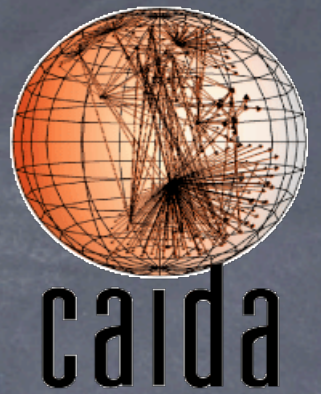




ARIN & CAIDA

IPv6 survey

summary



ARIN XXII meeting
15 October 2008
Los Angeles, VA

our oil crisis: IPv4 exhaustion

- our experiment with consensual treatment of integers has hit a snag: IANA will run out of IPv4 addresses in 'a few' (2-3?) years
 - how do we accommodate continued growth and innovation?
- possible solutions
 - steward transition to IPv6 (w/many hearts, & some .gov.*)
 - steward a market for IPv4 (we vigorously gave up once)
 - steward reclamation of IPv4 (our country 'tis of lawyers)
 - NATs all the way down (guarantees a worse world)
 - magic confluence (what got us ipv4 in the first place)

- Hurricane: bgp.he.net/ipv6-progress-report.cgi
- Arbor study: .002% of customer traffic, growing
- APNIC: bgp, AS, dns, http queries .02-1%
- MRP: mrp.net/IPv6_Survey.html <1%
- CAIDA studies: AScore6 posters, .004% traffic
- Google?

- DREN met OMB deadline June 08 (then disabled6)
 - DOD NIC issues v6 prefixes since July 2008
 - copious notes on what works and doesn't(<http://www.internet2.edu/presentations/jt2008jul/20080722-broersma.pdf>)

measuring IPv6 use: reality

- measurement in this area pretty unsatisfying
 - no rigorous definition of 'use' means
 - no incentive to provide access to data, if it even exists
 - like so many other critical questions about the Internet..

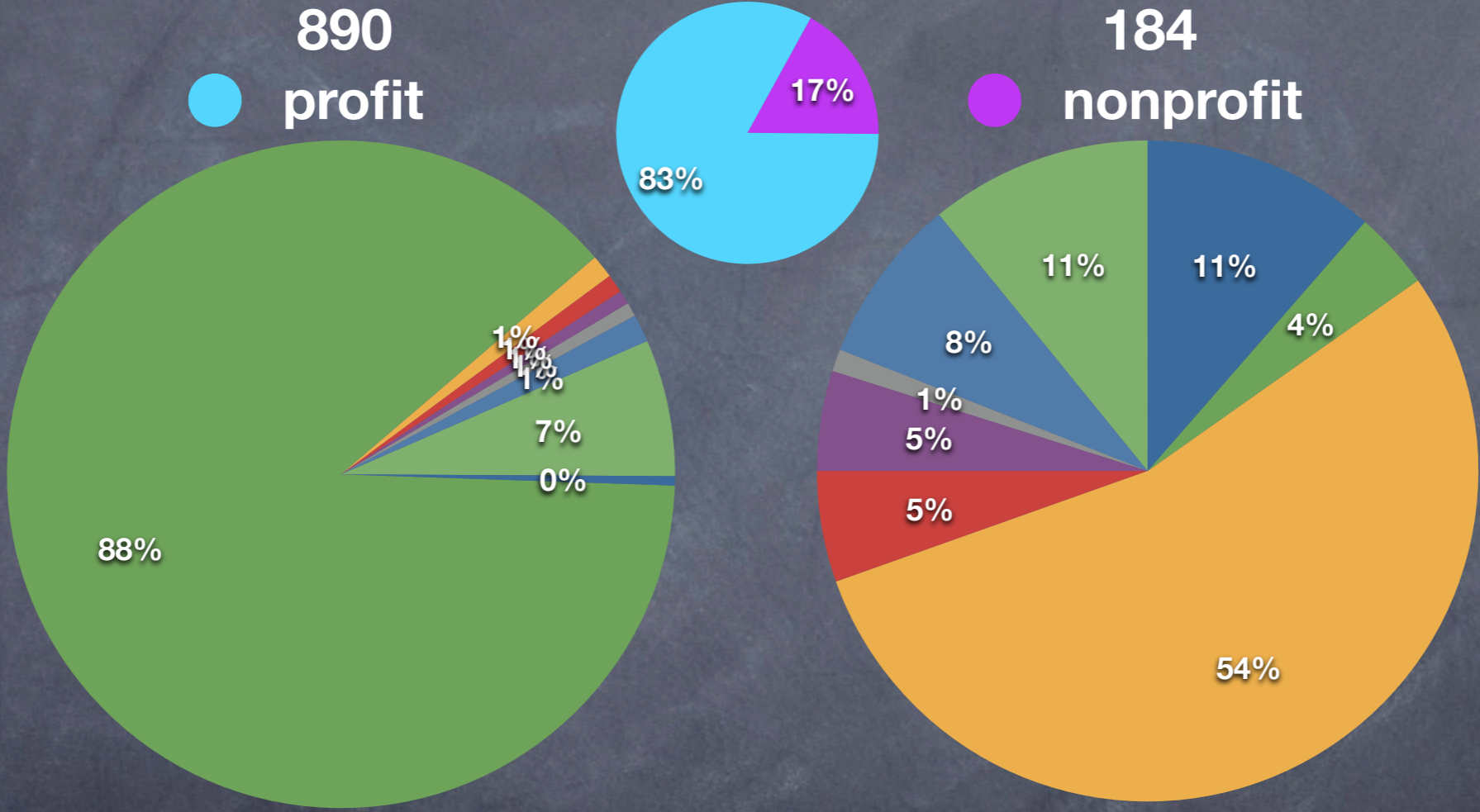
- alternatives to actually measuring use
 - find marginally related data set+liberal assumptions
 - base opinions on trusted ideology
 - hope for the best
 - work on obstacles to actually measuring use

- attempt a “census”: survey through RIR channels
 - March 2008: ARIN region (350)
 - Sept 2008: all regions (1100)
 - start to build some history
- caveats:
 - unknown number respondents per org
 - economic, political and psychological dust on the lens
 - anonymity limits utility
 - survey expanded geographically, so trends may mislead

IPv6 sept 2008 survey results

- respondent demographics
 - organization type, size, RIR used, geography
 - people least conscious of IPv6
- IPv6 penetration as a function of above parameters
- IPv6 motivations, hurdles, plans, expectations
- words to remember

organization classification



- Association
- Commercial Business
- Education
- Government
- Government - federal
- Government - local
- Research and Development
- other

