

RPKI & Routing

Some Measurements

RPKI and RouteViews

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the flames are mine

Like Broadband,
North America
is the RPKI
Third World

Why NoAm Folk Think RPKI Adoption is Low

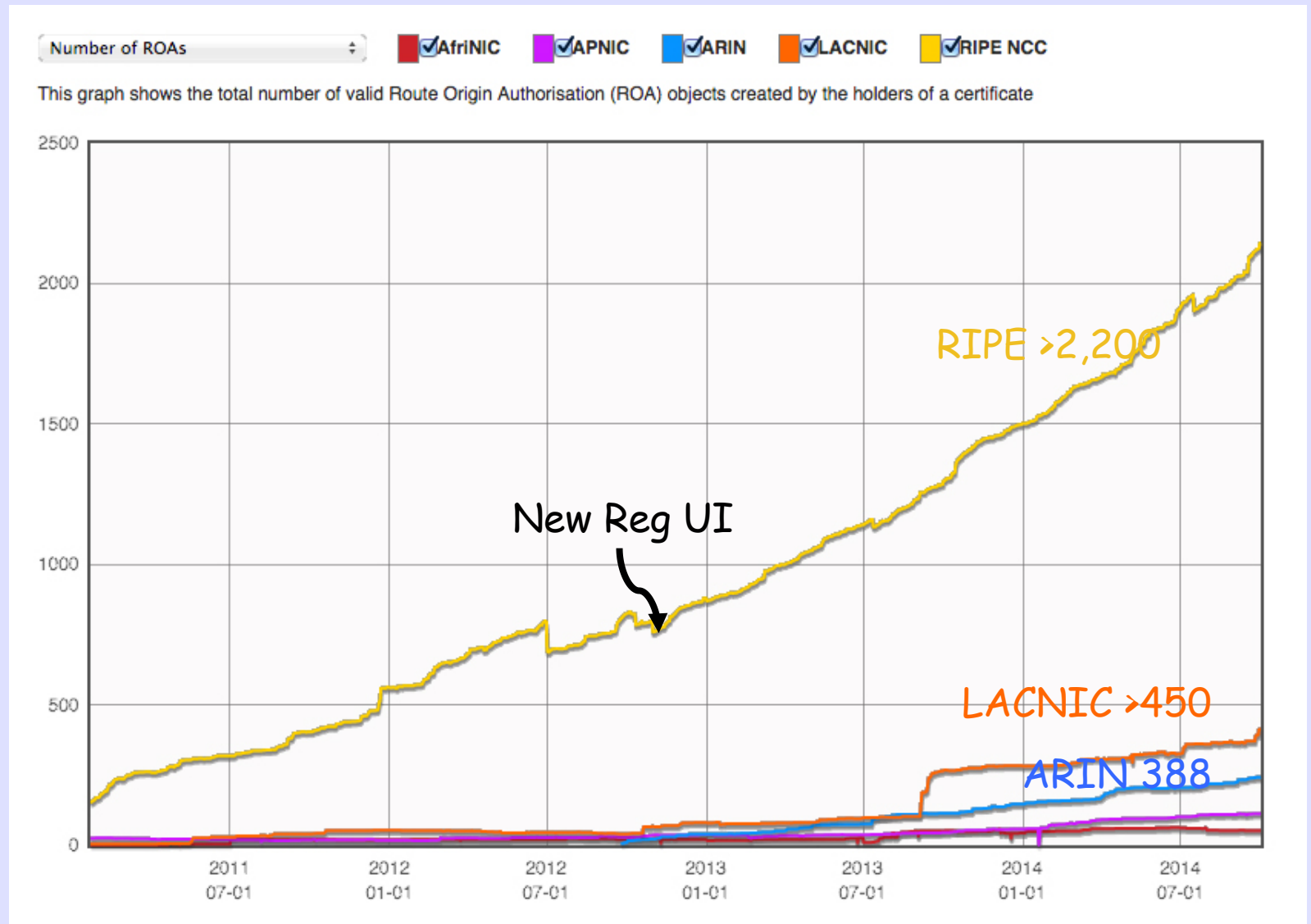
RIR	Total	Valid	Invalid	Unknown	Accuracy	RPKI Adoption Rate
AFRINIC	11769 (100%)	59 (0.5%)	51 (0.43%)	11659 (99.07%)	53.64%	0.93%
APNIC	133035 (100%)	578 (0.43%)	511 (0.38%)	131946 (99.18%)	53.08%	0.82%
ARIN	195815 (100%)	1044 (0.53%)	278 (0.14%)	194493 (99.32%)	78.97%	0.68%
LACNIC	72858 (100%)	16749 (22.99%)	614 (0.84%)	55495 (76.17%)	96.46%	23.83%
RIPE NCC	138800 (100%)	10788 (7.77%)	1512 (1.09%)	126500 (91.14%)	87.71%	8.86%

A Lot Better
Than IPv6

Half are Two LIRs

Embarrassing

It's Embarrassing



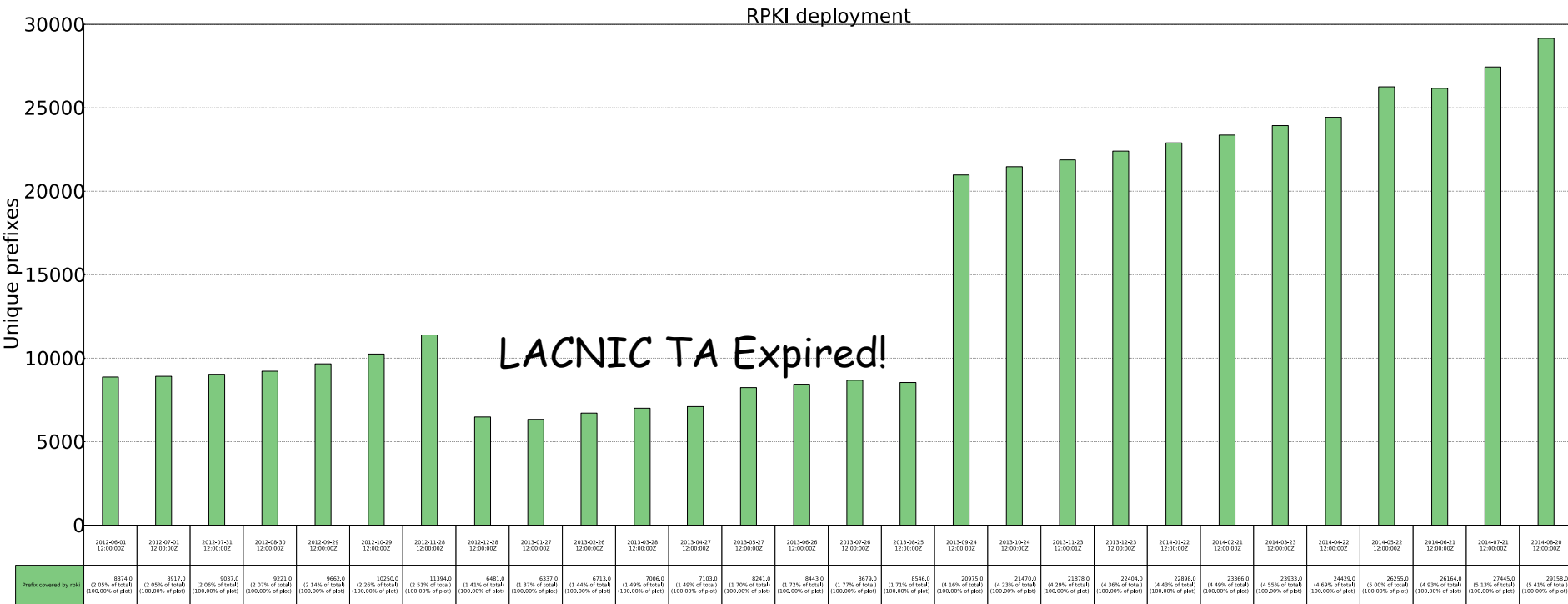
It's What Happens
When You Let Lawyers
and Wannabe Regulators
Run the Internet

