

# Drilling down into LAC networks from the APNIC data

George Michaelson

**ggm@apnic.net**

# APNIC uses adverts to measure



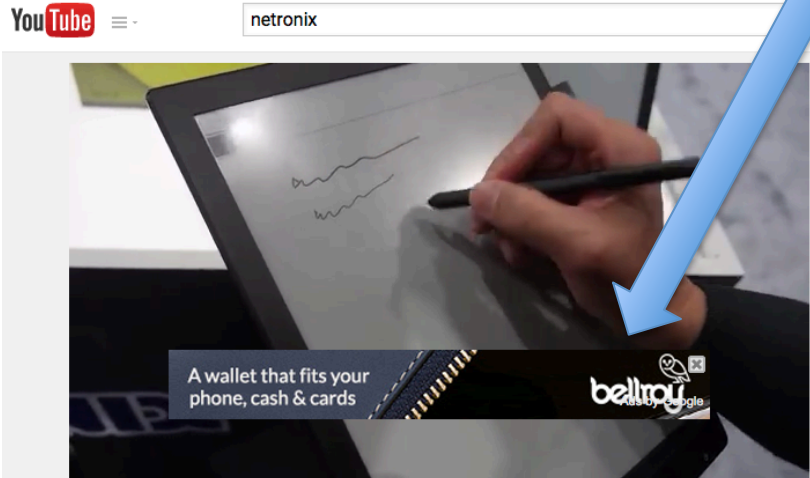
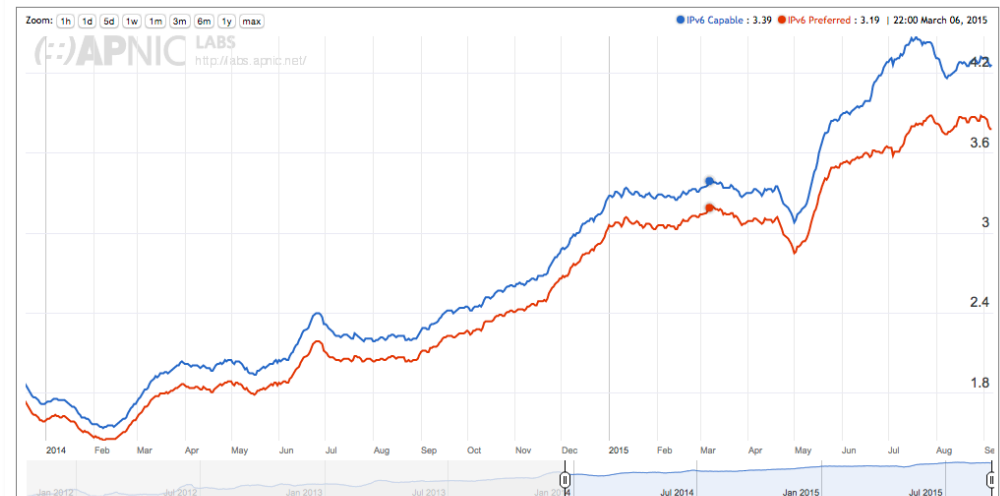
E Ink Booth Tour at CES 2014, Sony DPT-S1,

The overlay box is running an advert  
-It's active code.

We make graphs like this from the data



## IPv6 Country Deployment for World (XA)



Netronix shows 13.3" flexible E Ink digitizer sub-400gr  
i.MX6 Solo Lite Android note taker

# APNIC measurement system

- Running since 2010
- A collection of specific websites, and advertising channel based collections
- End-User measurement directly in the browser
- “what can people really do”
- Currently 12-13 million samples per day
- Adjusted by ITU user statistics to account for placement biases

# APNIC used flash to measure

- Flash had many issues
  - Its not installed by default on many OS, Browsers
  - Users disable it
- Increasingly its being abused
  - Long list of exploits
  - Spam and other bad behaviours
  - Intrusive advertising 'capturing' the screen

# End of flash: news at 11

- After many years, google has responded to community complaint and closed off 'default run' for 3<sup>rd</sup> party flash content on web pages
  - As of September 1, flash does not run by default unless identified as critical for the web page
  - Third party flash (adverts) in particular affected

# End of flash: news at 11

- As a result, our random harvest of end user capability from flash has ended.
- We had a plan...

# Start of HTML5

- The advertising ecology has moved from flash to HTML5 (javascript) with tighter controls on what can be done inside the advert
- We developed javascript for measurement some time ago, and had code ready to run
  - (if you want to add javascript based measurements to your website, we can talk)

# Start of HTML5

- We got approval from google to continue our measurements inside an HTML5 model
- This has been running in parallel with Flash based collection since June
- We have now cut over to exclusively measuring end-user behaviours using HTML5
  - There is some discontinuity in the data but we believe the fundamental measurement is consistent: We see what end users see



# Flash had its limits

- It turns out, the vast majority of our flash measurement ran on Windows platforms
  - Flash on OSX, in firefox required hand installation
  - Some Android systems came with flash installed
    - Most didn't
  - Few iOS devices had flash

# Flash had its limits

- Because Windows doesn't run much on cellular networks (except through 'mifi' devices and windows phones which have very small market share)
- We had little insight into Mobile device networks
  - We saw 'mifi' views of 3 & 4G, and WiFi, but not much of the true cellular network.