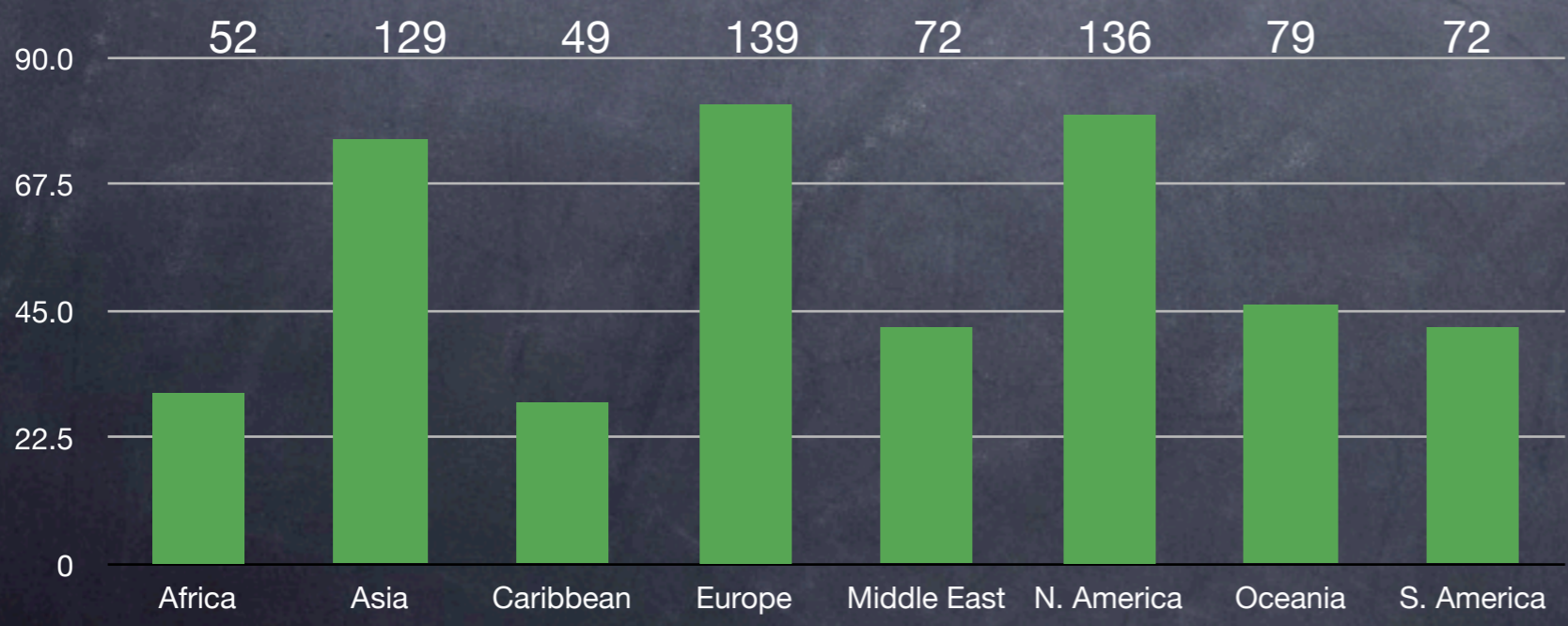
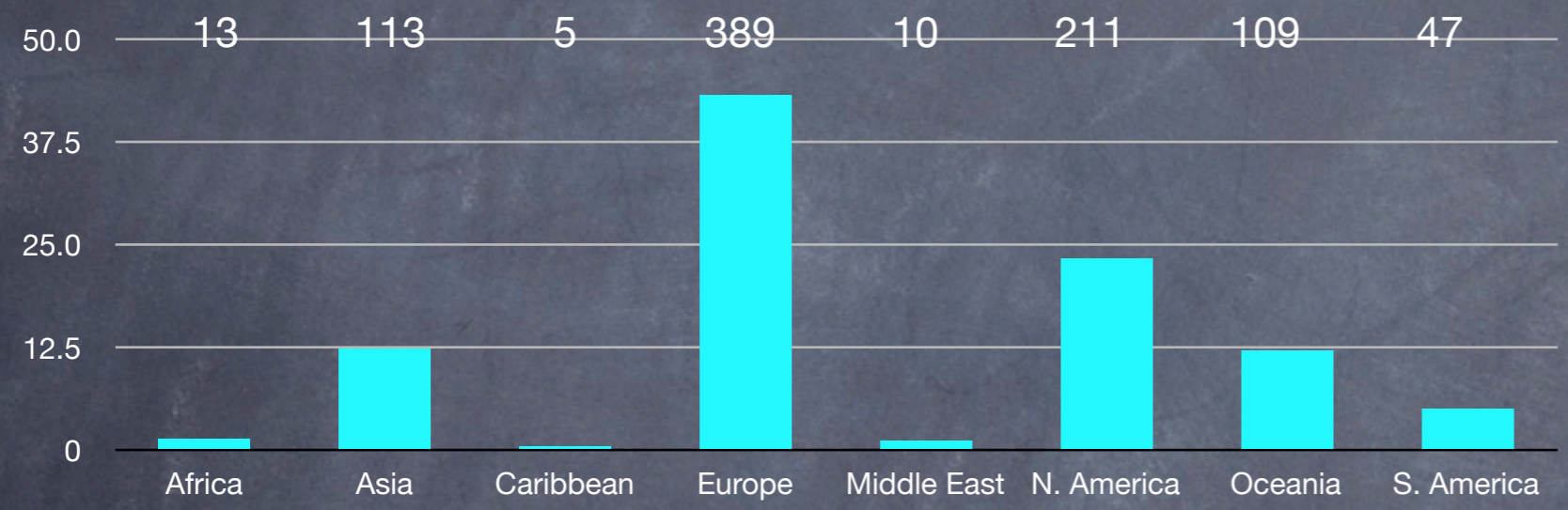
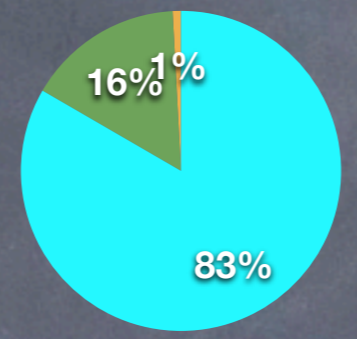


Geographic Breakdown



Regions of Operation

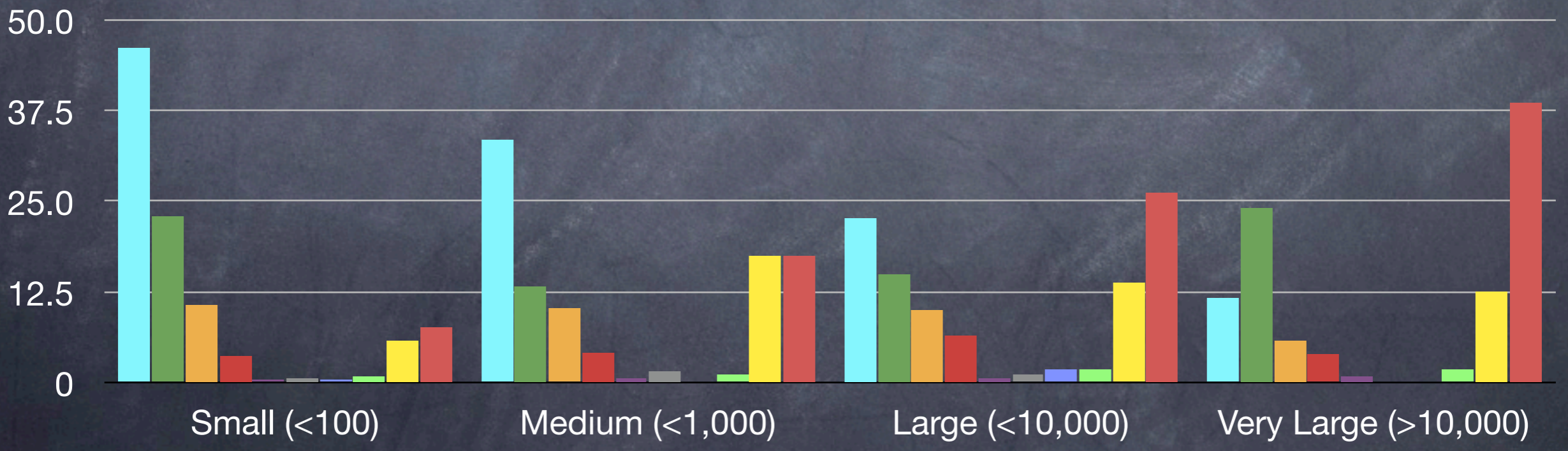
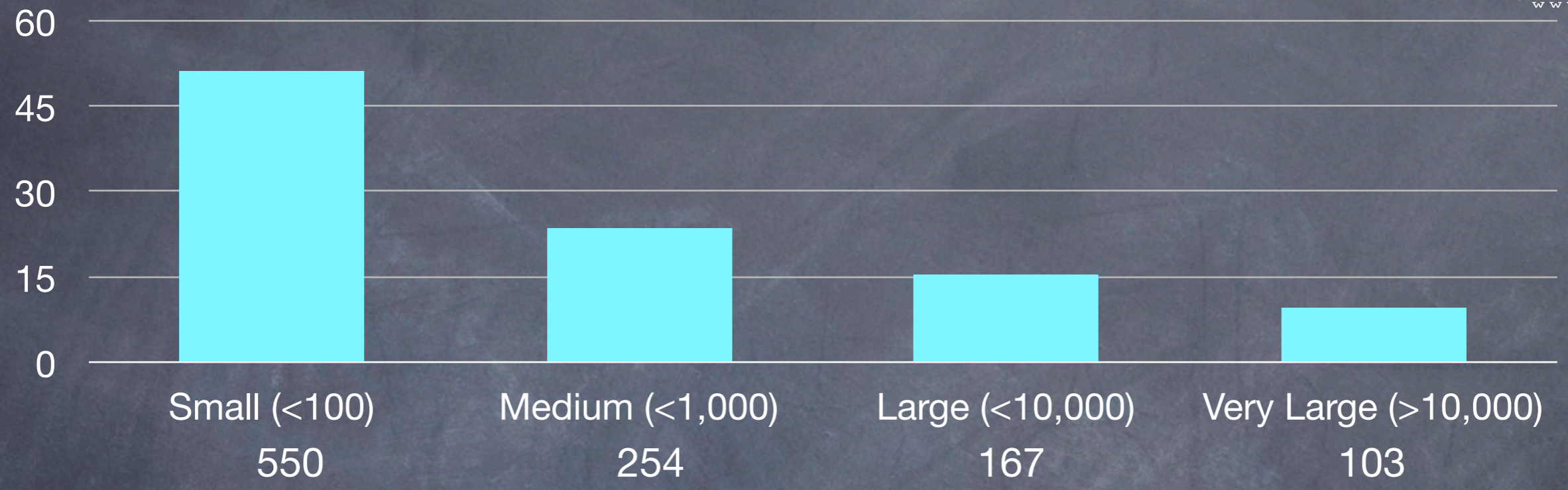
● single ● multiple ● unknown



