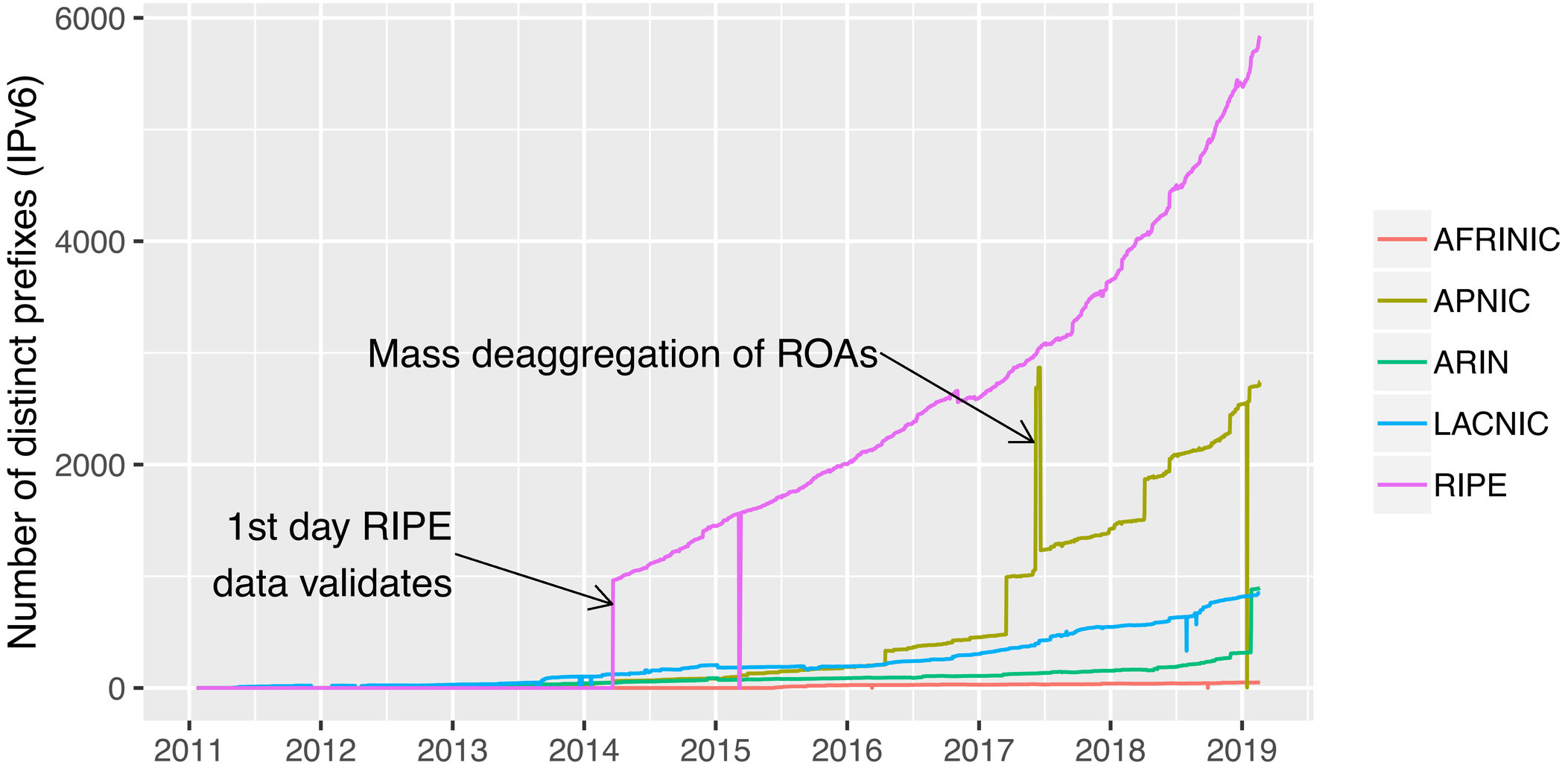
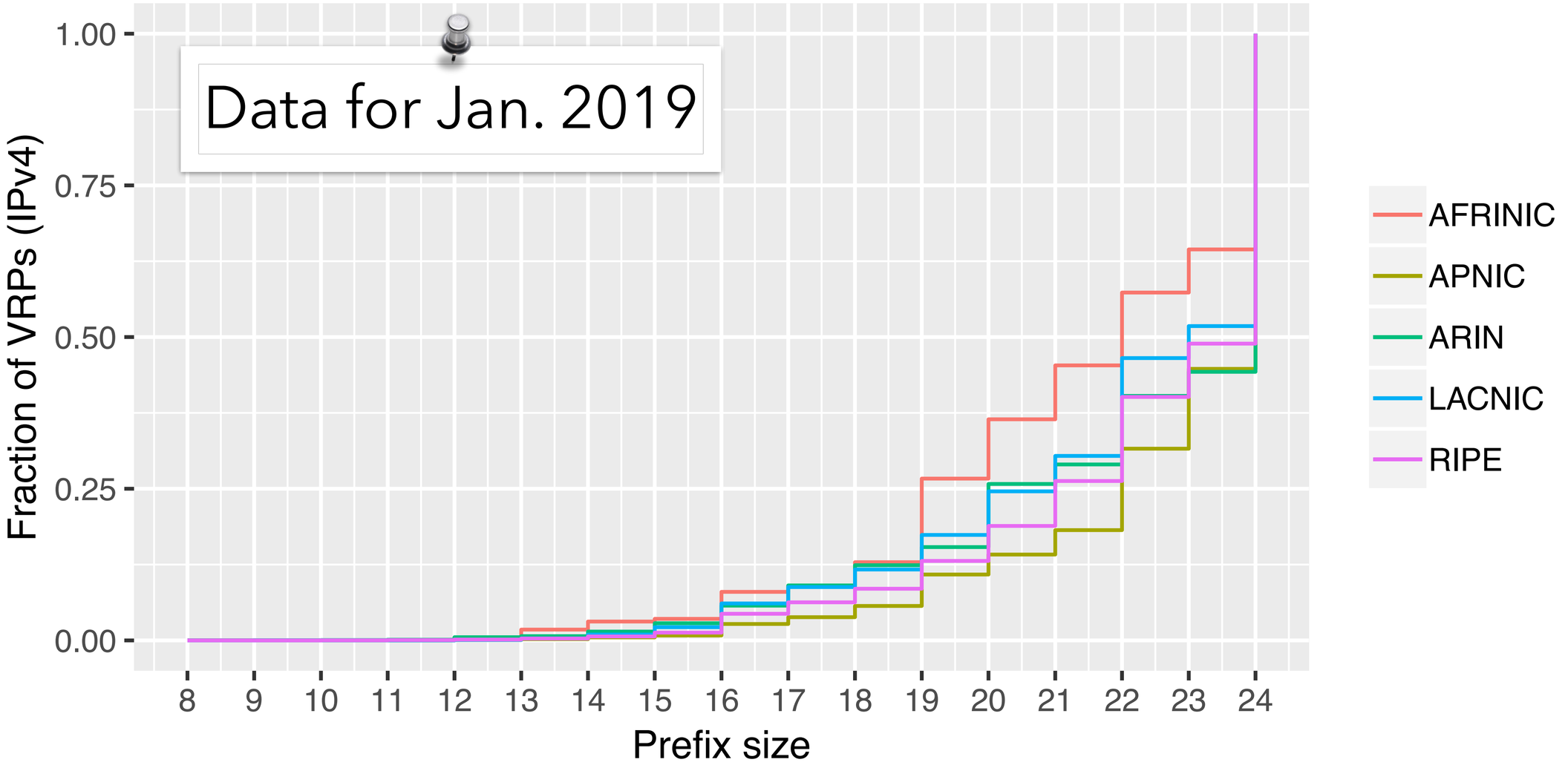