# HTML5 offers new opportunities

- We now see a much more ‘interesting’ mix of operating systems and browsers
  - We see Android and iOS devices
- We now have insights into the behaviours of these devices on cellular networks as well as WiFi

# Eyeball share

- APNIC's advert is placed on random devices
  - Google has a consistent record of a near-linear rate of presentation onto new IP addresses
  - There is no obvious bias to any specific provider
    - There are clear biases to economies which accept cheap adverts, which we adjust for using the ITU model of world population and registered subscribers

# Eyeball share

- What we see is therefore a first approximation reflection of relative share of those eyeballs
  - Its not 'market share' but it is eyeball, browser based share.
- We also see into corporate, transit and other networks
  - Some of these have quite large 'footprints' of users (Facebook, Opera, Google)

# Some significant recent deployments

- If we look into some recent big deployments can we see how the different end-user devices are affected by the IPv6 technology?

# Some significant recent deployments

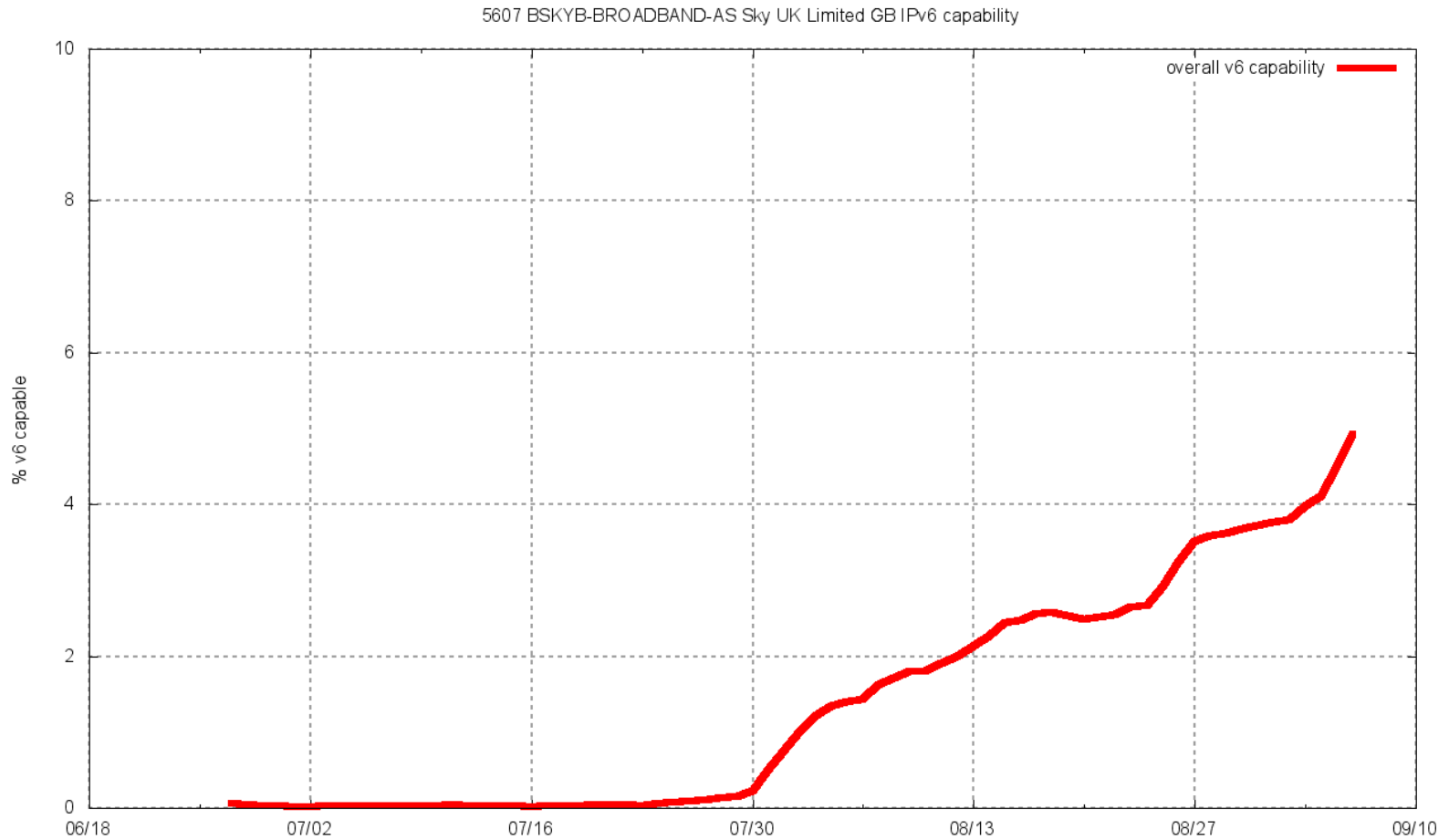
- Sky UK
- Cable provider, nationwide
  - No cellular, but lots of home WiFi
  - Upgrading 80,000 customers per night to IPv6
- Top-3 provider of broadband in the UK from their own data
  - Currently the top ranked end-user provider in the UK from our eyeball data
  - <http://stats.labs.apnic.net/v6pop?c=GB&d=2>