Operate in single country

country	total	percentage
UNITED STATES	173	21.84
AUSTRALIA	61	7.70
GERMANY	43	5.43
UNITED KINGDOM	40	5.05
NEW ZEALAND	33	4.17
RUSSIAN FEDERATION	25	3.16
NETHERLANDS	24	3.03
BRAZIL	22	2.78
ITALY	19	2.40
CANADA	19	2.40
JAPAN	18	2.27
INDIA	17	2.15
FRANCE	17	2.15
THAILAND	13	1.64
MEXICO	12	1.52
SWEDEN	11	1.39
CZECH REPUBLIC	10	1.26
NORWAY	10	1.26
other	83	10.48

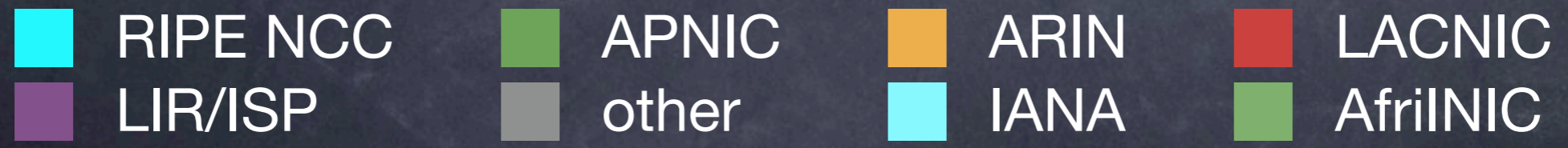
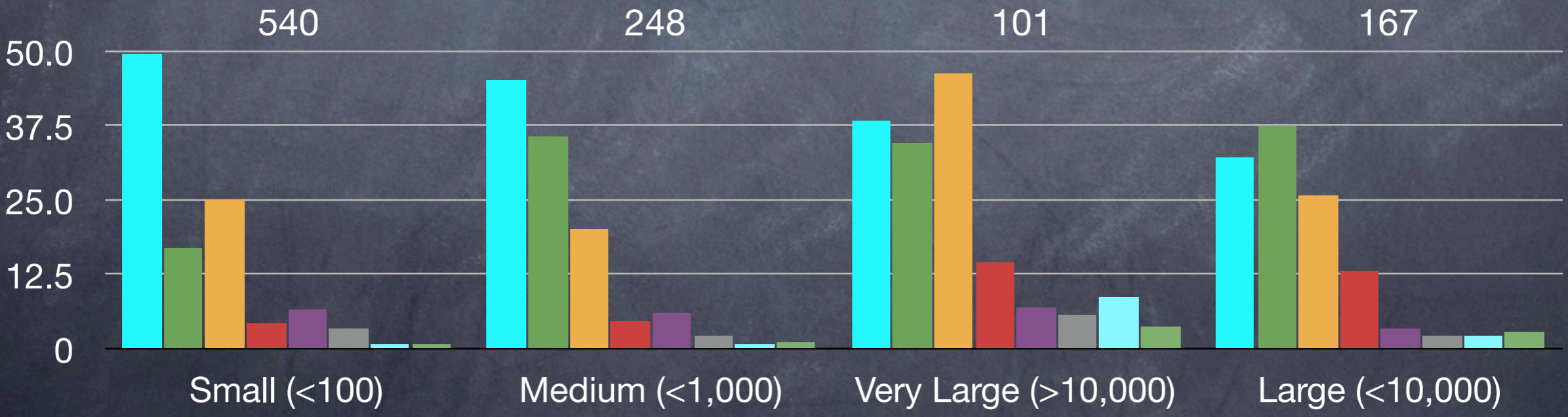
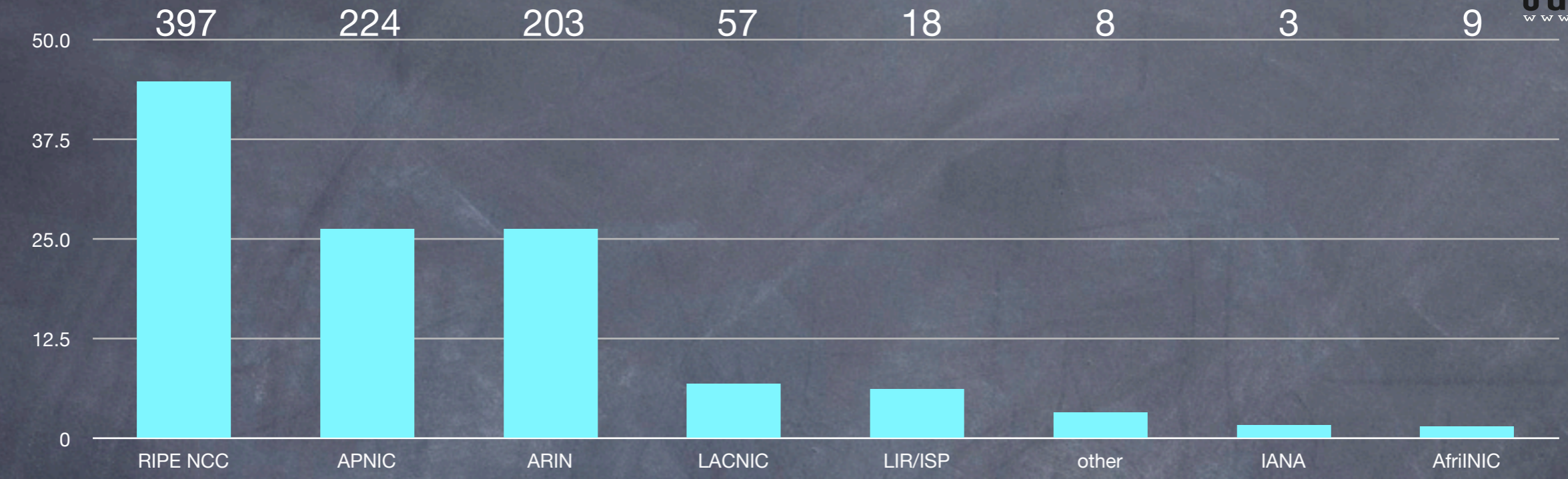
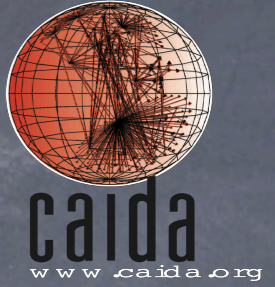
Organization Size



- Europe
- N. America
- Oceania
- S. America
- unknown
- Middle East
- Caribbean
- Africa
- Asia
- multiple