Prefix size distribution RIRs (IPv4)



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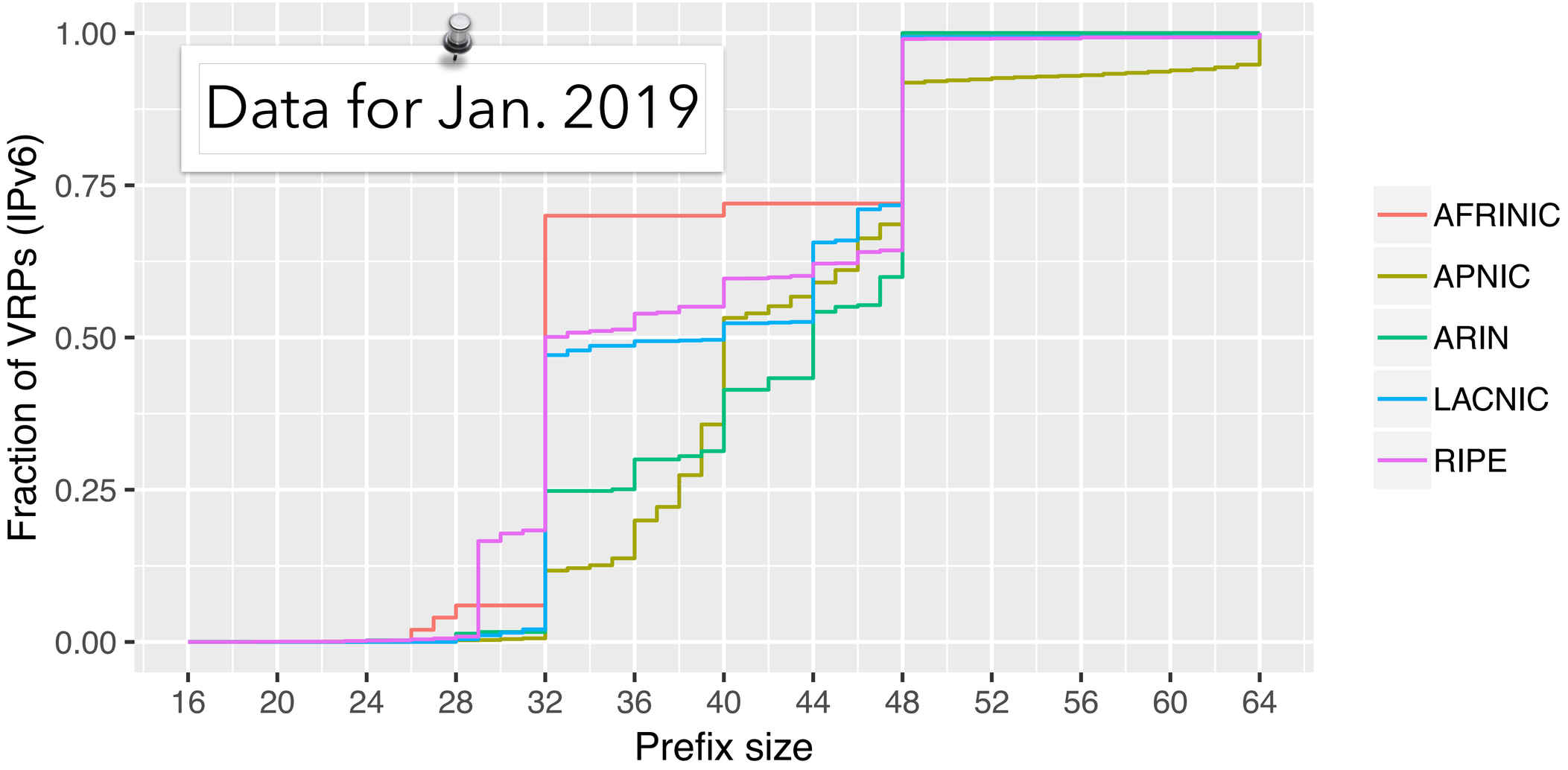
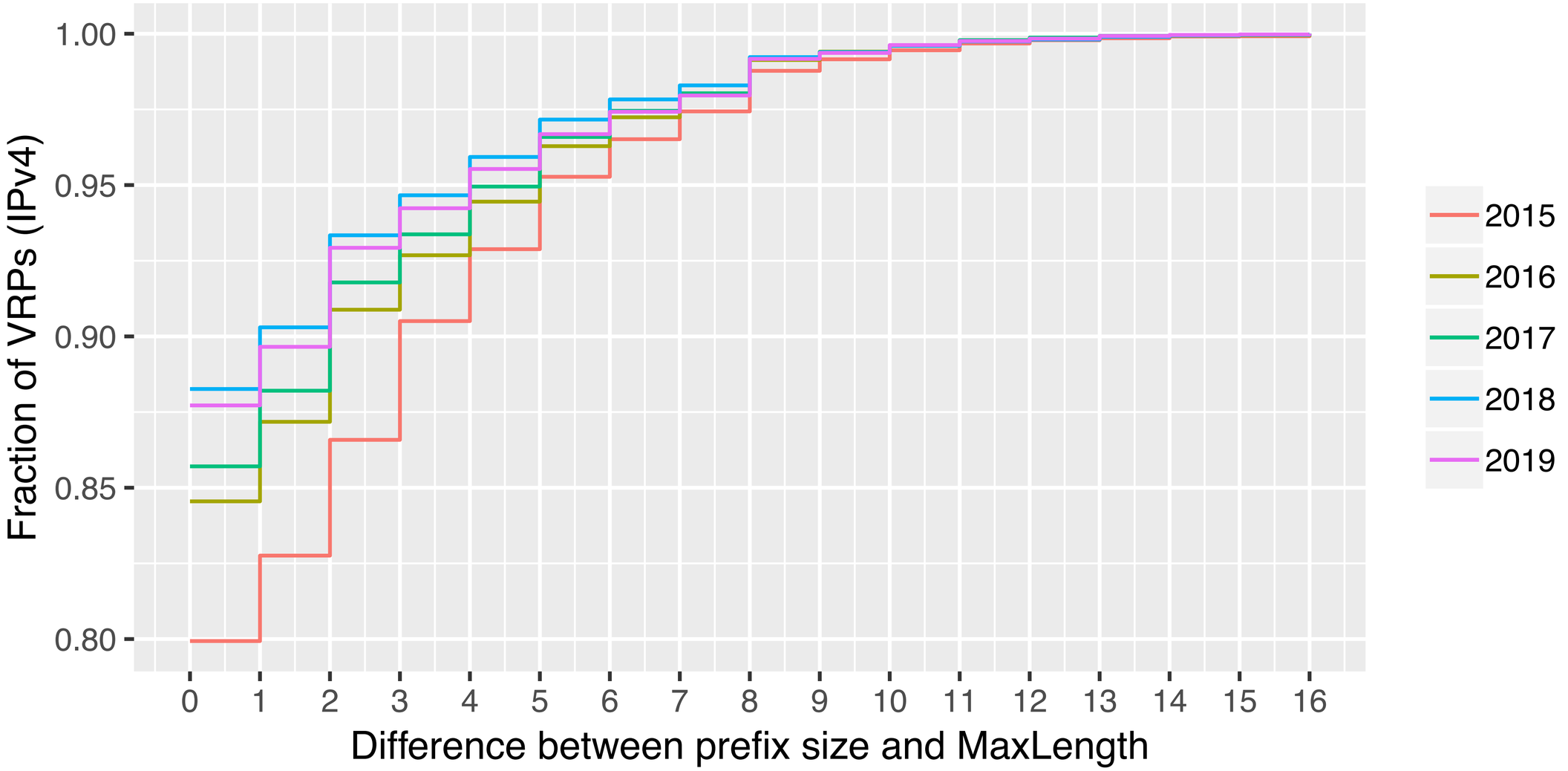