# UK IPv6 by provider

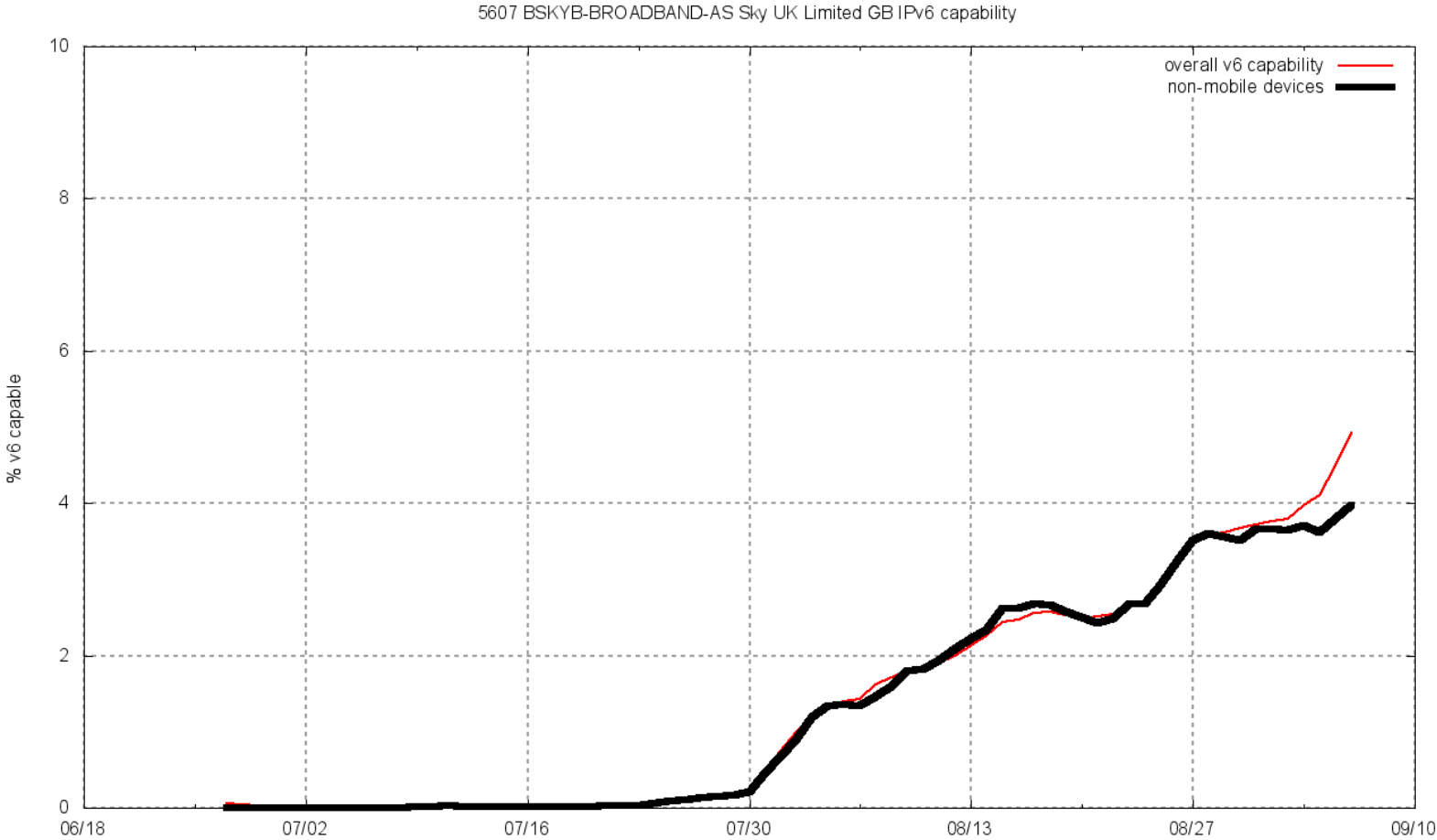
Rank	ASN	AS Name	Users (est.)	% of country	V6 Capable
1	AS5607	BSKYB-BROADBAND-AS Sky UK Limited	11072593	19.03	14.85
2	AS5089	NTL Virgin Media Limited	10284108	17.68	0
3	AS2856	BT-UK-AS BT Public Internet Service	8549439	14.7	0
4	AS60339	H3GUK Hutchison 3G UK Limited	5327911	9.16	0
5	AS13285	OPALTELECOM-AS TalkTalk Communications Limited	3638298	6.25	0
6	AS12576	ORANGE-PCS Orange Personal Communications Services	2906133	5	0