But Let's Talk Measurement

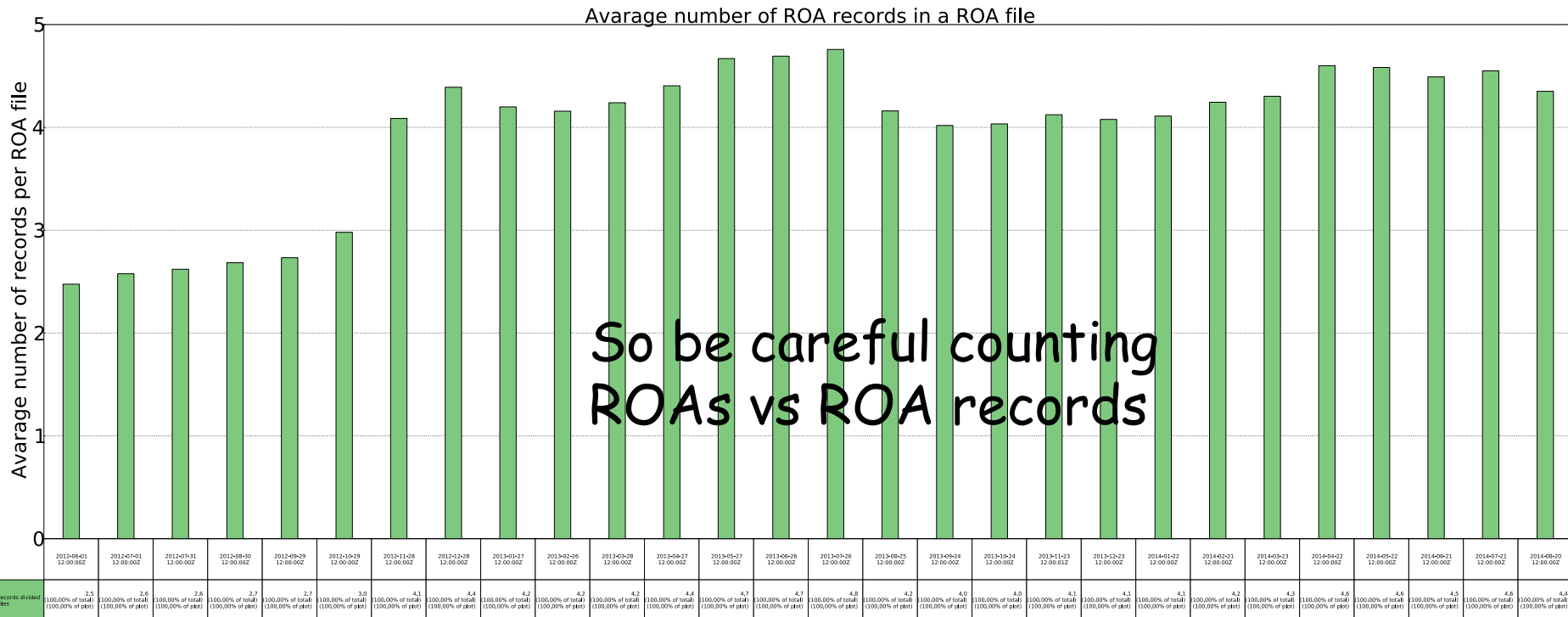
DataSets

- 2.5 Years of RPKI captured hourly
- Except for ARIN because they're nuts (started doing it anyway this year)
- Route Views (from LINX and others), so multiple paths for a prefix
- ESnet validating router traffic capture