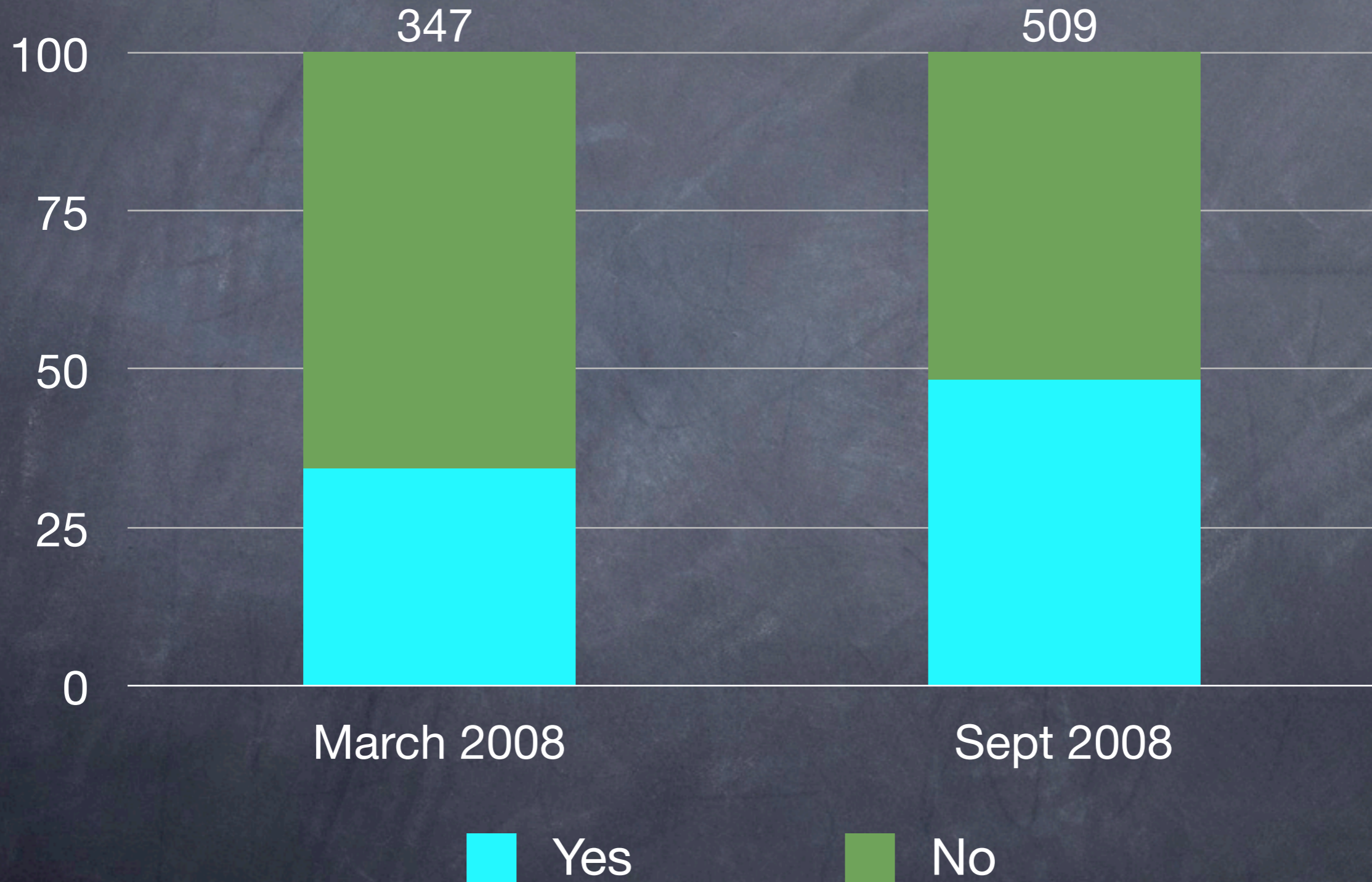
Source of Allocations



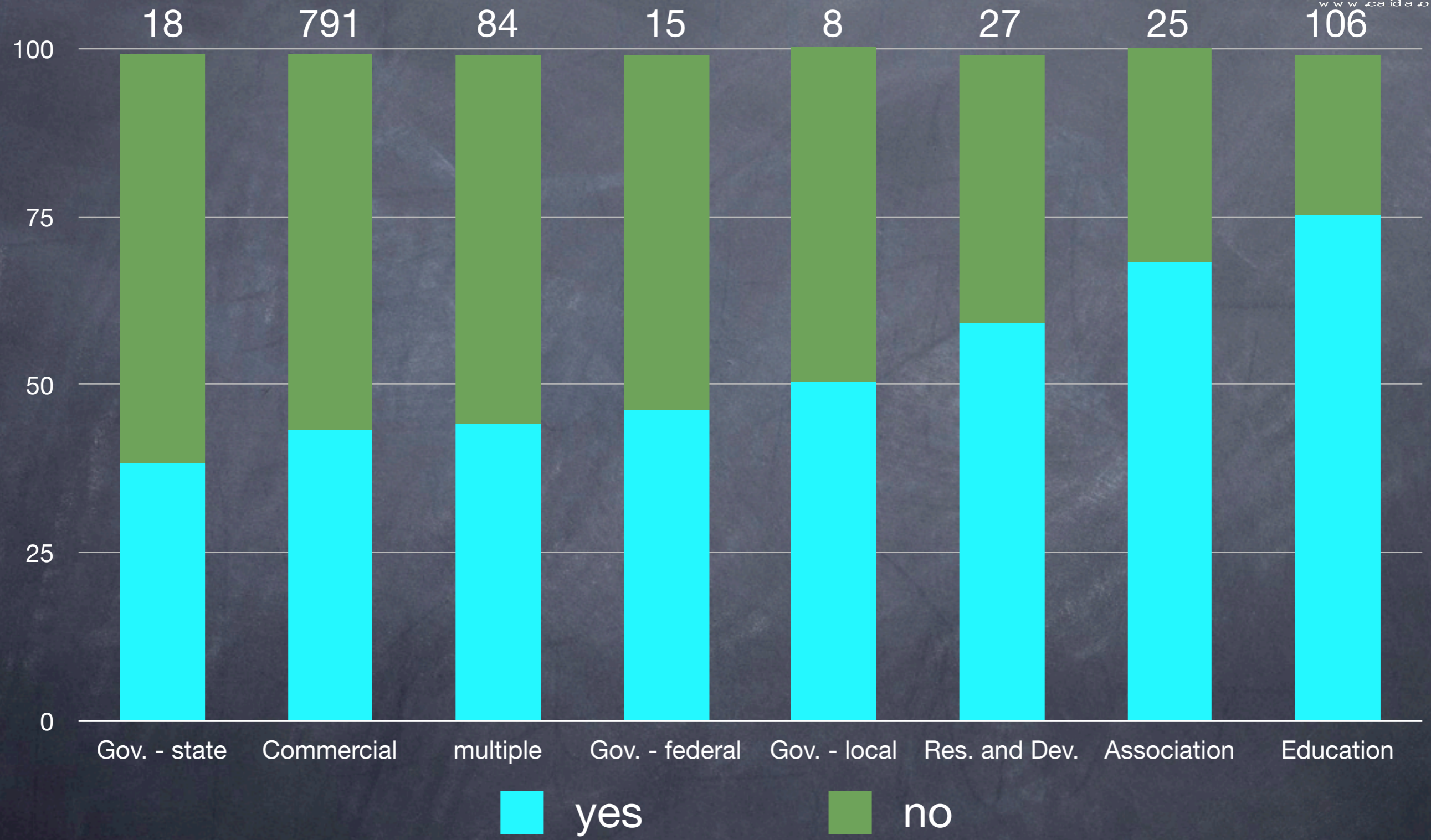
what did respondents say about:

- IPv6 activity, nature of service
- motivation, hurdles
- expected needs next year
- longevity without allocations
- strategy for next phase of growth

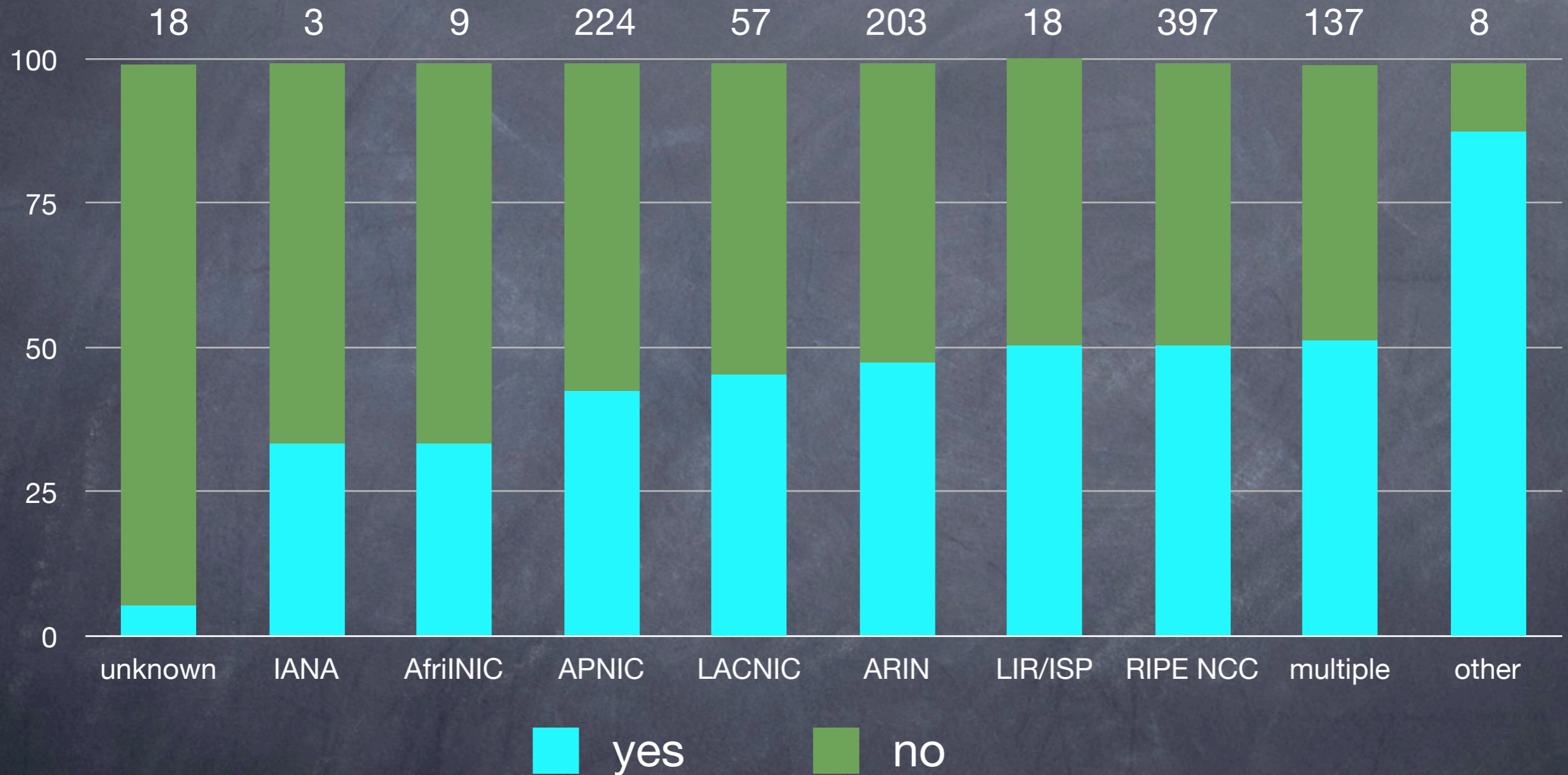
do you have an ipv6 allocation?



