Have We Reached 1000 Prefixes Yet?

A snapshot of the global IPv6 routing table

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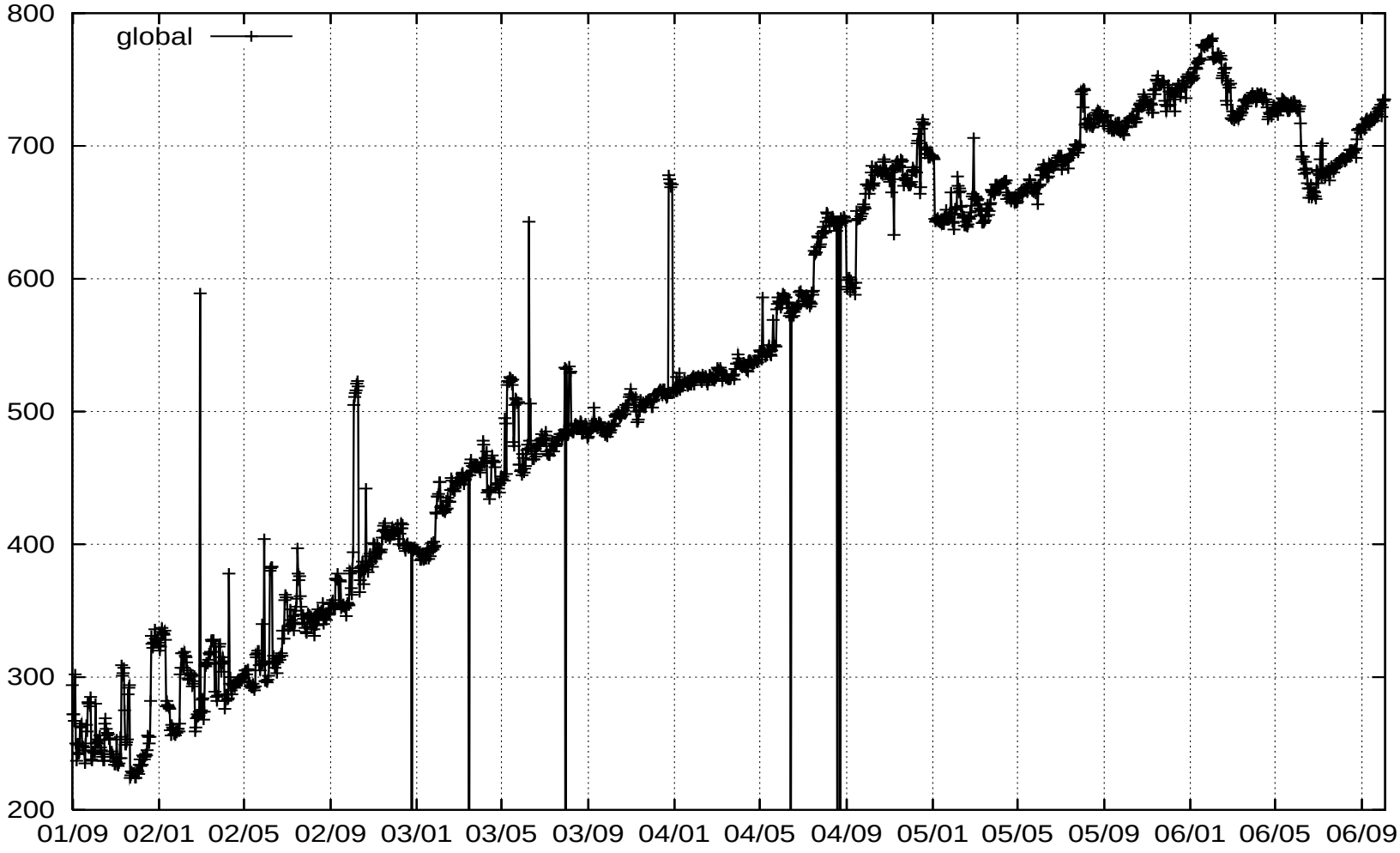
Overview