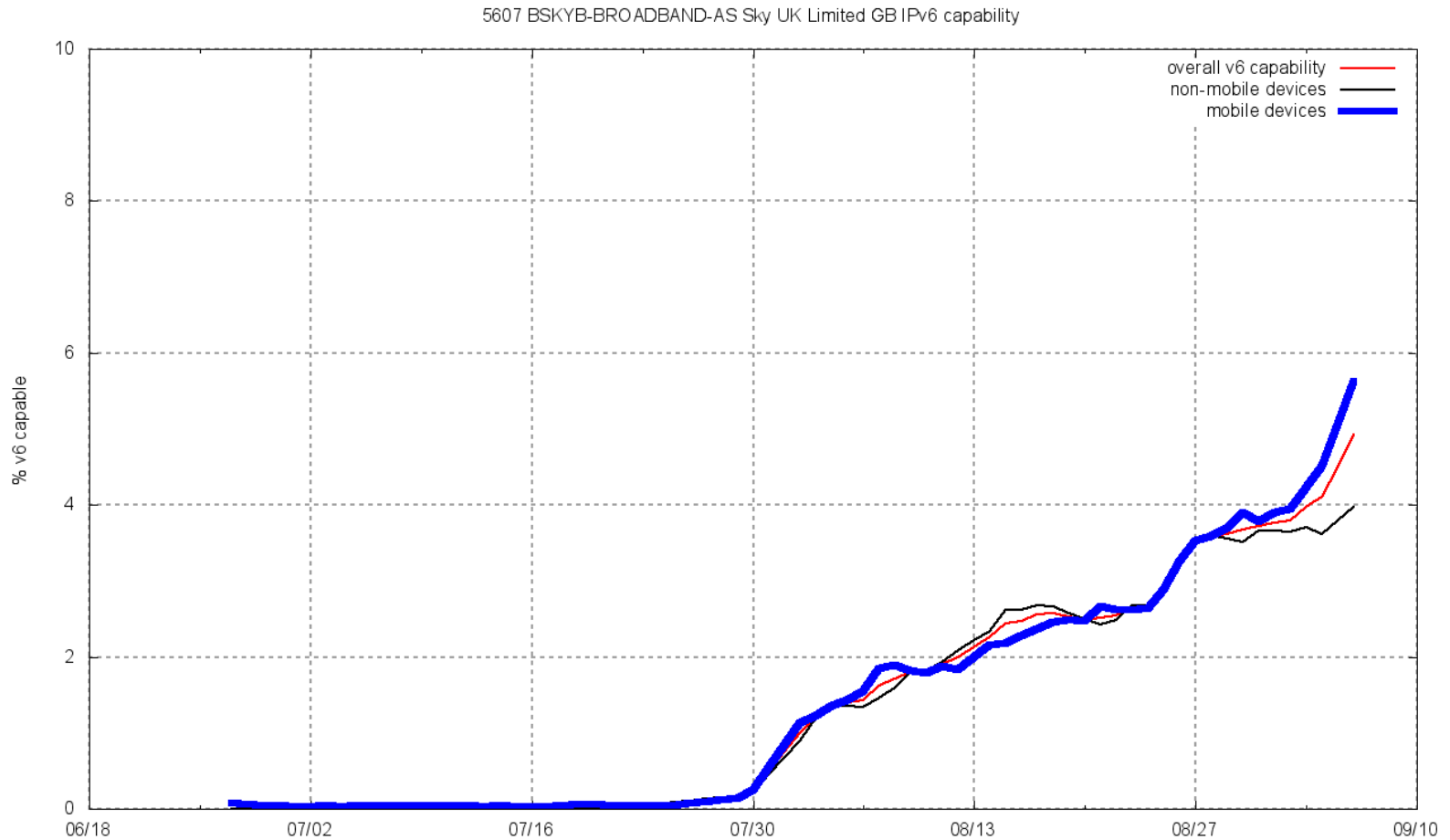
# Sky Broadband Overall IPv6



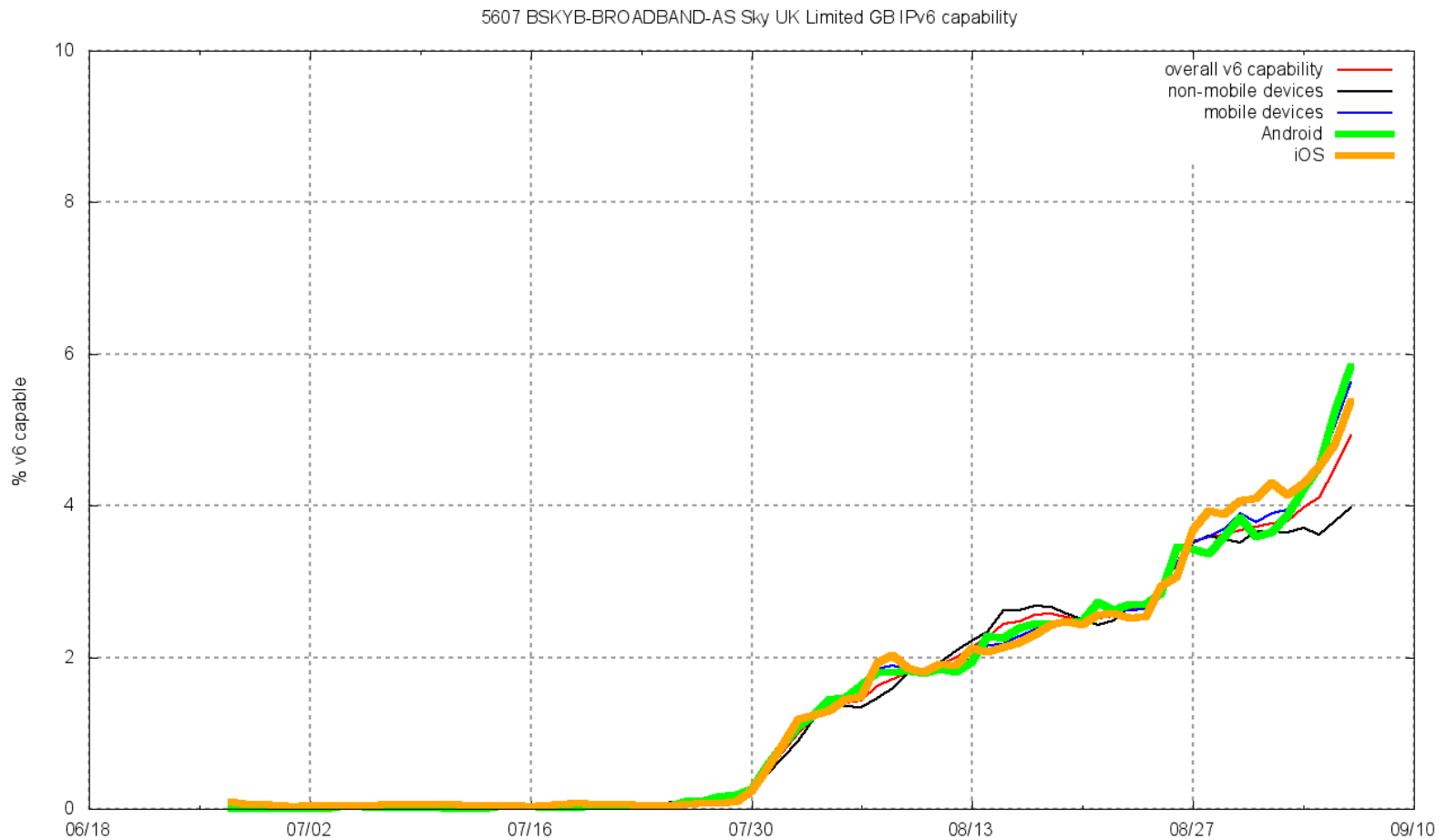
# Sky Broadband non-mobile IPv6



# Sky Broadband Mobile device IPv6



# Sky Broadband iOS/Android IPv6



# Cable doesn't disadvantage

- No strong bias to any device type (desktop, mobile) or OS (Windows, OSX, Android, iOS)
- True dual-stack deployment in mix of PPP, IPoE, centrally managed cable modem plan
- The UK is likely to get to 20%+ IPv6 capability by 2016 at this rate of deployment
- What will competitor providers do?