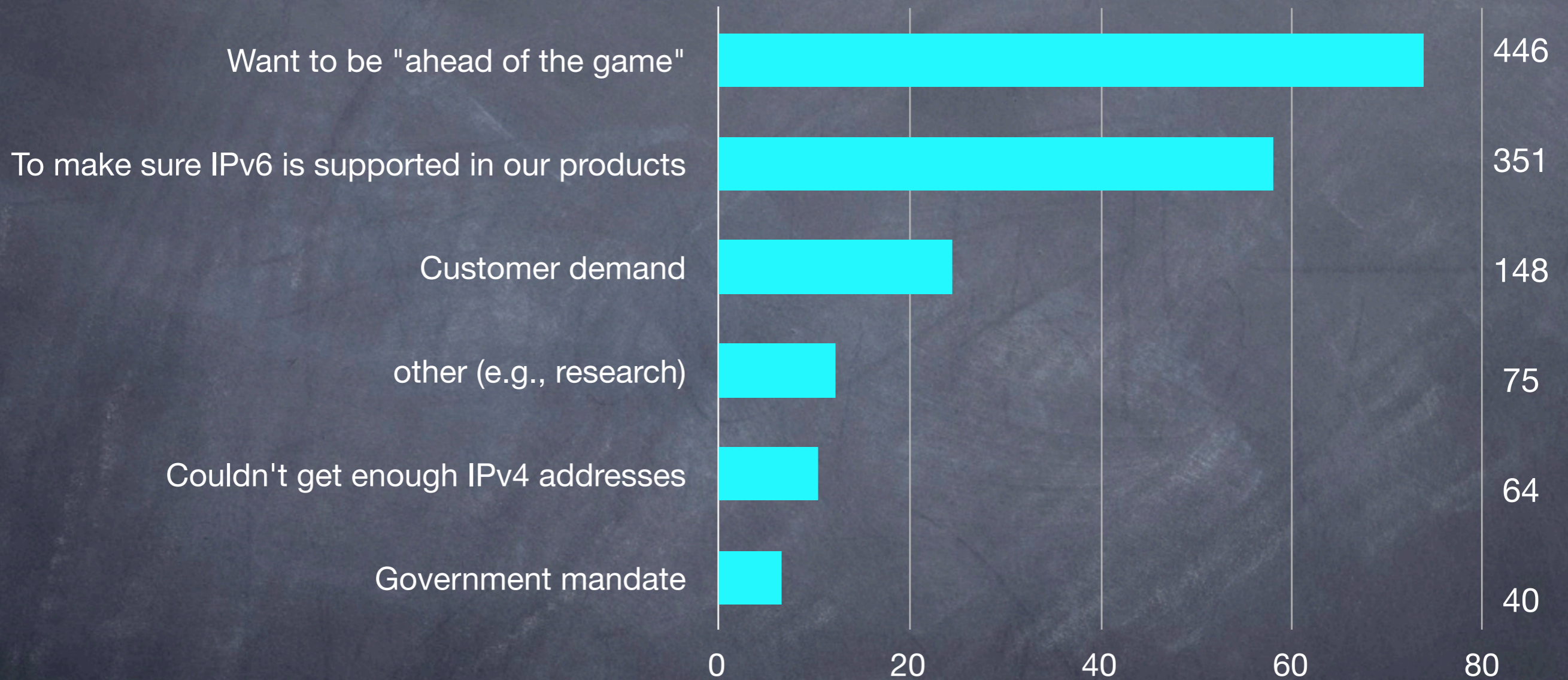
IPv6 allocation by organization type



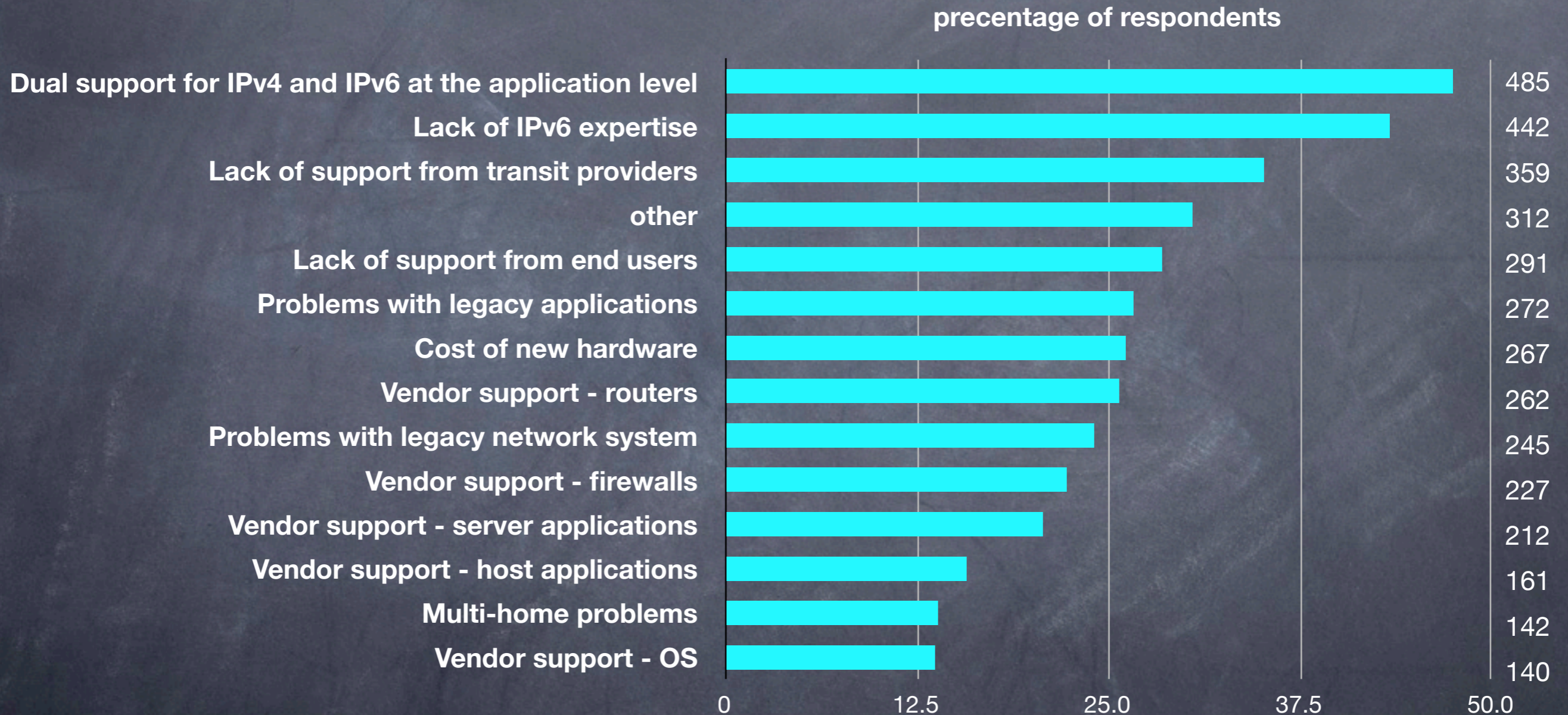
IPv6 allocation from which RIR?



motivation for getting IPv6



hurdles for ipv6



“Virtually every box could be checked. Registry policies & procedures are also a serious problem.”

“lack of quality support in residential cpe and middleboxes (firewalls, load balancers, ddos mitigation)”

hurdles for ipv6

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“lack of quality support in residential cpe and middleboxes (firewalls, load balancers, ddos mitigation)”