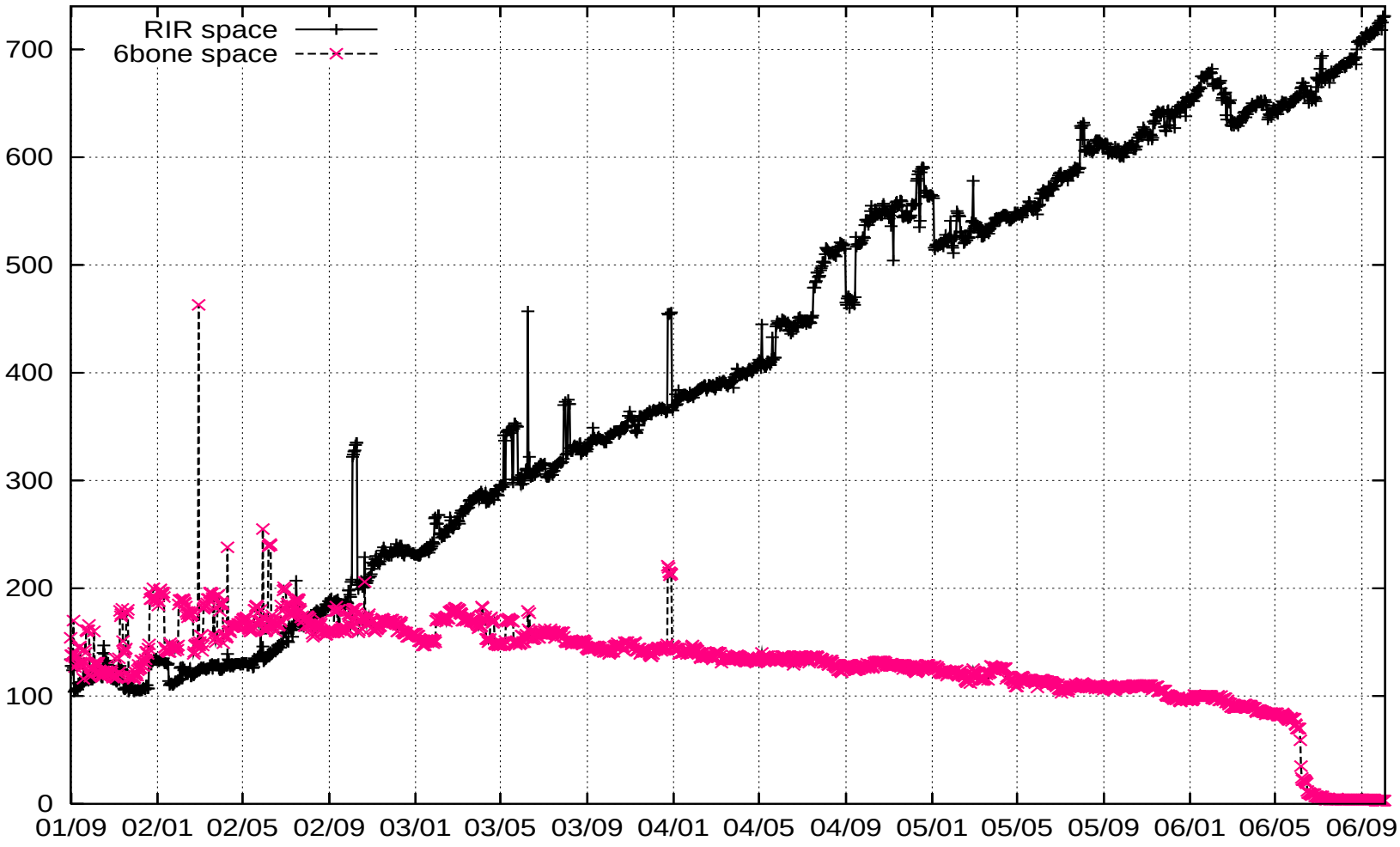
- pictures & trends
- the end of the 6bone
- numbers...
- references