ROAd Prefixes

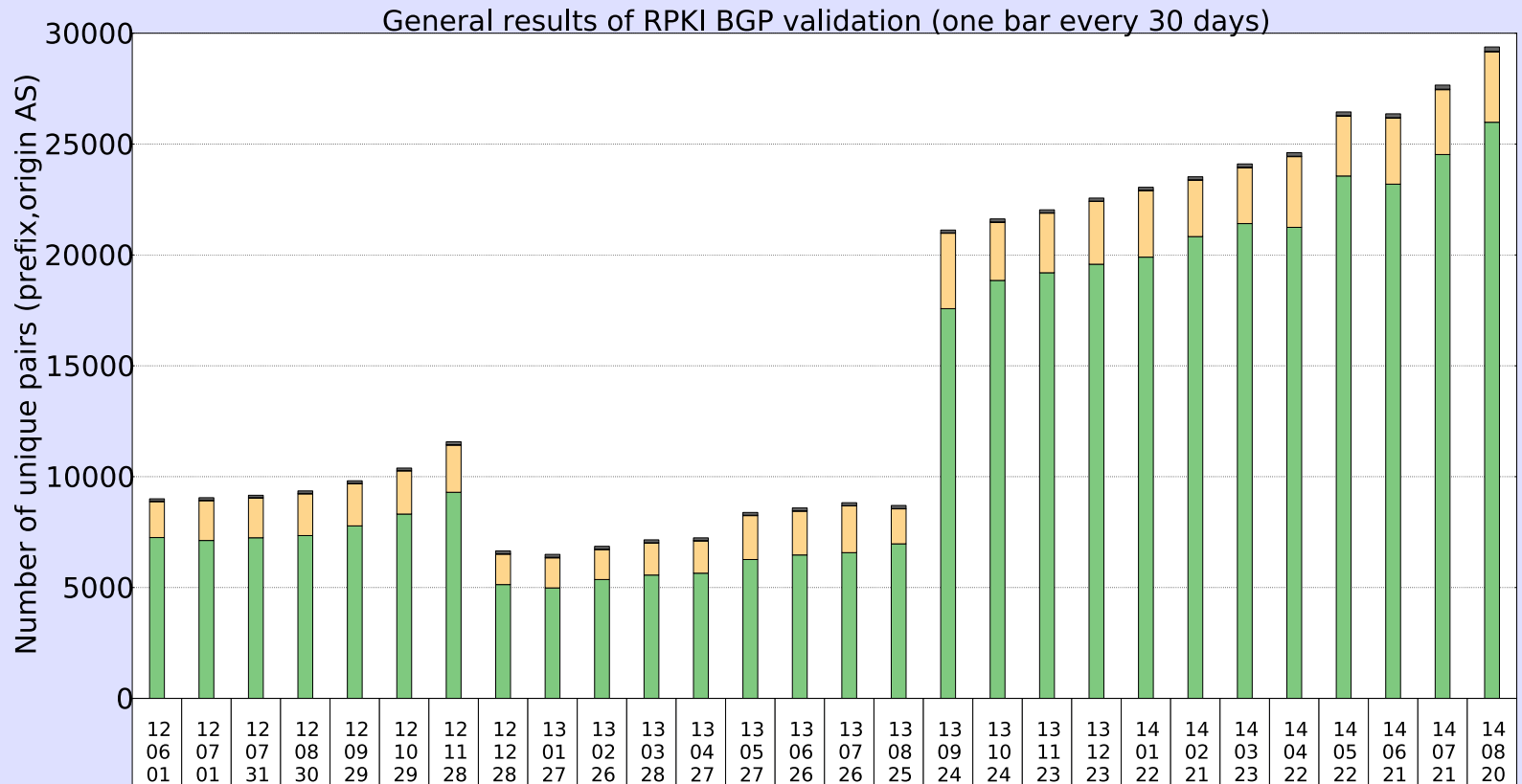


ROAs / File



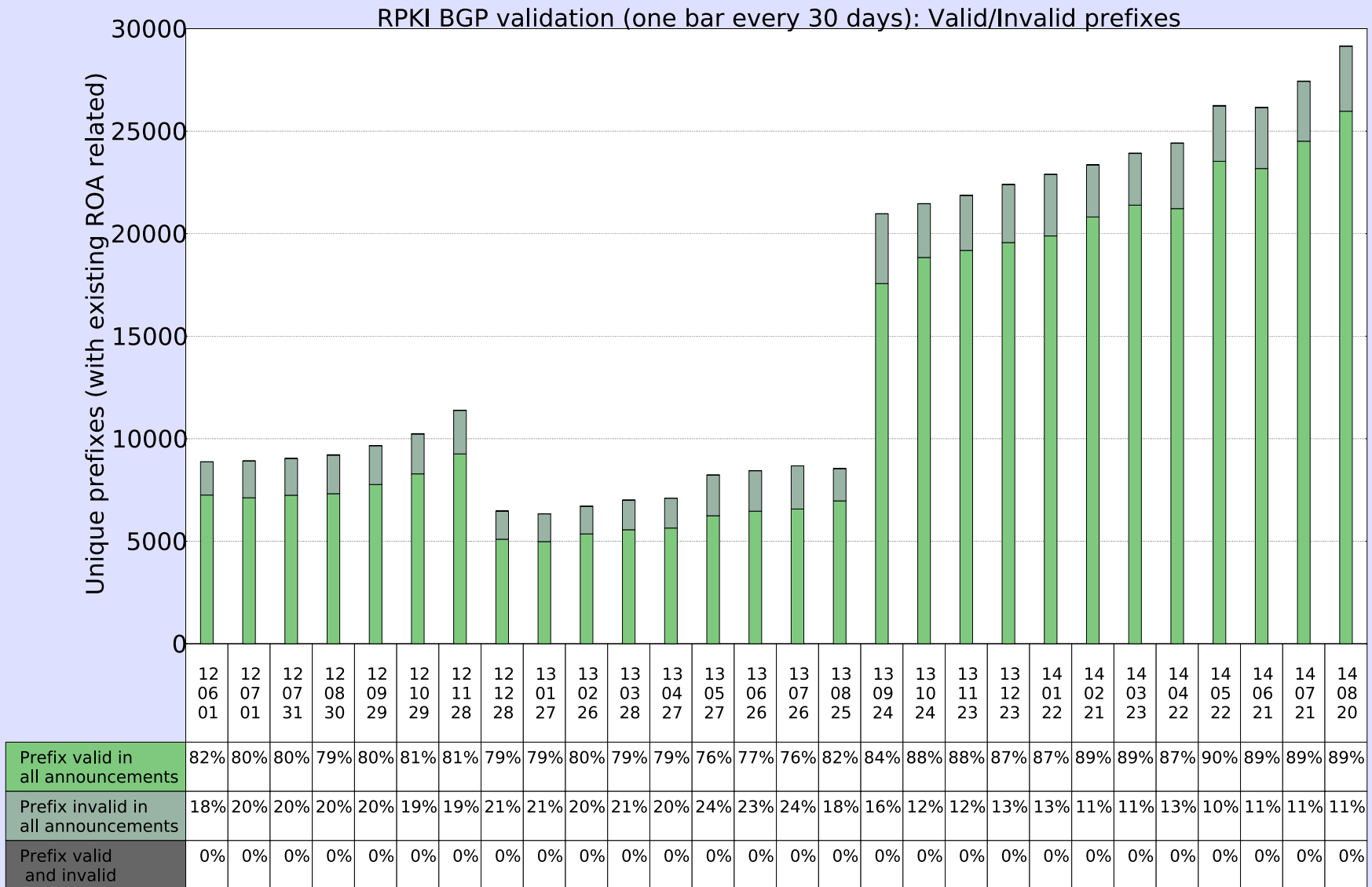
I personally think this is bad practice.
One wants to control each separately.