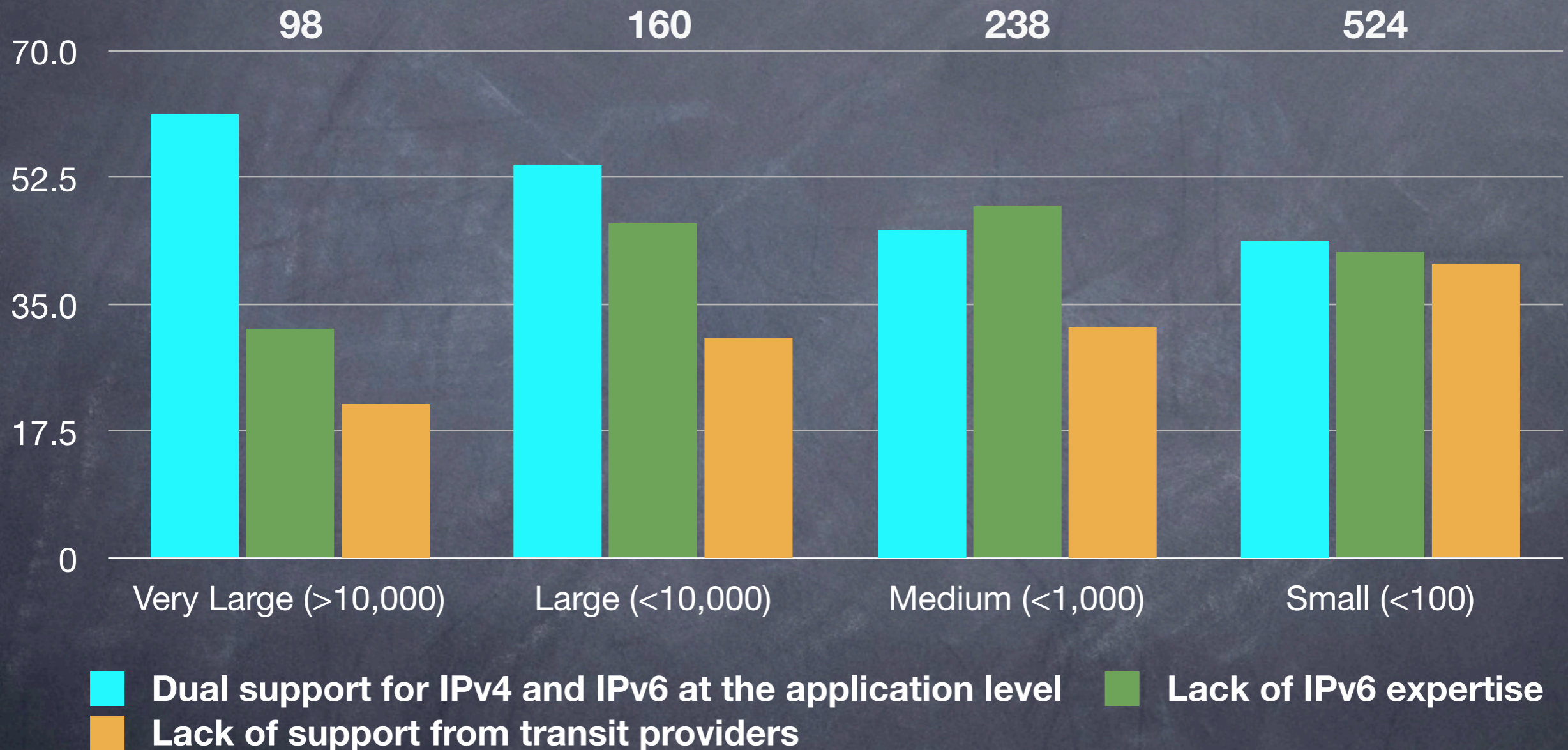
“The main part of our business is web hosting and there seems little point putting much effort in to hosting on ipv6 if no content consumers have it and all requests will come in as ipv4 anyway (or am I demonstrating the 'lack of ipv6 expertise' here?)”

“we don't see the point, if you're gonna run dual stack anyway, choose something decent, ipv6 is in our opinion one of the more crappier protocols, just like ipv4, doesn't bring anything to switch from crap to crap.”

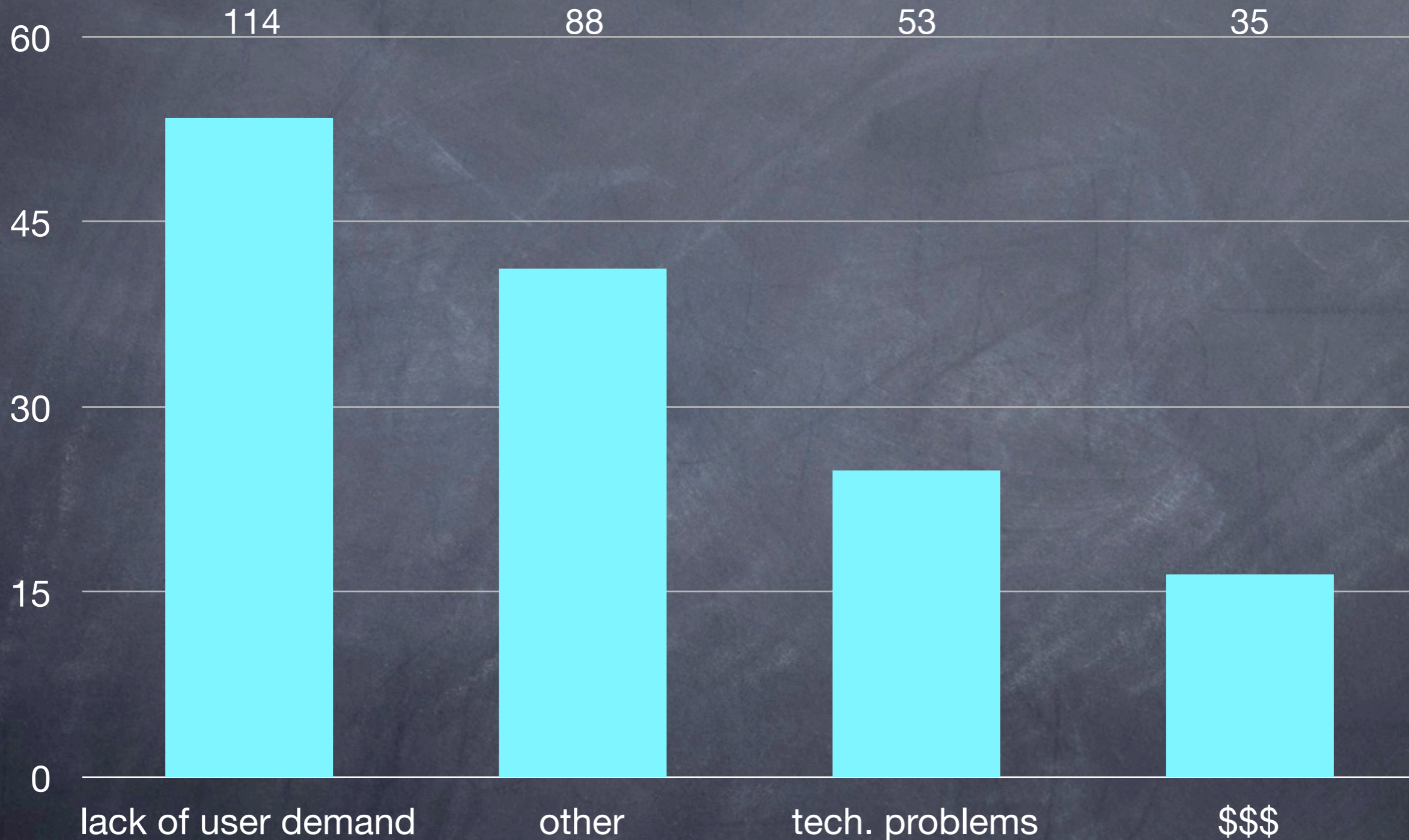
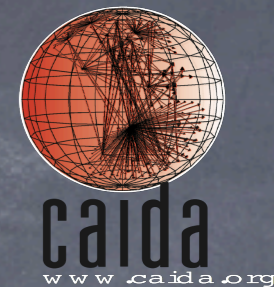
Lack of organizational capability to deploy. IT = triage. We only spend time working on things that are "broken". Until IPv4 is "broken" or causes a problem, most IT shops.. probably won't migrate, even if there was reasonable benefit. I also..lack trust that [sysadmins and developers] are sufficiently educated in IPv6. .. These guys still hard-code IPv4 addresses into applications and configuration files. Too many joe-blow admins out here.

“Why spend the money if there is no extra profit?”

does size affect what hurdle is?