Slides online at: http://www.space.net/~gert/RIPE/R53-v6-table/

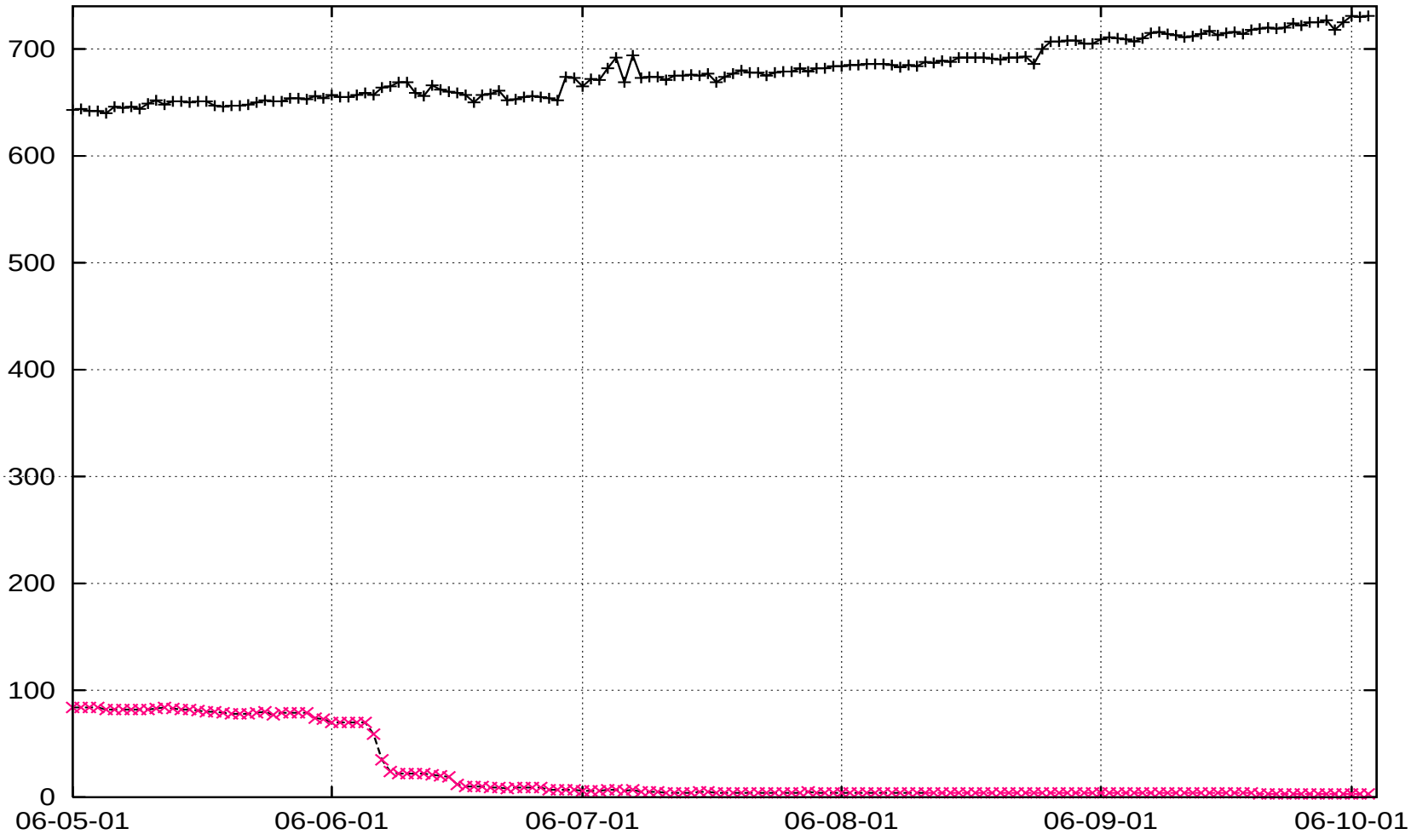
Graphics: Total Prefixes - 5 years



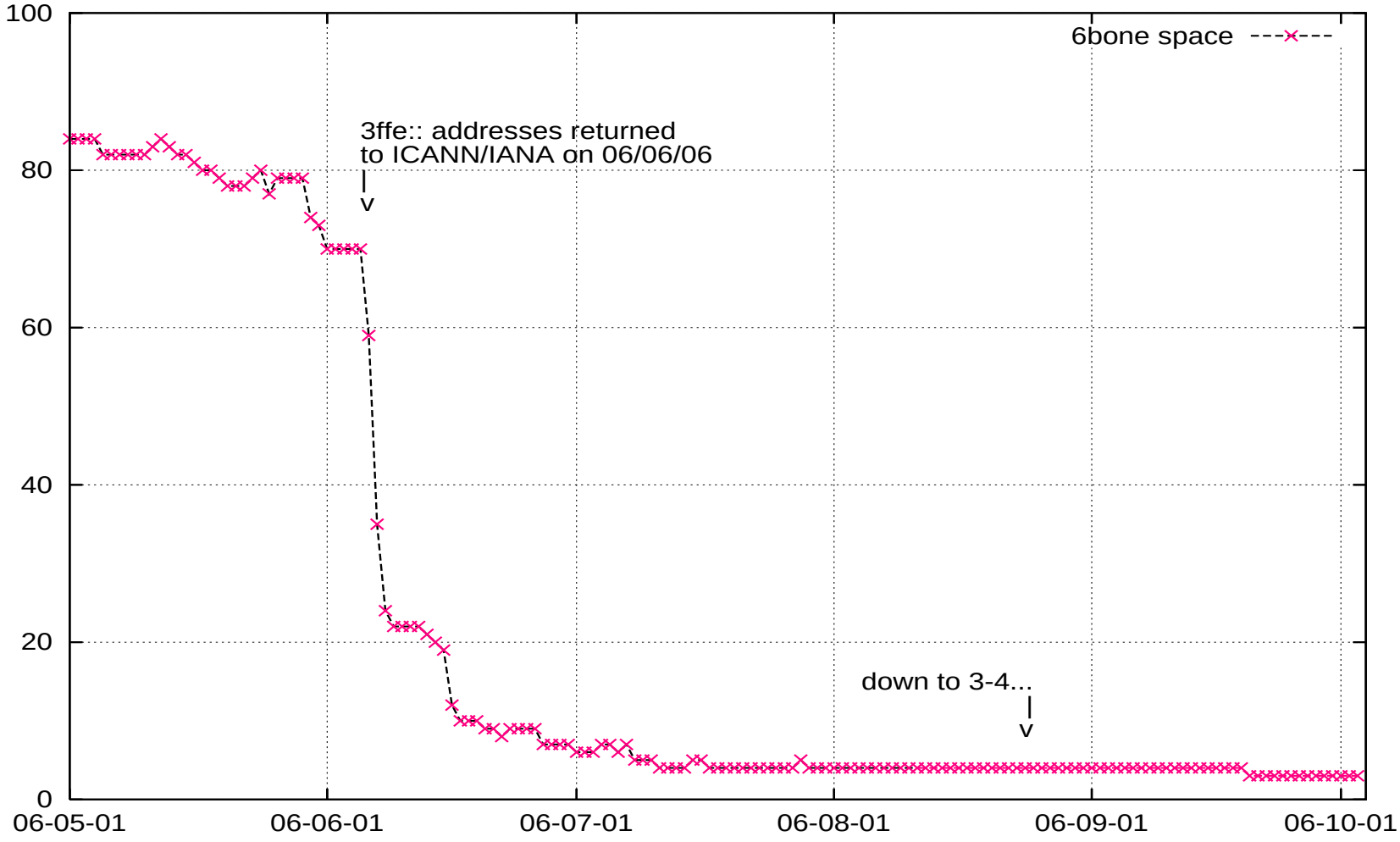
Graphics: RIR vs. 6Bone Prefixes - 5 years