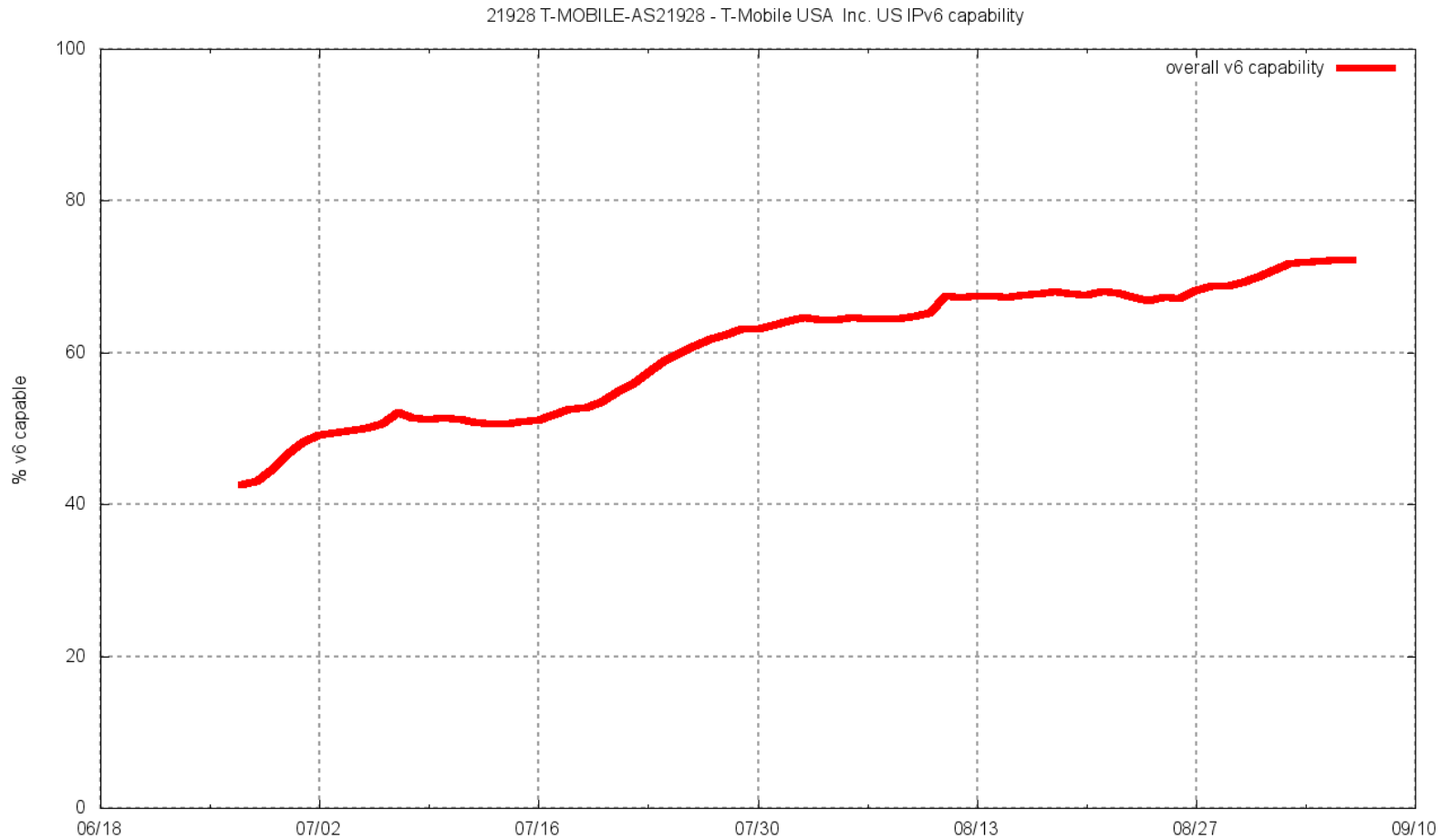
# iOS and 464xlat

- Apple made a decision NOT to implement 464xlat mechanisms
  - iOS devices on a v6 cellular network do not support 464xlat.
- Therefore where there is significant iOS deployment, 464xlat excludes iOS
- Can we see this?

# T-Mobile

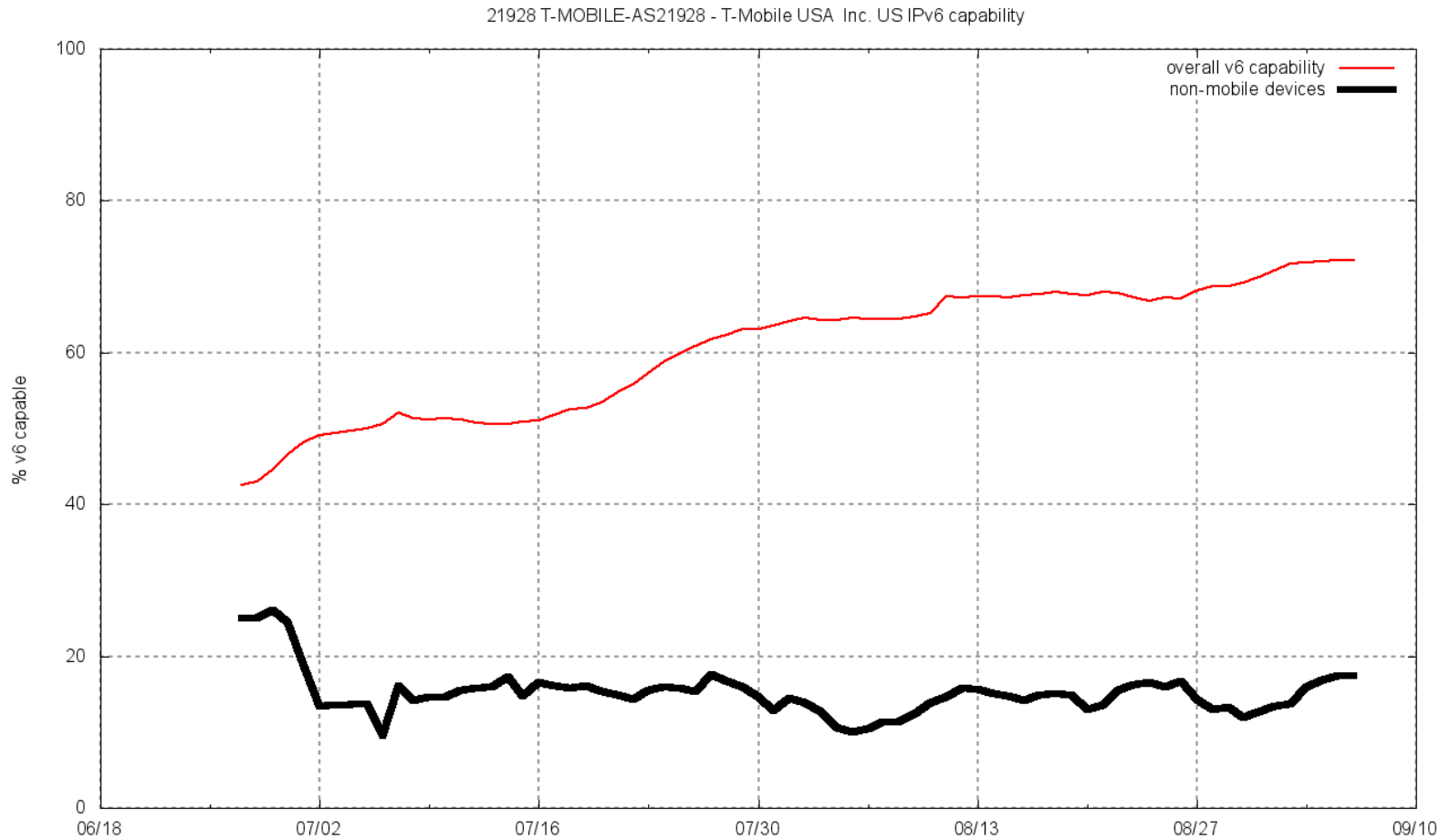
- We know T-Mobile USA deployed 464xlat
  - Pure IPv6 with translation for IPv4
- It's predominantly a Cellular provider with some WiFi services
- It should have a strong signal of IPv6 capability
  - With no significant iOS usage