Raw RPKI Validation

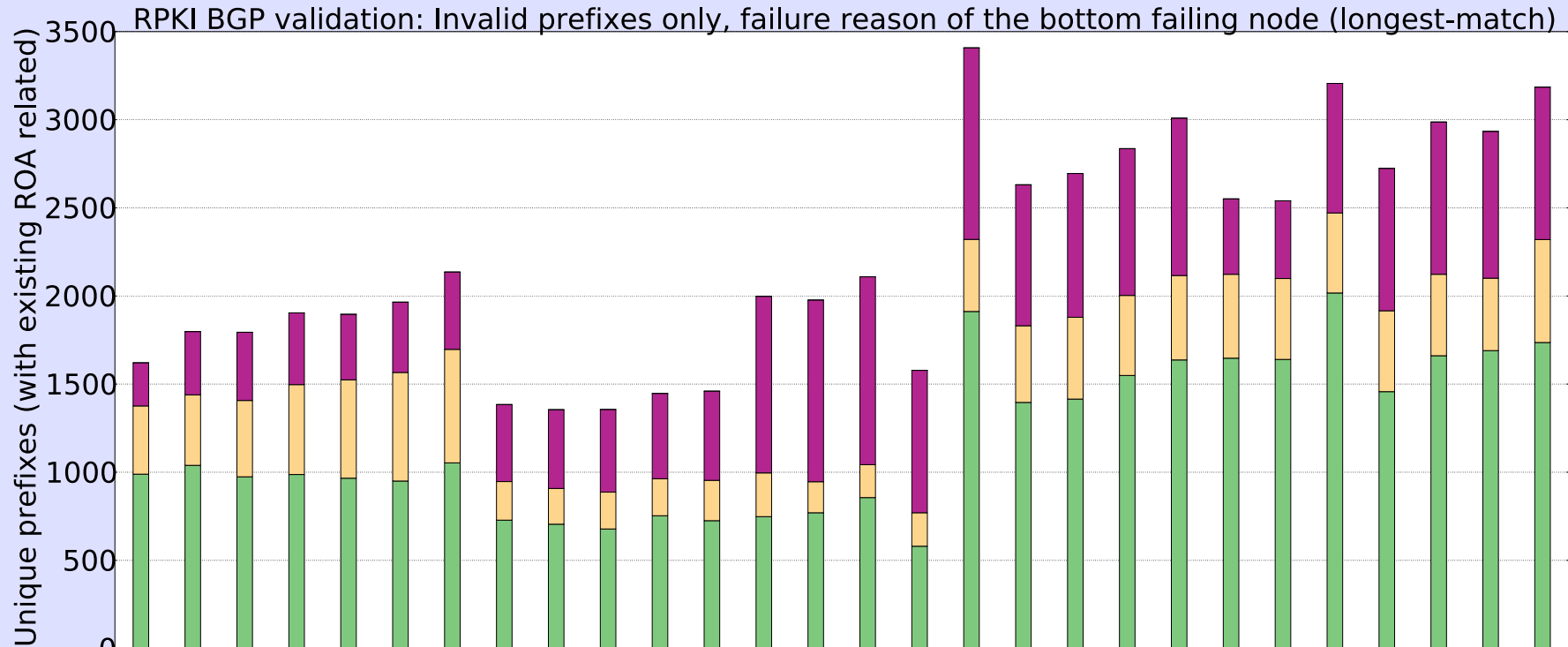


Validation successful	81%	79%	79%	78%	79%	80%	80%	77%	77%	78%	78%	78%	75%	75%	74%	80%	83%	87%	87%	87%	86%	89%	89%	86%	89%	88%	89%	88%
Validation failed	18%	20%	20%	20%	19%	19%	18%	21%	21%	20%	20%	20%	24%	23%	24%	18%	16%	12%	12%	13%	13%	11%	10%	13%	10%	11%	11%	11%
AS_TRANS found	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
AS_SET found	1%	1%	1%	1%	1%	1%	1%	2%	2%	2%	2%	2%	2%	2%	1%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%