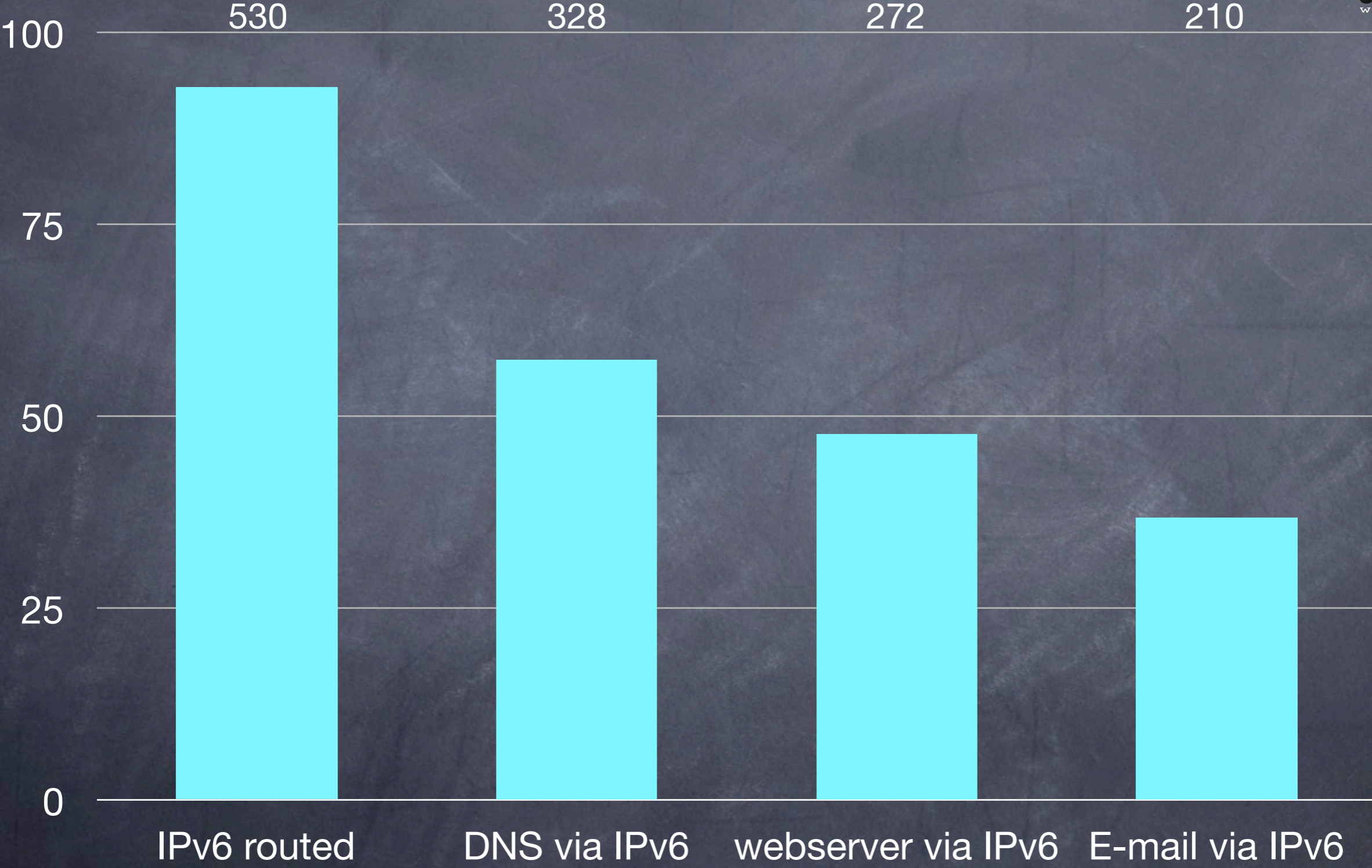
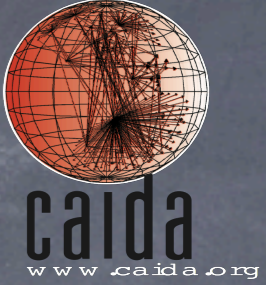


why IPv6 was turned off again



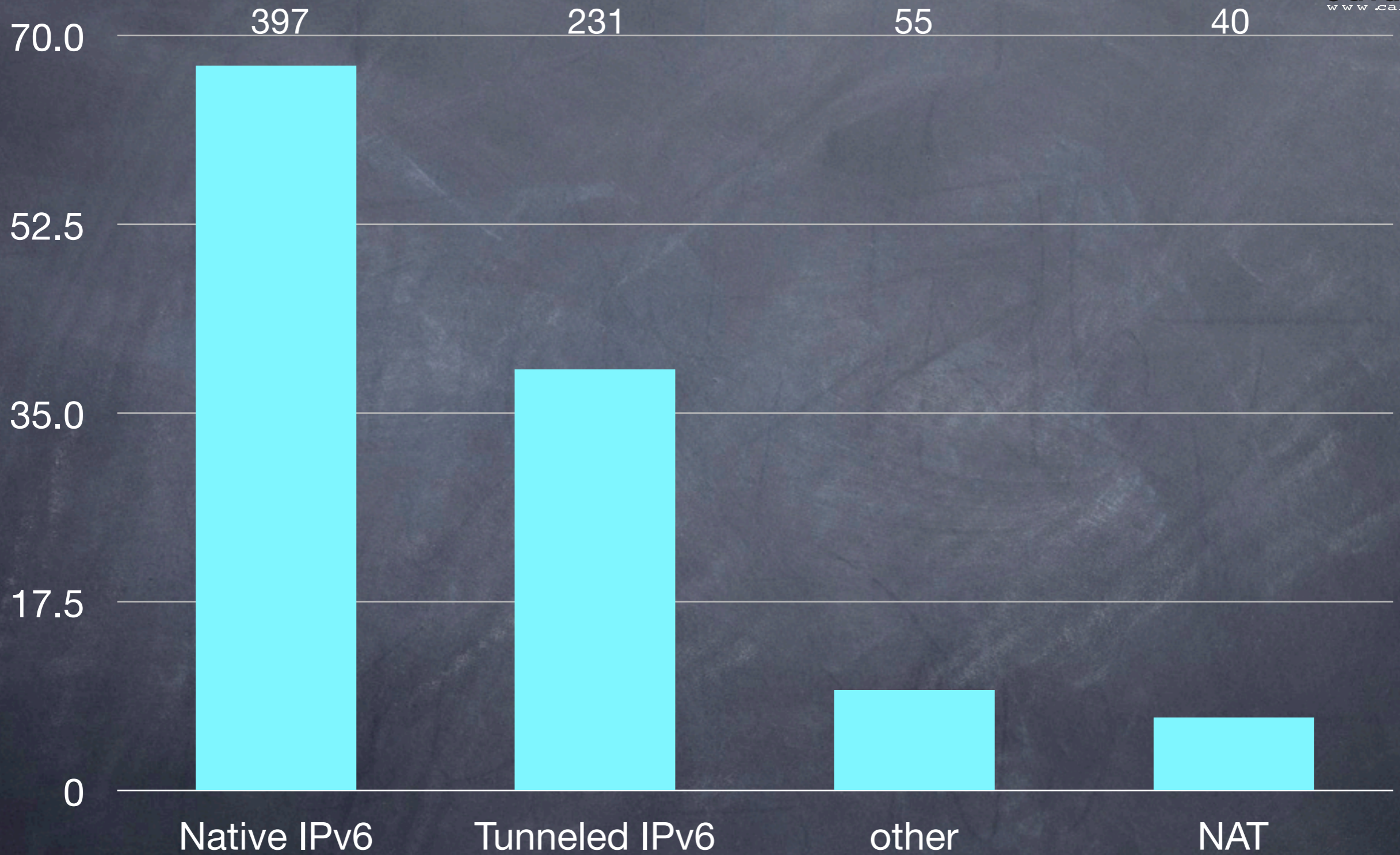
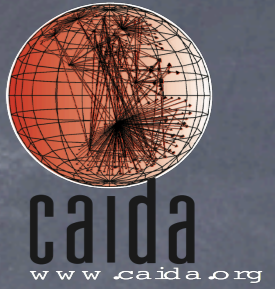
caveat: lots of "other" is 'we never turned it on.'