Graphics: RIR vs. 6Bone Prefixes - 5 months



Graphics: The End Of The 6bone



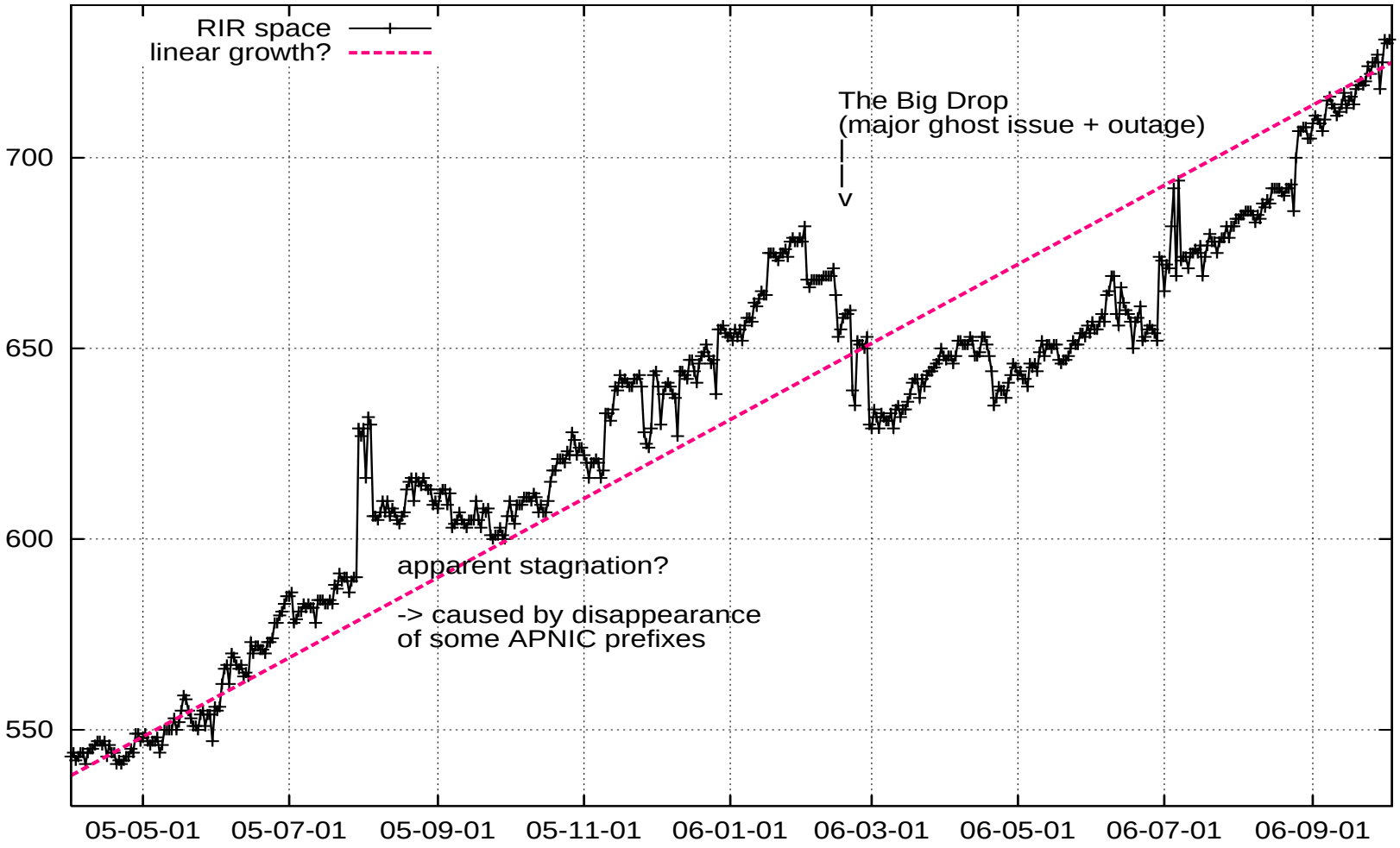
The End Of The 6bone

- on 06/06/06, the 3FFE addresses allocated to the 6Bone test network have been returned to ICANN/IANA (rfc3701)
- this means: there are no official address holders from 3FFE anymore, anybody still announcing space is an address highjacker