Effective Validation

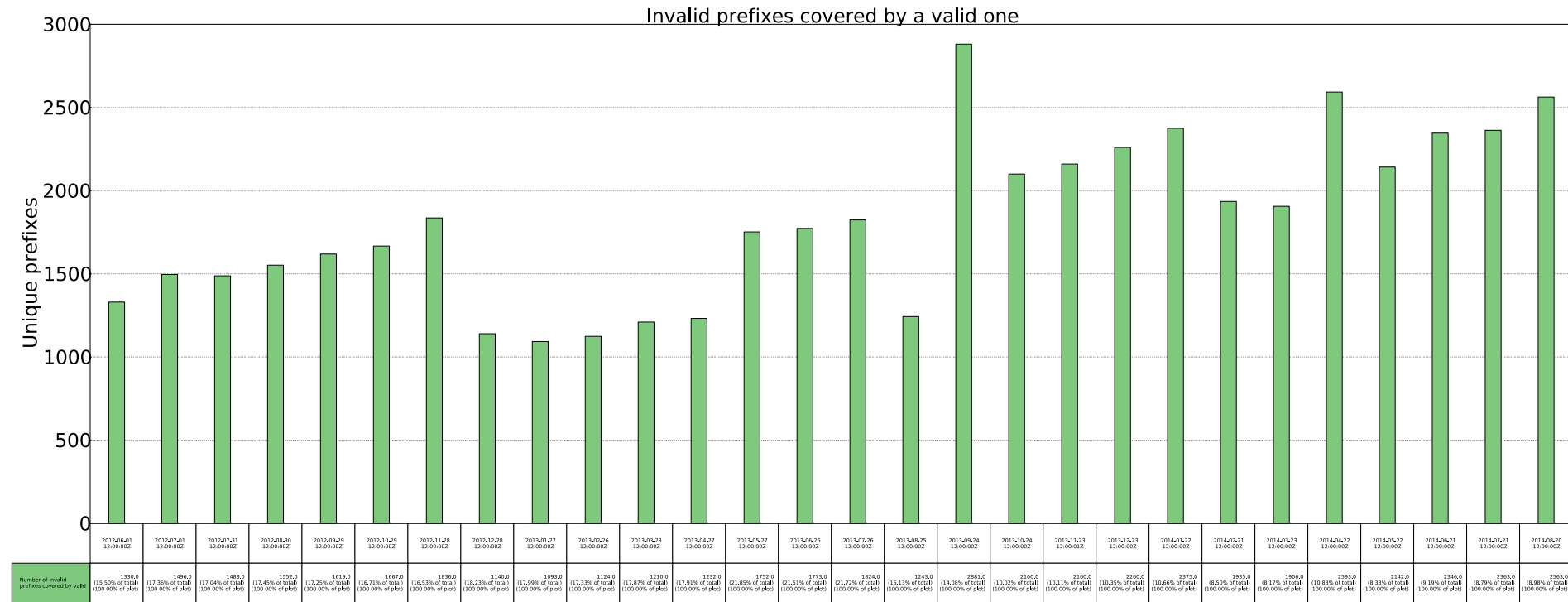


Longest Match Invalids

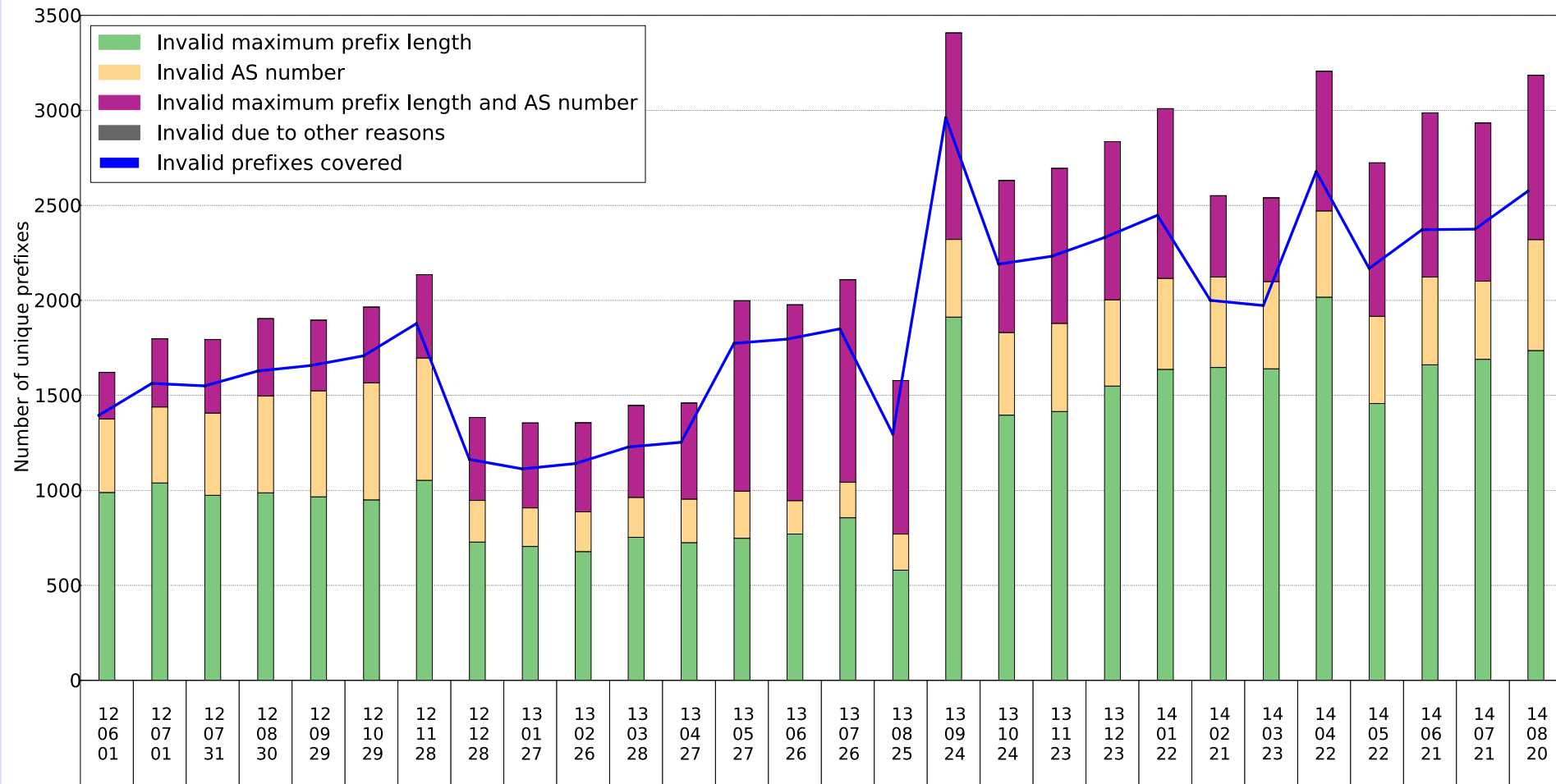


	12 06 01	12 07 01	12 07 31	12 08 30	12 09 29	12 10 29	12 11 28	12 12 28	13 01 27	13 02 26	13 03 28	13 04 27	13 05 27	13 06 26	13 07 26	13 08 25	13 09 24	13 10 24	13 11 23	13 12 23	14 01 22	14 02 21	14 03 23	14 04 22	14 05 22	14 06 21	14 07 21	14 08 20
Invalid maxlength	61%	58%	54%	52%	51%	48%	49%	53%	52%	50%	52%	50%	37%	39%	41%	37%	56%	53%	53%	55%	54%	65%	65%	63%	53%	56%	58%	55%
Invalid ASN	24%	22%	24%	27%	29%	31%	30%	16%	15%	15%	15%	16%	12%	9%	9%	12%	12%	17%	17%	16%	16%	19%	18%	14%	17%	15%	14%	18%
Invalid maxlength and ASN	15%	20%	22%	21%	20%	20%	21%	32%	33%	35%	33%	35%	50%	52%	51%	51%	32%	30%	30%	29%	30%	17%	17%	23%	30%	29%	28%	27%