Prefix vs. Max Length (IPv4)



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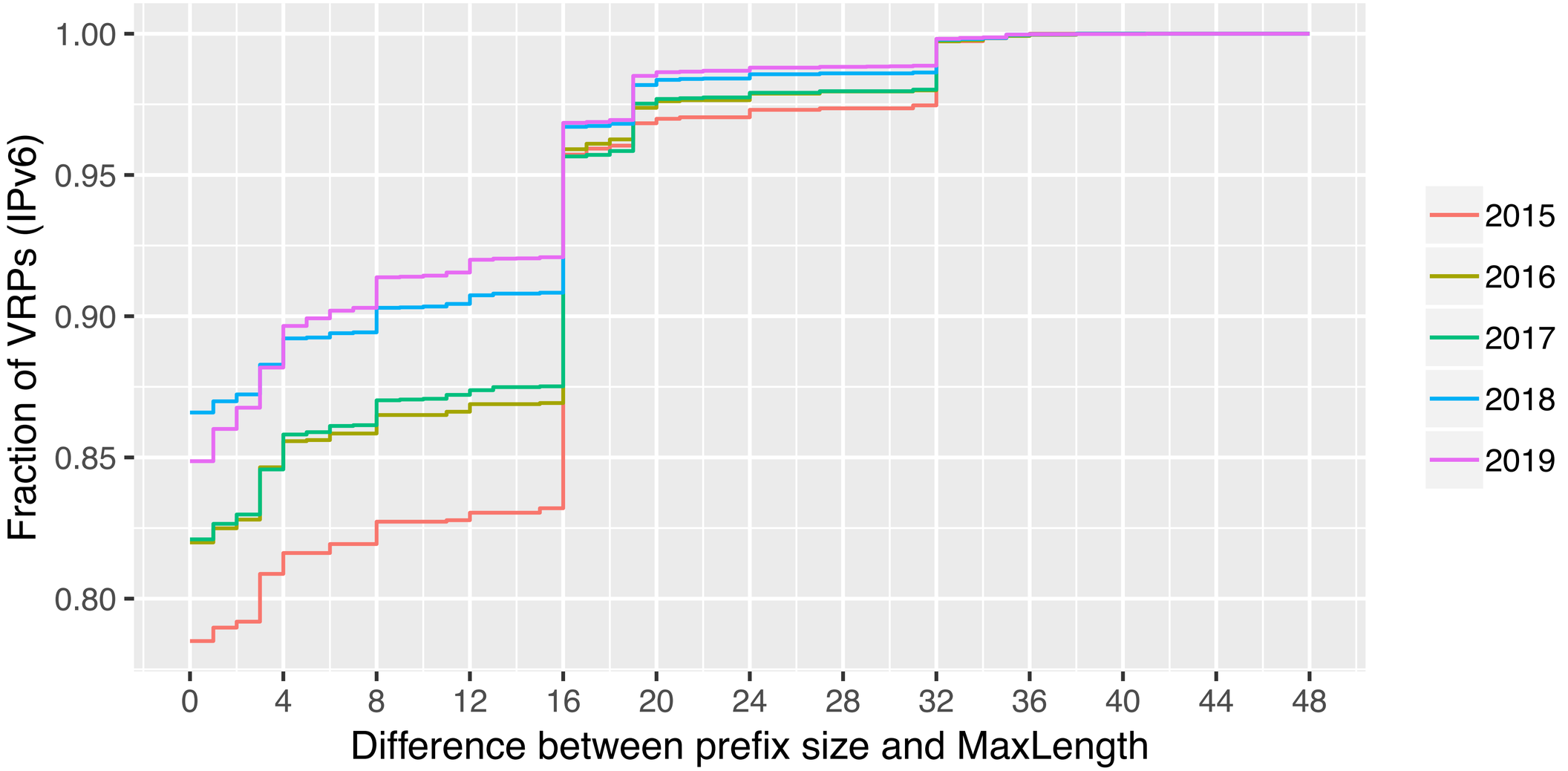

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