nature of ipv6 services



caveat: iff you have ipv6 services

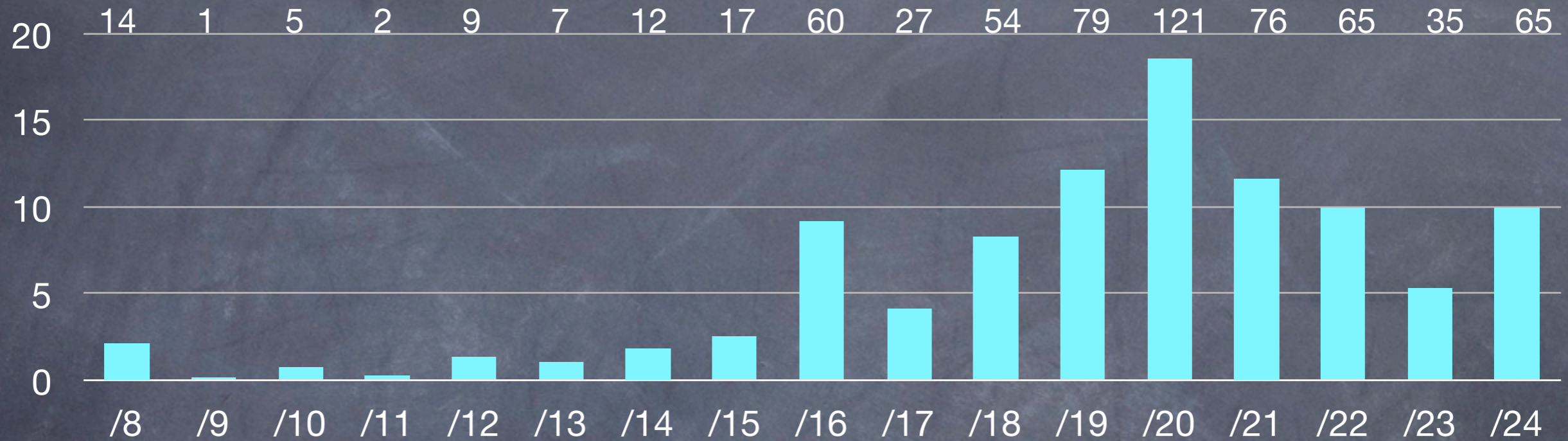
ipv6 external connectivity



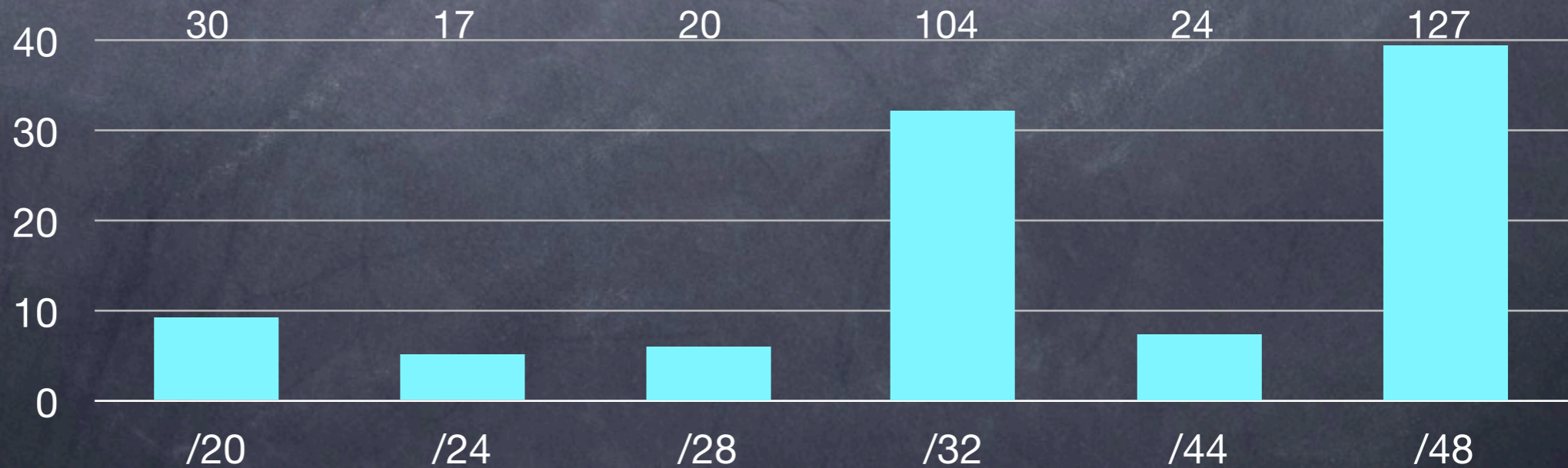
caveat: "other" is often "none"

expected address requests next year

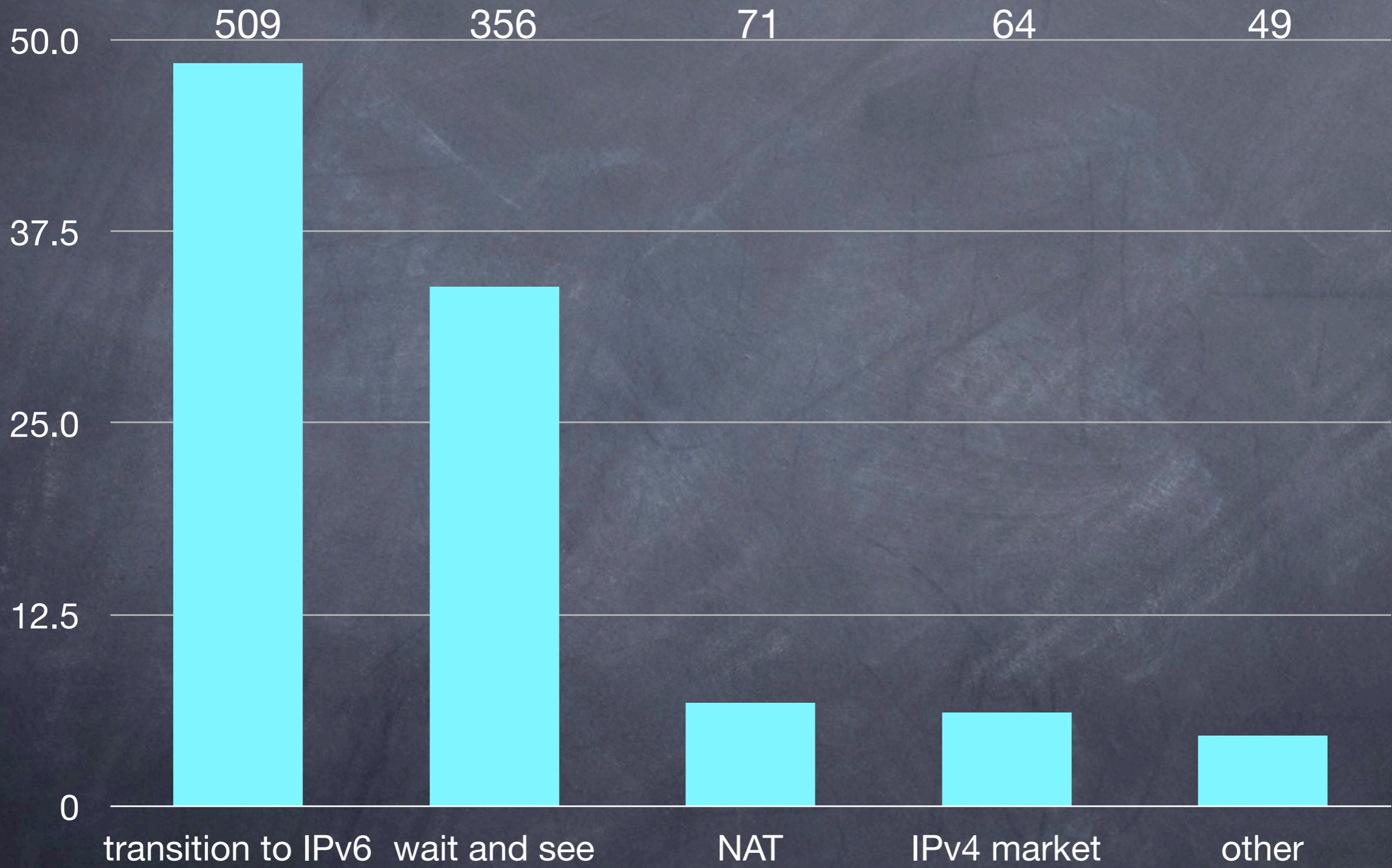
IPv4



IPv6



plans for next phase



capital shifts from 2005->2008

(the ones who need to innovate in the core have more capital)

INNOVATOR	EPS (\$)	MKT CAP (\$B)
MCIW (->VZ)	-11.22 (2)	6.5 (82)
SPRNT/NXTL	-0.31 (-10.6)	34 (11.5)
VERIO/NTT	1.98 (4)	71.6 (27)
LEVEL3	-0.74 (-.3)	1.9 (2.4)
SBC/T	1.41 (2)	78 (157)
QWEST	-0.45 (1.5)	7.7 (5)
COGENT	-7.42 (-.6)	0.2 (.2)
GLBC	-13.84 (-5)	0.3 (.6)
SAVVIS	-0.9 (-.05)	0.12 (.4)
ABOVENET	n/a	n/a
WILTEL	n/a	n/a
TELEGLOBE ->?	-0.74 (n/a)	0.2 (n/a)
C&W -> ?	0.70	4.7B
TWTELCOM	-1.12 (-.12)	1.0 (1.0)
TWCABLE	0.48 (1.1)	82 (22)
XO -> ?	-2.18	0.4

INNOVATOR	EPS (\$)	MKT CAP (\$B)
CISCO	0.87 (1.31)	108 (109)
GOOGLE	3.41 (15)	97 (114)
AMAZON	1.25 (1.4)	19 (24)
YAHOO	1.07 (.7)	49 (17.5)
EBAY	0.73 (.4)	51 (23)
JUNIPER	0.53 (.78)	13 (10)
APPLE	1.56 (5.1)	47 (92)
INTEL	1.33 (1.2)	141 (90)
VERISIGN	0.93 (-1.2)	6.15 (4.6)
DELL	1.27 (1.34)	76.3 (28)
MICROSOFT	1.12 (1.87)	269B (220)

source: finance.yahoo.com, 25 oct 2005, 15 oct 2008

next steps

- more analysis of survey data
- solicit feedback from you on next survey
- follow up with those willing to donate measurements
- increase ipv6 active probe capabilities (ascore6)
- increase traffic analysis of ipv6 vs v4 (rsa, legacy)
- address ownership analysis (next slide)
- economic analysis
- scenario planning workshops

scenario planning

Peter Schwartz, *The Art of the Long View*

- of course we should try to change the future: it's the only thing we can change.
- goal: not an accurate picture of tomorrow, but rather making better decisions about the future
- formalize (or at least write down) what we know: what are long term forces and how do they interact? who is measuring them, and how? what tradeoffs do they imply?
- are we leaving a better future than we found?
 - are we net gaining or net losing freedom/autonomy?

*Many are stubborn in pursuit of the path they have chosen,
few in pursuit of the goal. -- Friedrich Nietzsche*