Invalid Covered by Valid

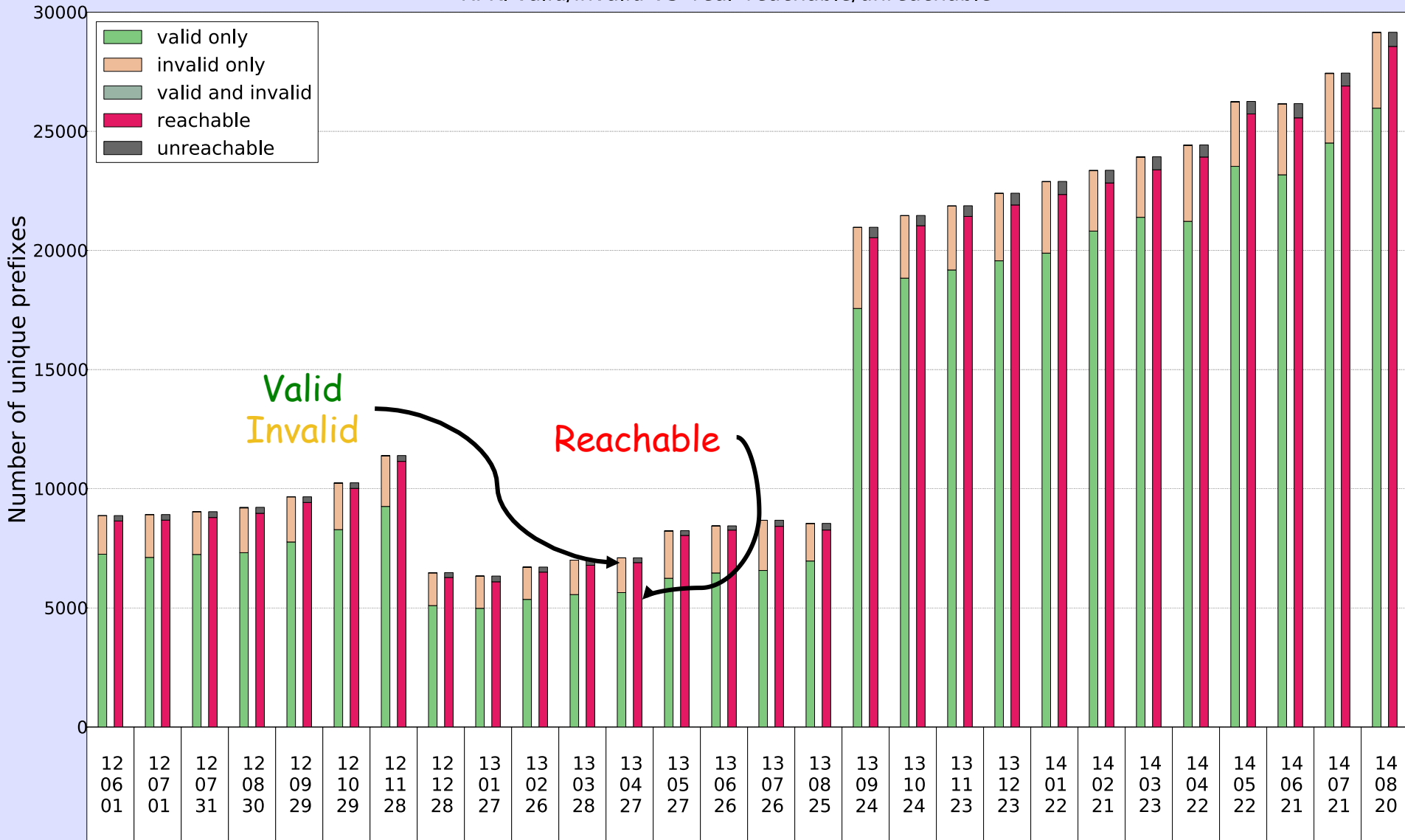


Packets Get There Anyway



Reachable Anyway

RPKI valid/invalid VS 'real' reachable/unreachable



83.23% of “both
maximum length and AS
number” invalid prefixes
contain the ‘correct’ AS
on the AS path

I.e. allocation from upstream has ROA but multi-homed child does not

Shame on us, the ISPs

There are very few
actual 'bad' ROAs
resulting in True
Invalids

There are ROAs with
MaxLen 16 and the ISP
announces 24s

Shame on those ISPs

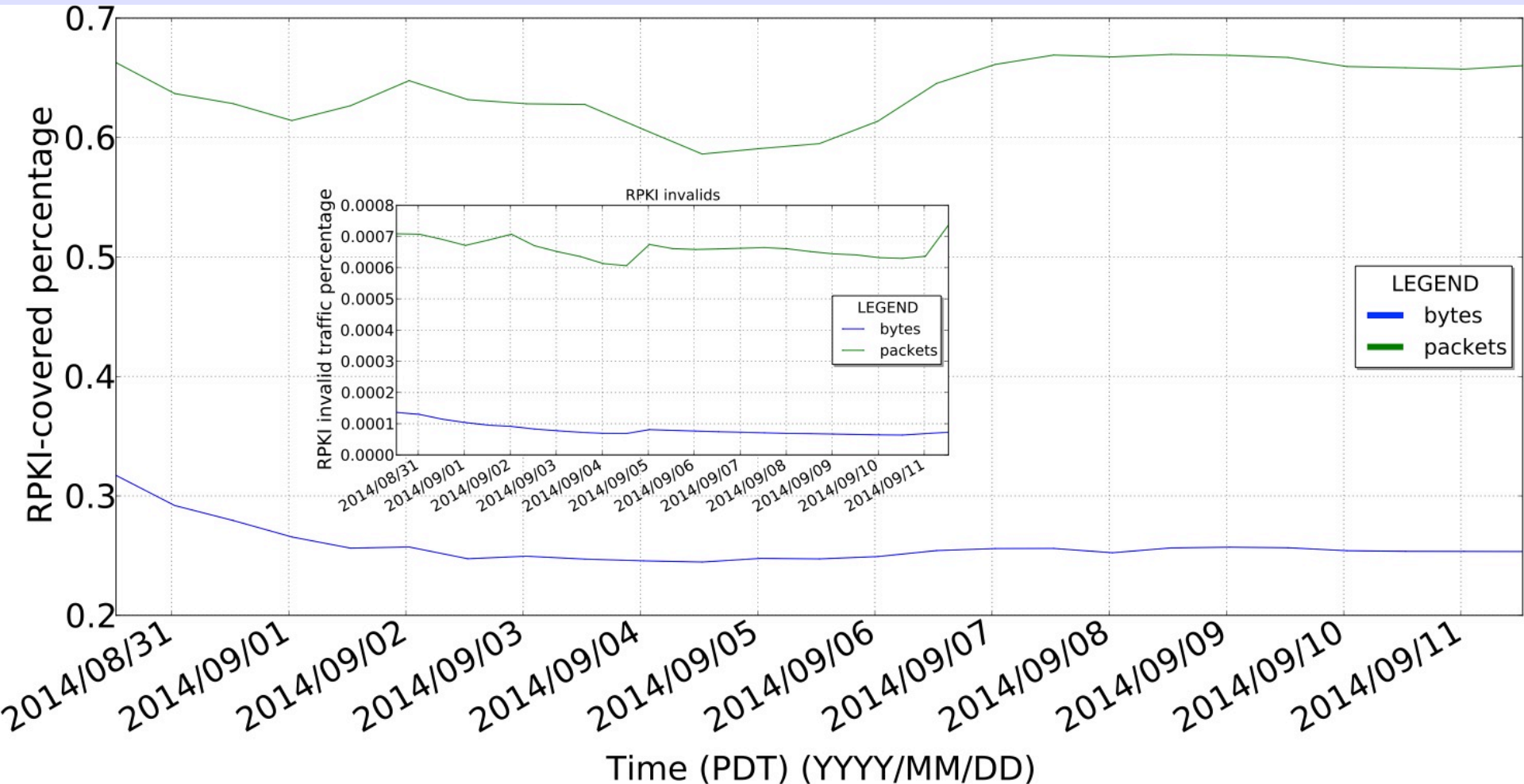
Shame on RIRs for not
whacking their registrants