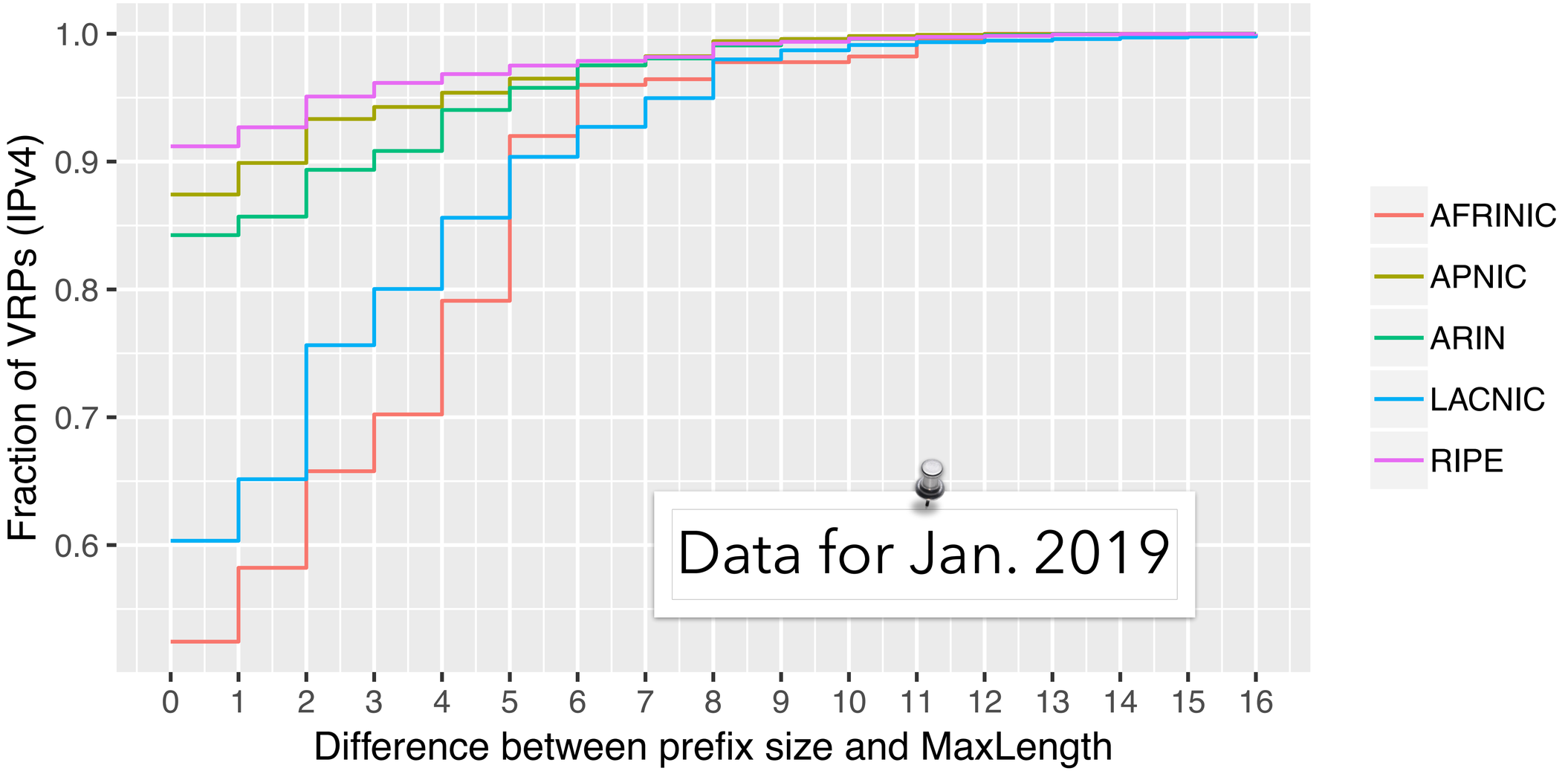

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