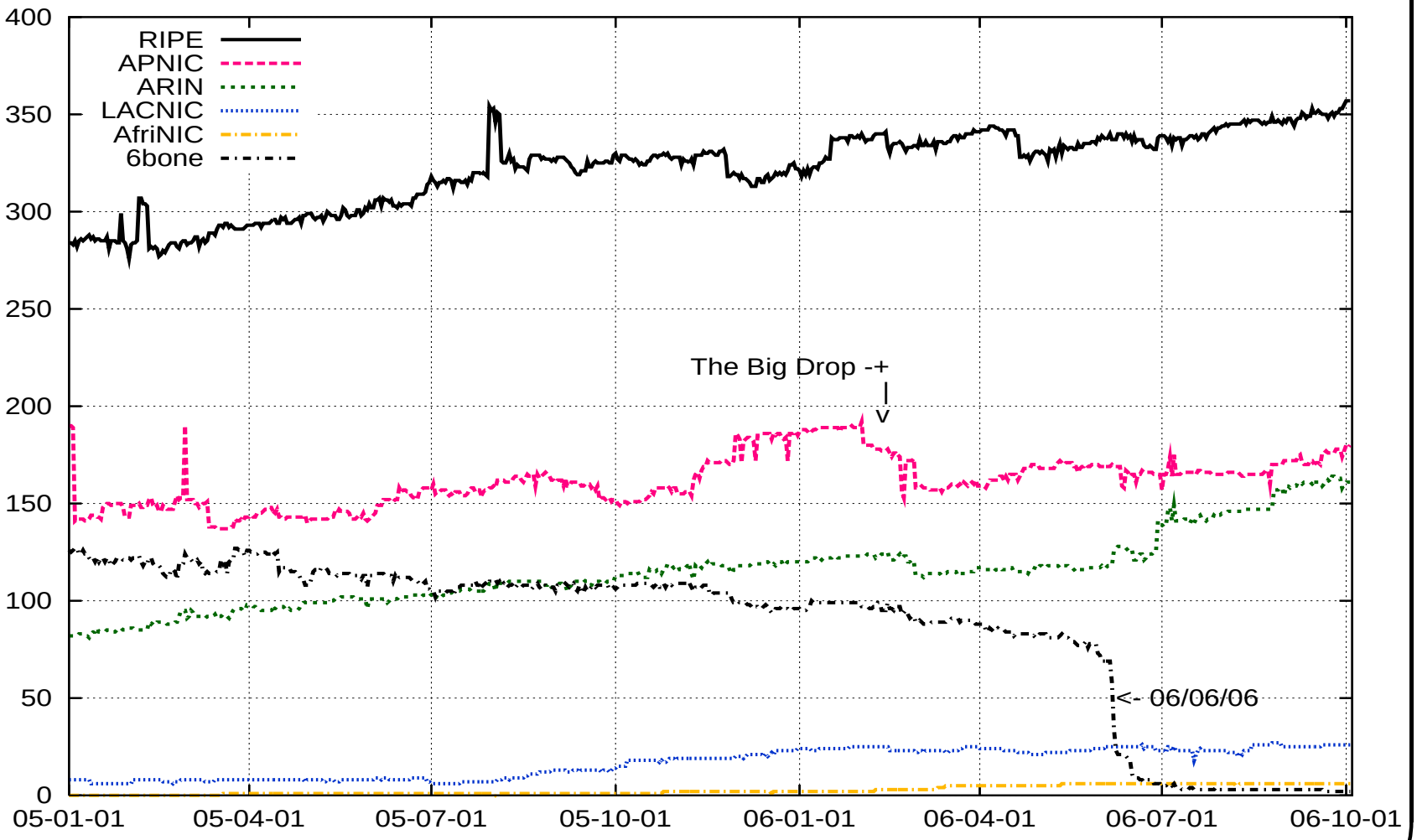
```
*  3FFE::/24          2001:470:1FFF:2::     6939 6939 4555 i
*  3FFE:800::/24      2001:470:1FFF:2::     6939 6939 4555 i
*  3FFE:8110::/28     2001:7F8::CB9:0:1     3257 8954 i
```

- this does NOT mean
  - "the end of the IPv6 Internet!"
  - "early IPv6 networks will be disconnected!"
- but: please stop using 3FFE transfer networks
- please *STOP* giving transit to 3FFE announcements!

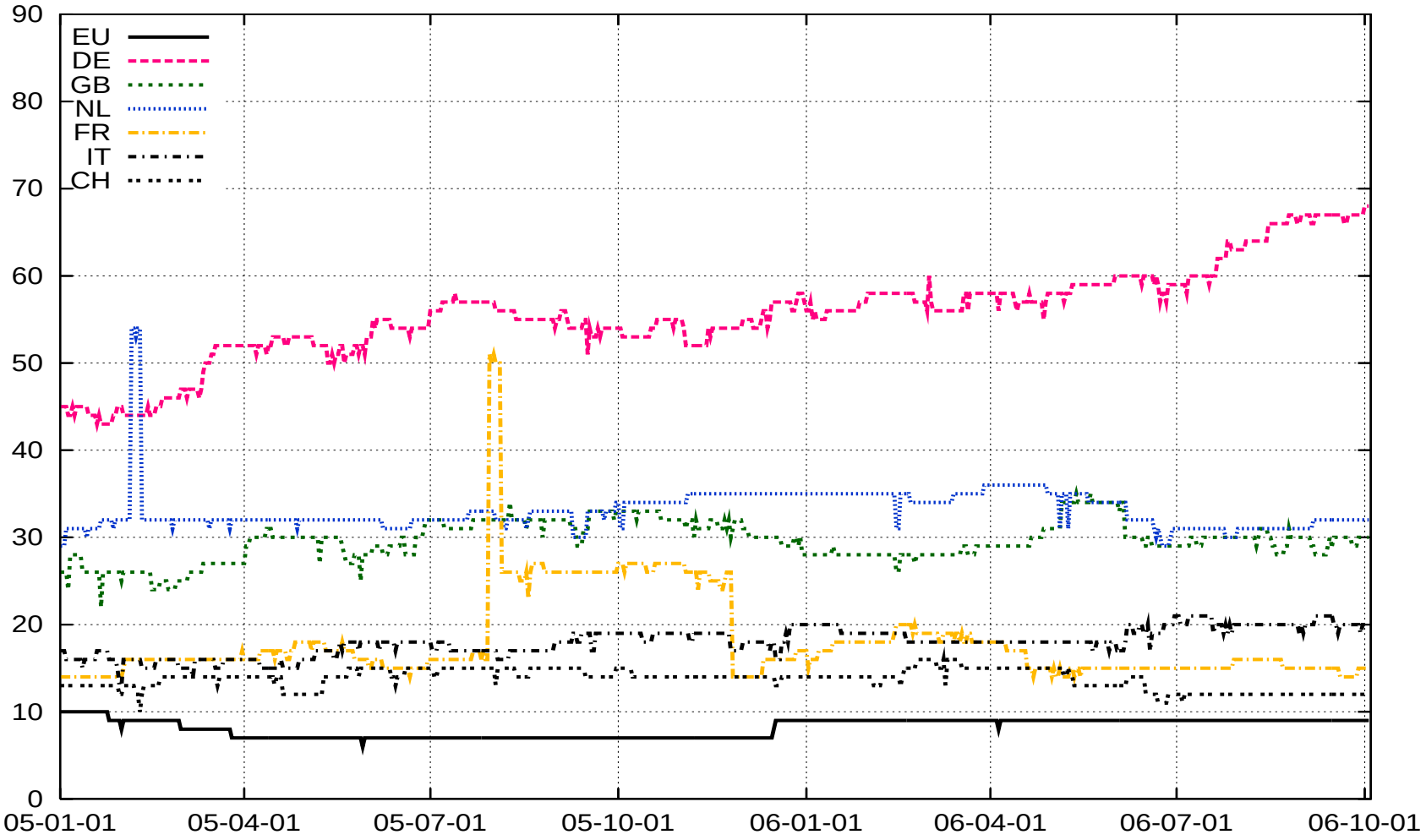
Graphics: trends? (RIR prefixes, 18 months)