Serious operational
problems at the CAs

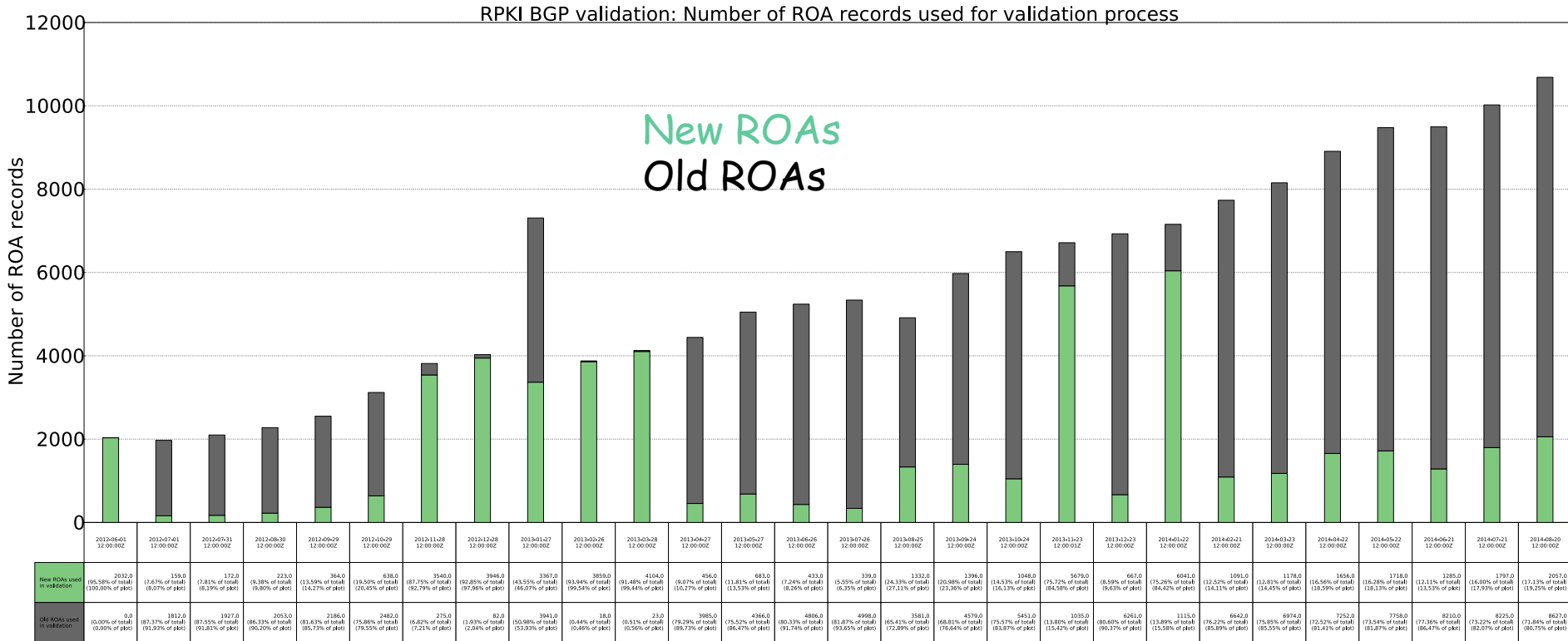
Shame on the RIRs

Let's Look at a Router

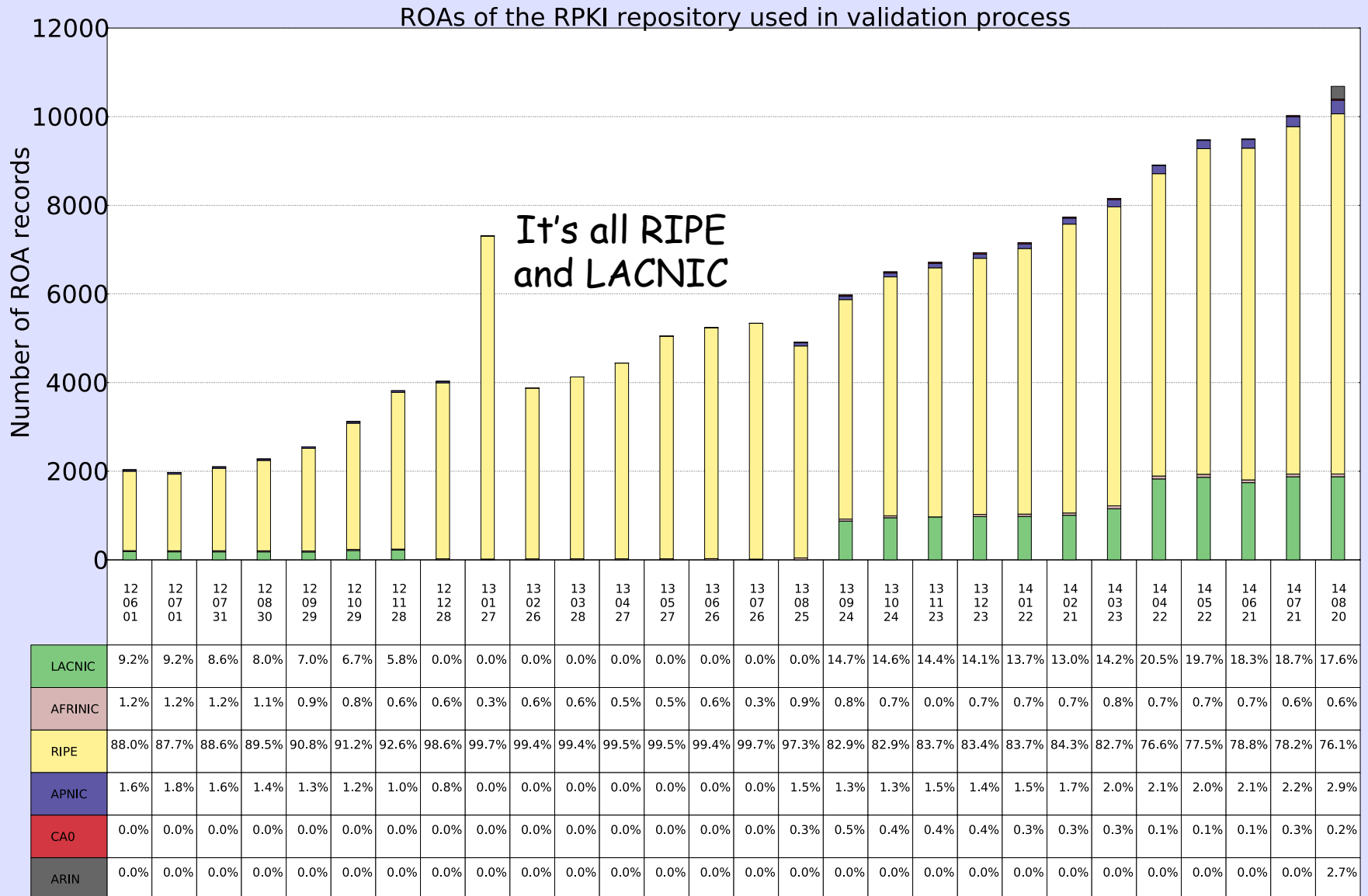
Packets at ESnet



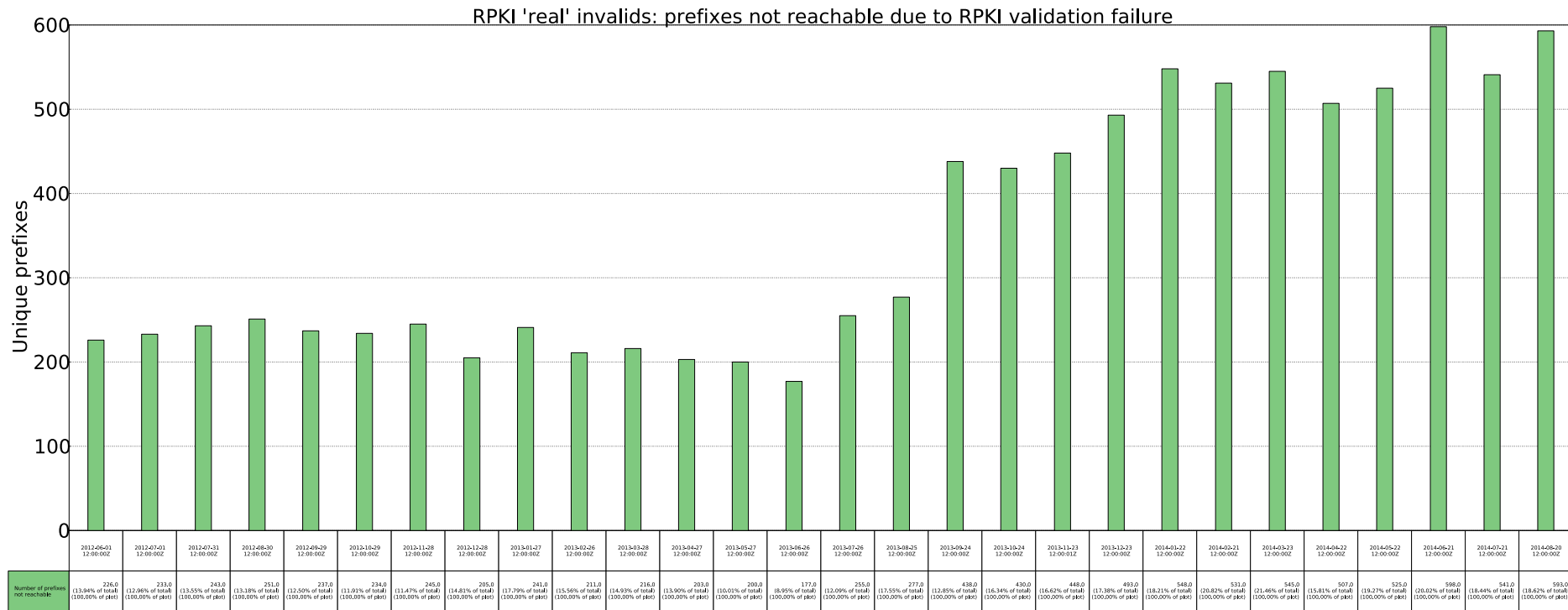
ROAs Used to Validate



ROAs Used per CA



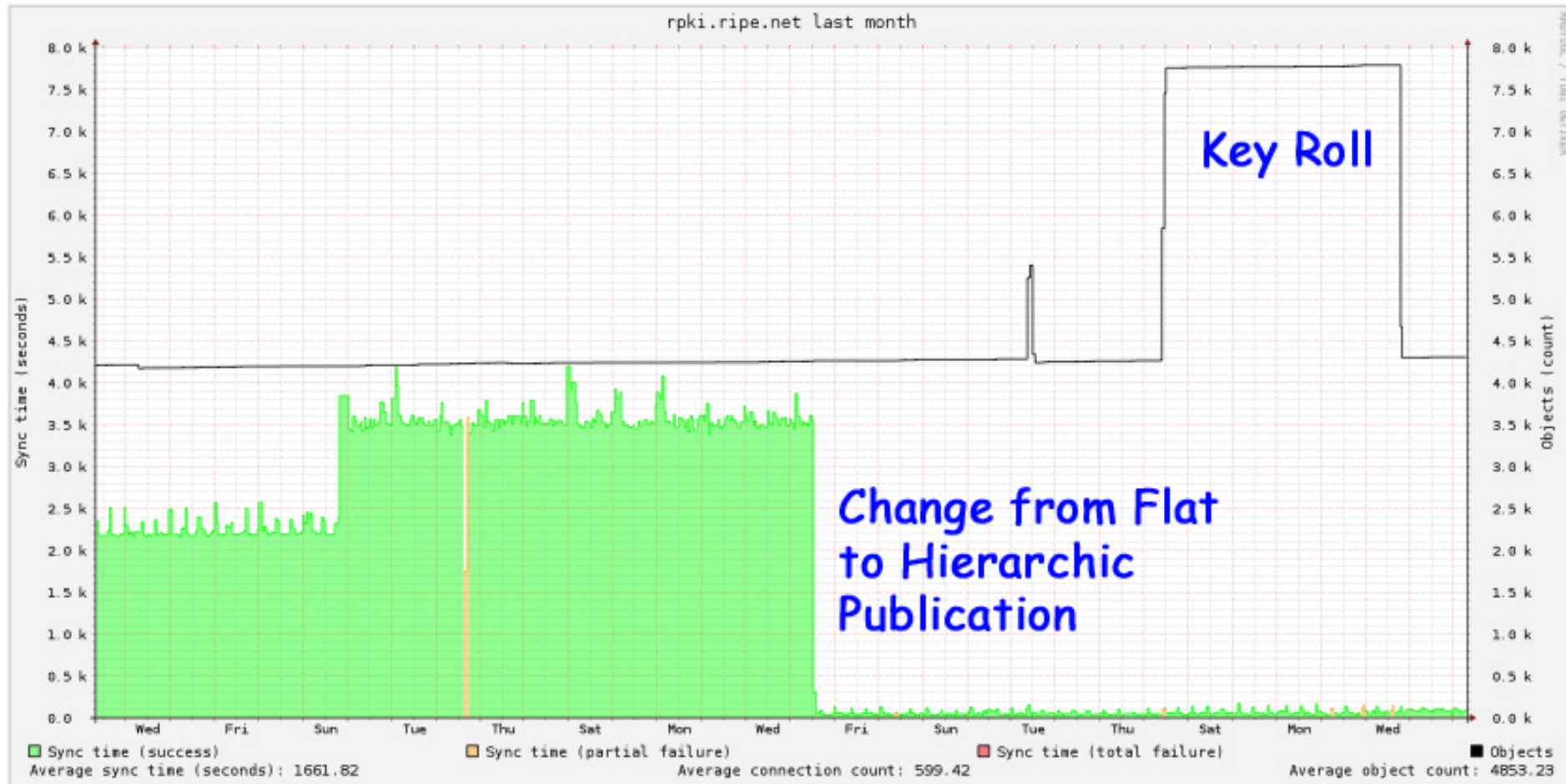
Real Invalids



Hierarchic Publication

rpki.ripe.net over last month 2012-11-09T07:05:58Z

Overview Repositories Problems All Details



The Blame?

- RIPE NCC has 1542 invalid announcements, 846 of them are caused by just 10 ISPs.
- Biggest offender might seem fr.sfr with 420 of them (e.g. <http://localcert.ripe.net:8088/bgp-preview?q=77.128.0.0/11>) but they say this is intentional. They actually **want** all the traffic to go to AS15557, so be careful drawing conclusions.

The RPKI is Out There

More widely deployed than
IPv6 or DNSsec

Time to clean up our act