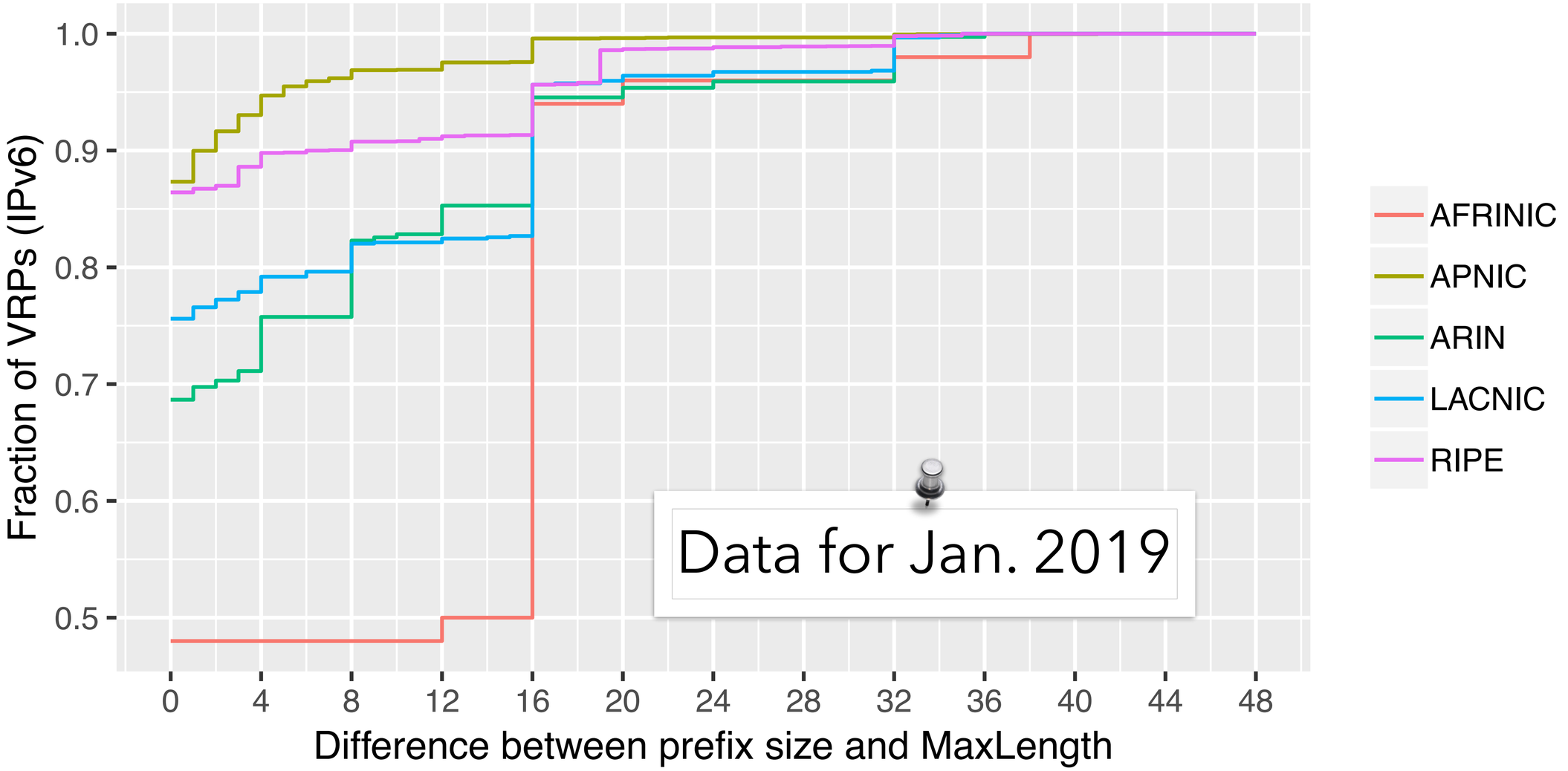
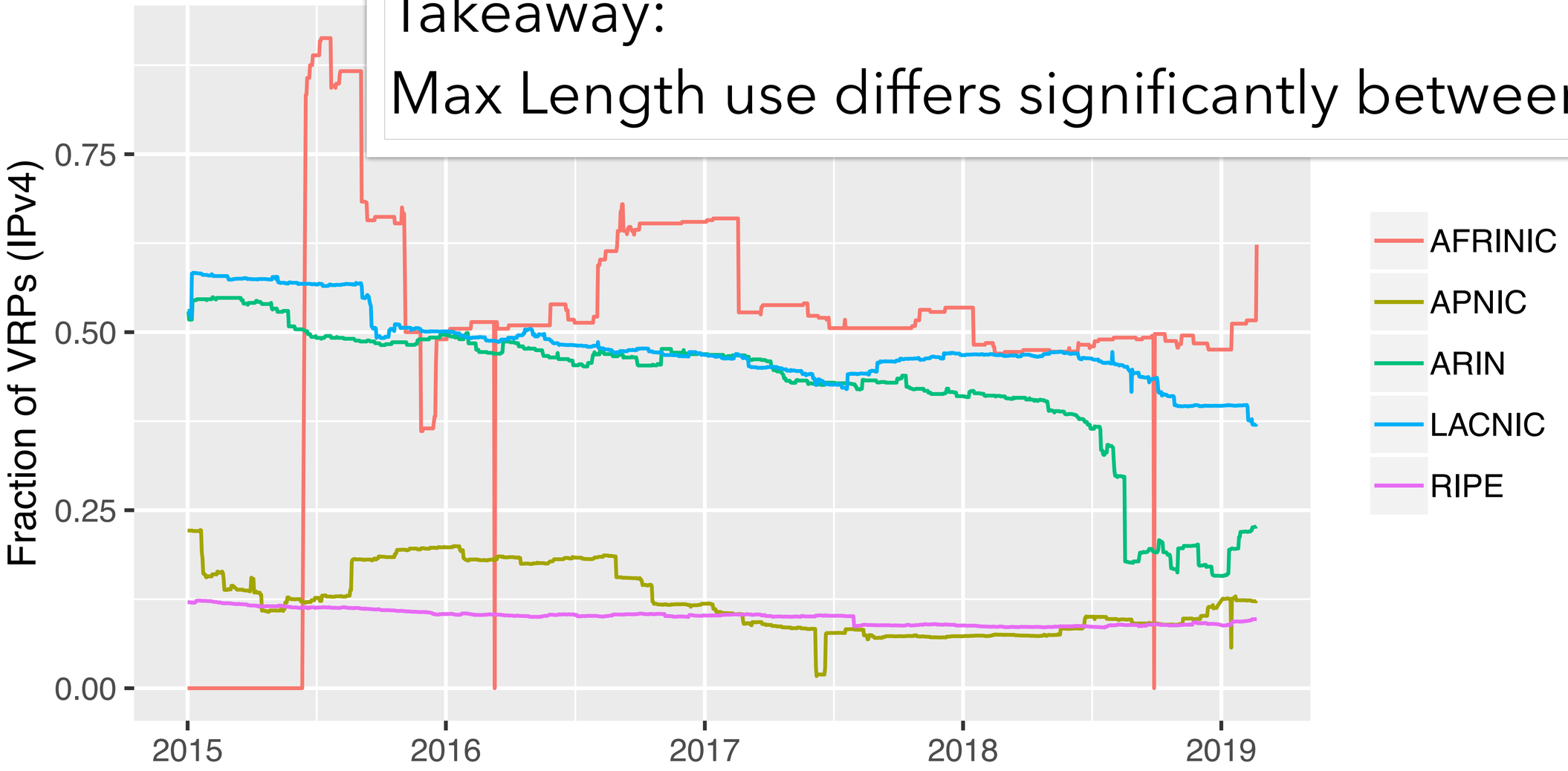


Differences between RIRs

Takeaway:

Max Length use differs significantly between RIRs