Graphics: prefixes by RIR region



Graphics: prefixes by country (RIPE)



Numbers - AS numbers

- as of 2006/10/02: 629 unique AS numbers visible (04/24: 589)
  - 426 origin-only ASes (no transit paths seen) (391)
  - 179 ASes originate & give transit (182)
  - 24 transit-only ASes (e.g. 57, 2153, 5549, 6667, . . .) (16)
- mixture of RIR (2xxx::) and 6Bone (3ffe::*) space announced
  - 536 ASes originate 1 RIR prefix (447)
  - 0 ASes originate 1 6Bone prefix (25)
  - 1 AS originates 1 6Bone + 1 RIR prefix (41)
  - 41 ASes originate 2 RIR prefixes (4 due to /32+/35)
  - 27 ASes with “more than that”, maximum is 15 prefixes
- 4 ASes still announce their prefix as /32 and /35
- note: all paths observed from AS5539

ASes - why are people announcing 2+ prefixes

- 6bone to RIR migration: 1 6bone, 1 RIR prefix, *history!*

```
2001:420::/35          109 i
3FFE:C00::/24          109 i
```

- /35 to /32 migration: 2 RIR prefixes, *temporary*

```
2001:420::/35          109 i
2001:420::/32          109 i
```

- Traffic Engineering? Internal aggregation leaking out?

```
2001:48D0::/35          3549 11537 2153 195 i
2001:48D0::/34          3549 11537 2153 195 i
2001:48D0::/33          3549 11537 2153 195 i
2001:48D0::/32          3549 11537 2153 195 i
2001:48D0:2000::/35     3549 11537 2153 195 i
2001:48D0:4000::/35     3549 11537 2153 195 i
2001:48D0:4000::/34     3549 11537 2153 195 i
2001:48D0:8000::/35     3549 11537 2153 195 i
2001:48D0:8000::/34     3549 11537 2153 195 i
2001:48D0:8000::/33     3549 11537 2153 195 i
```

- mergers and acquisitions, business units, growth, ...

```
2001:360::/32          1221 i
2001:8000::/20         1221 i
```

Numbers - Prefixes

As of 2006/10/02: 734 prefixes in total (2006/04/24: 724)

/n	global	RIR space	6bone	6to4	(2006/04/24)
/16	1	0	0	1	(1 0 0 1)
/19-21	6	6	0	0	(6 6 0 0)
/24	3	1	2	0	(30 0 30 0)
/25-/27	3	3	0	0	(1 1 0 0)
/28	2	1	1	0	(22 1 21 0)
/29-/30	3	3	0	0	(3 3 0 0)
/32	567	567	0	0	(538 513 25 0)
/33-/34	10	10	0	0	(4 4 0 0)
/35	30	30	0	0	(24 24 0 0)
/36-/39	3	3	0	0	(1 1 0 0)
/40	9	9	0	0	(6 5 1 0)
/41-/47	5	5	0	0	(3 3 0 0)
/48	86	86	0	0	(84 77 7 0)
/52-/60	1	1	0	0	(1 1 0 0)
/64	5	5	0	0	(0 0 0 0)
/65-/128	0	0	0	0	(0 0 0 0)

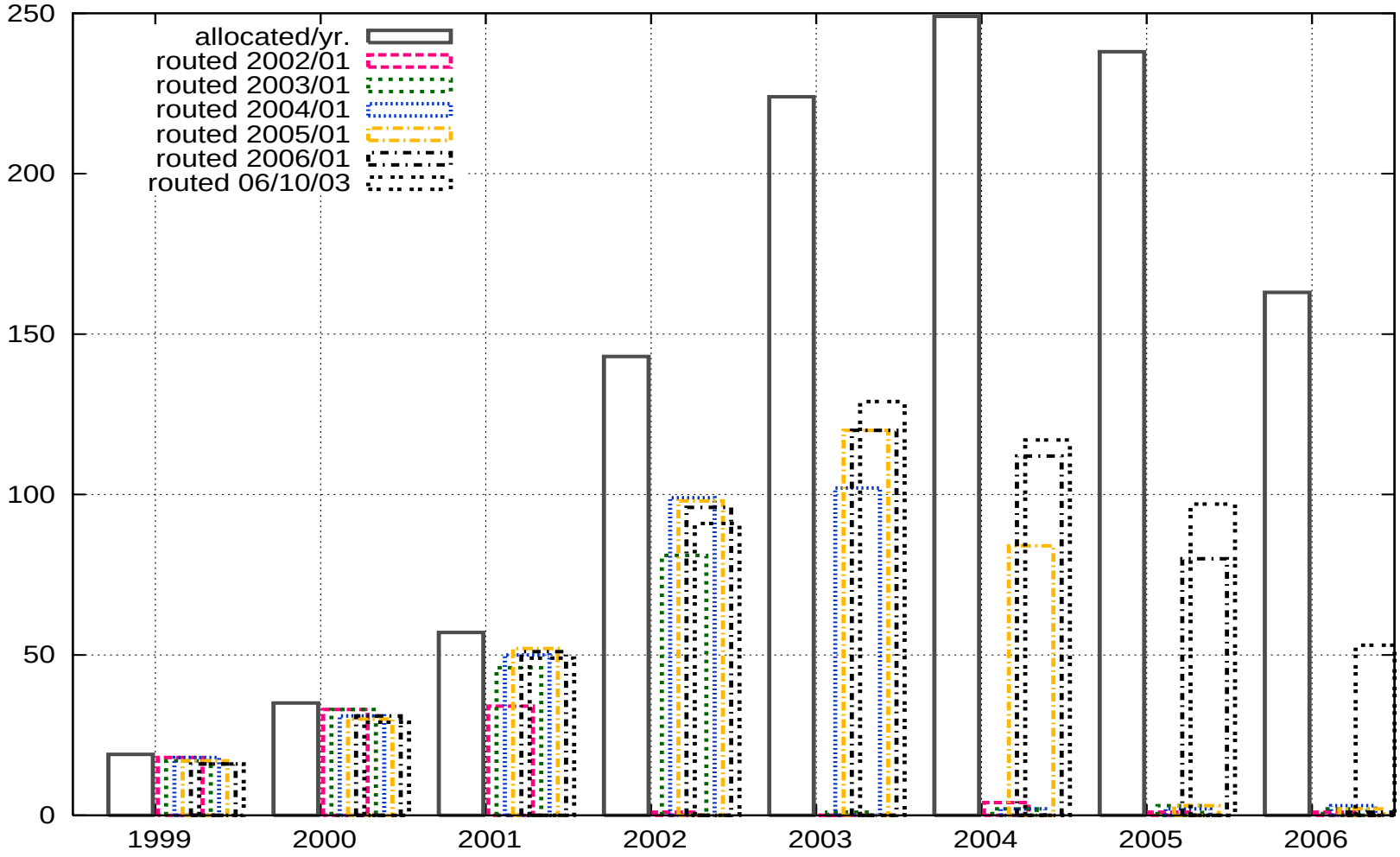
Numbers: RIRs, Allocations, ...

- On 2006/10/03, 1144 LIR blocks (2000::/4) allocated by RIRs:

RIR	alloc.	members	perc.	on 2006/04/24
ARIN	212	~ 2565	8.3%	198 (+7%)
APNIC	263	~ 2143	12.3%	249 (+6%)
RIPE	583	~ 4471	13.0%	547 (+7%)
LACNIC	63	~ 564	11.2%	51 (+24%)
AfriNIC	23	~ 350	6.6%	11 (+109%)

- note: not counting /48 microallocs and /35⇒/32 extentions
- actual *percentage* with IPv6 similar among regions
- 489 (R52: 437) allocations visible in routing table (*only 42%!*)

Graphics: Allocated vs. Routed



Numbers: RIRs: notable allocations (1)

- more "very large" allocations seen:
  - 2404:0e0::/28 MCI Asia Ptr, AP (2006/05/10)
  - 2404:180::/28 Samsung Networks, KR (2006/08/28)
  - 2610:080::/29 RCN Corporation, US (2006/06/02)
  - 2a01:110::/31 Microsoft, GB* (2006/06/01)
  - 2a01:2000::/20 Telecom Italia, IT (2006/05/16)
- first IPv6 PI networks assigned by ARIN:
  - 2620::/48 U.S. Securities & Exchange C. (2006/09/13)
  - 2620:0:10::/48 S. D. Warren Services (2006/09/13)
  - 2620:0:20::/48 CollabNet (2006/09/13)
  - 2620:0:30::/48 Tellme Networks (2006/09/14)
  - 2620:0:40::/48 YouTube, Inc. (2006/09/19)
  - 2620:0:50::/48 Univ. of Texas at Austin (2006/09/21)
- expect DNS anycast assignments from RIPE (2001:678::/29)
- $\Rightarrow$ **check your BGP filters!!**

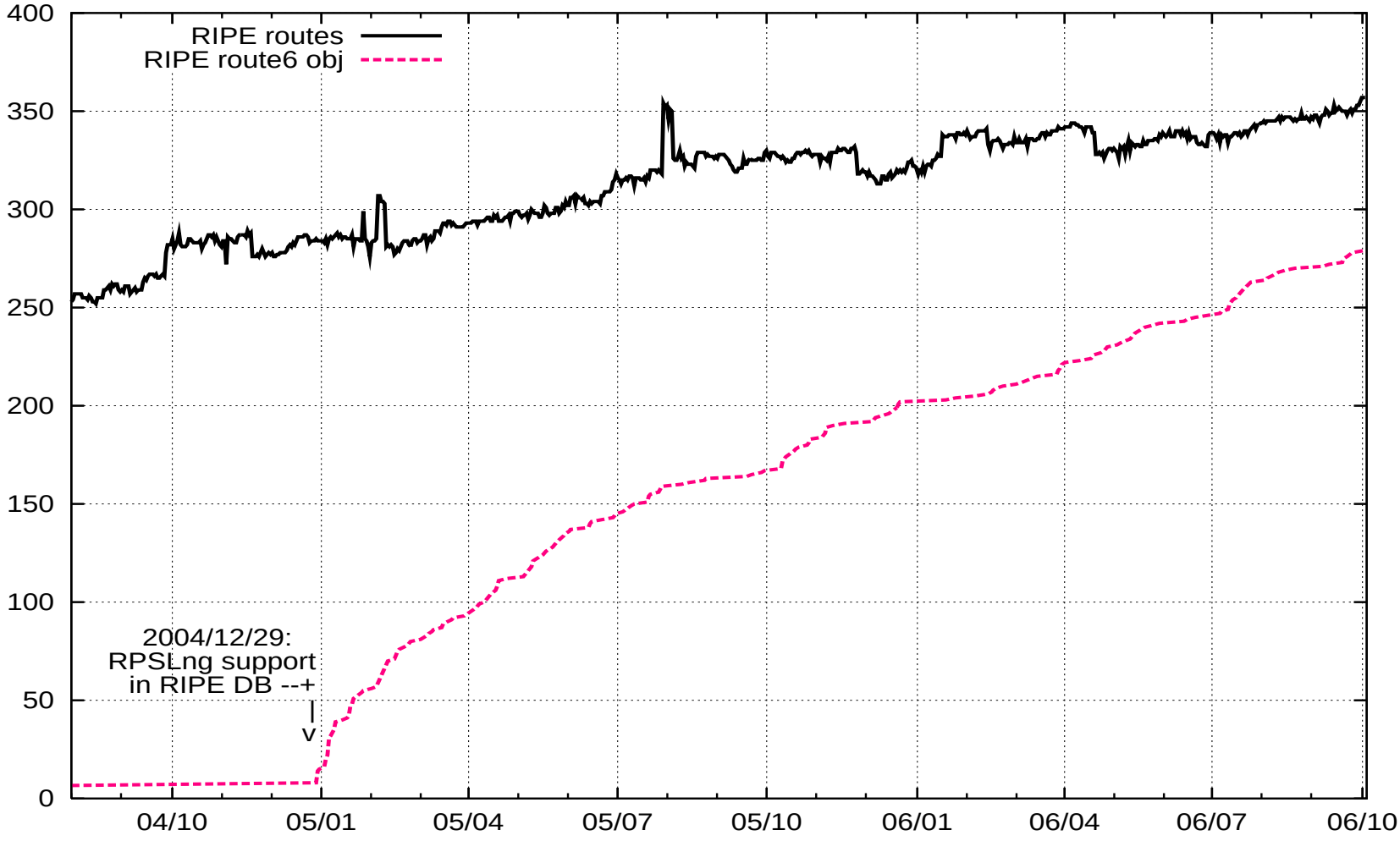
Numbers: RIRs: notable allocations (2)

- Allocations ICANN ⇒ RIRs since RIPE 52

Prefix	RIR	Date	Comment
2620:0000::/23	ARIN	12 Sep 06	

- http://www.iana.org/assignments/ipv6-unicast-address-assignments
- new global IPv6 distribution policy has been ratified by ICANN ⇒ expect /12 allocations to RIRs “real soon now”

Graphics: route6 objects vs. routes seen



route6 object example

- it's as easy as this...

```
route6:         2001:608::/32
descr:          DE-SPACE-2001-0608
descr:          SpaceNET AG, Munich
origin:         AS5539
notify:         noc@space.net
mnt-by:         SPACENET-N
changed:        gert@space.net 20041230
source:         RIPE
```

- strongly recommended, helps upstream/peer ASes build decent BGP filters, based on IRR data

References

- Ghost Route Hunter: http://www.sixxs.net/tools/grh/
- List of IPv6 blocks allocated by the RIRs:
  http://www.ripe.net/rs/ipv6/stats/index.html
- MIPP (minimum peering policy) project:
  http://ip6.de.easynet.net/ipv6-minimum-peering.txt
- IPv6 sample prefix filter page
  http://www.space.net/~gert/RIPE/ipv6-filters.html
- Slides are available at:
  http://www.space.net/~gert/RIPE/R53-v6-table/

Questions?

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