# T-Mobile



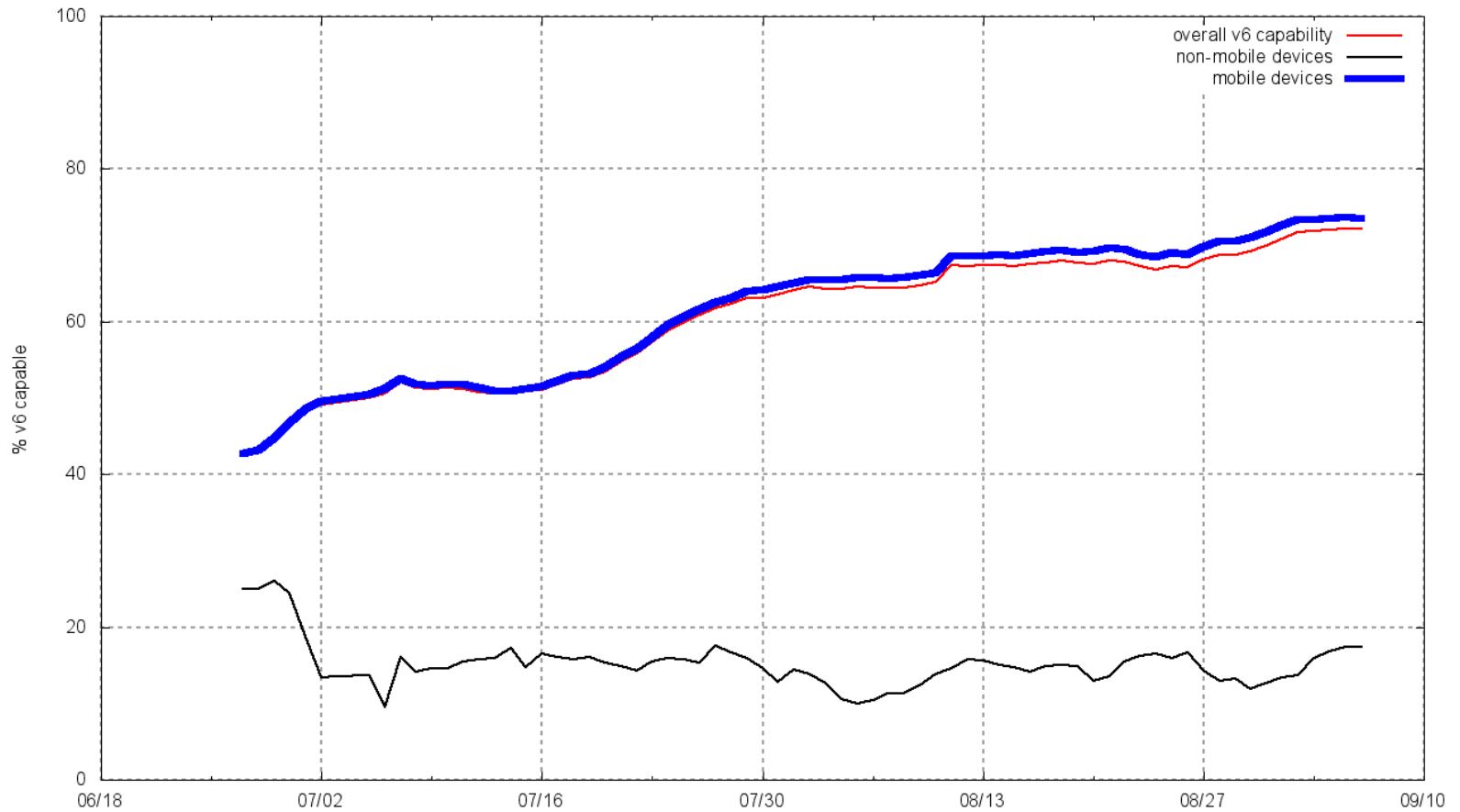


# T-Mobile



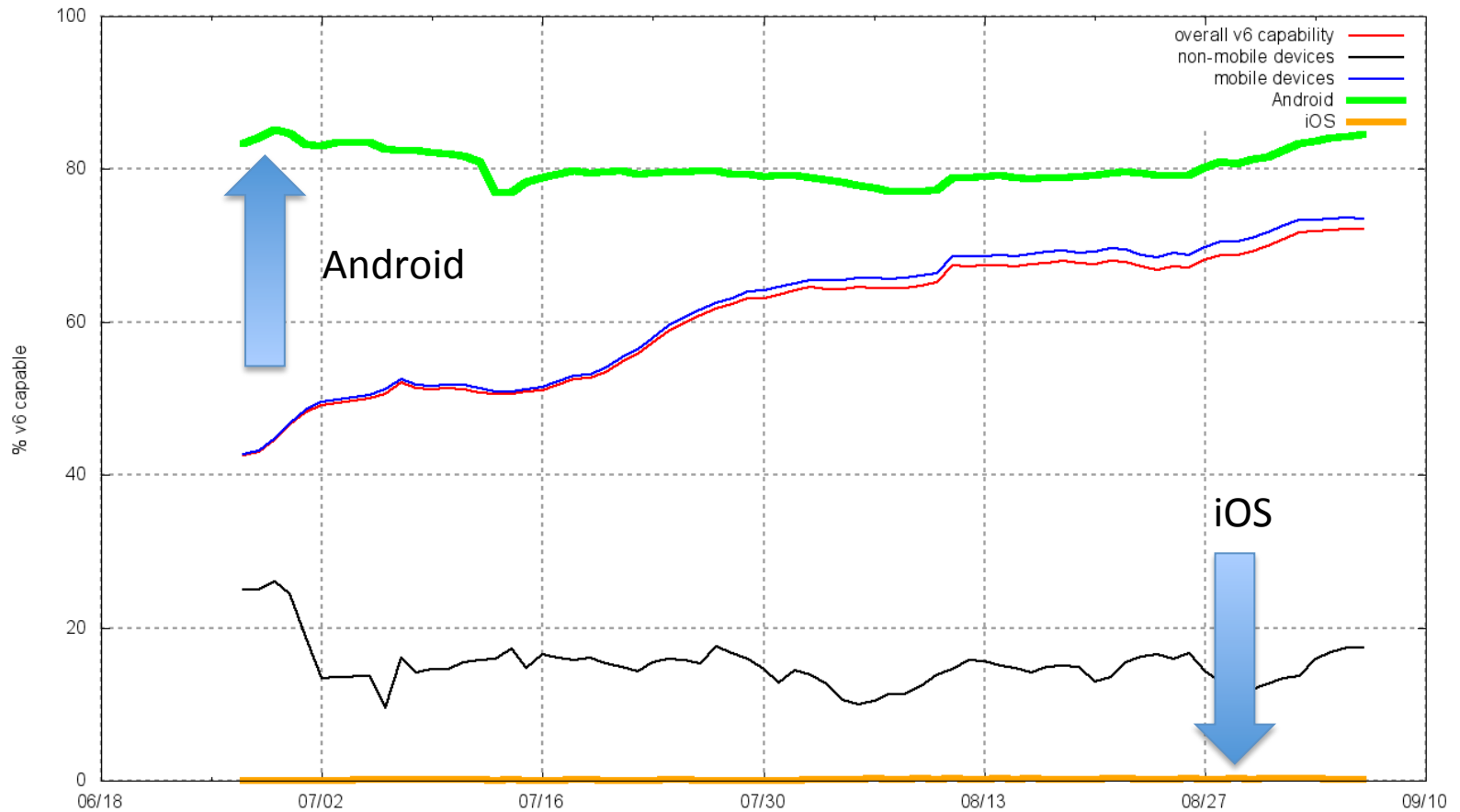
# T-Mobile

21928 T-MOBILE-AS21928 - T-Mobile USA Inc. US IPv6 capability



# T-Mobile

21928 T-MOBILE-AS21928 - T-Mobile USA Inc. US IPv6 capability



# 464XLat works

- The mechanism clearly works
  - Android devices show remarkably high, consistent level of IPv6 capability
- With Google, Facebook, Cloudflare, Akamai now routinely supporting dual-stack content it is likely a significant % of traffic flows over IPv6 and reduces pressure on the CGN/NAT requirement for IPv4
- The technology will not make sense for a company with large iOS handset deployment

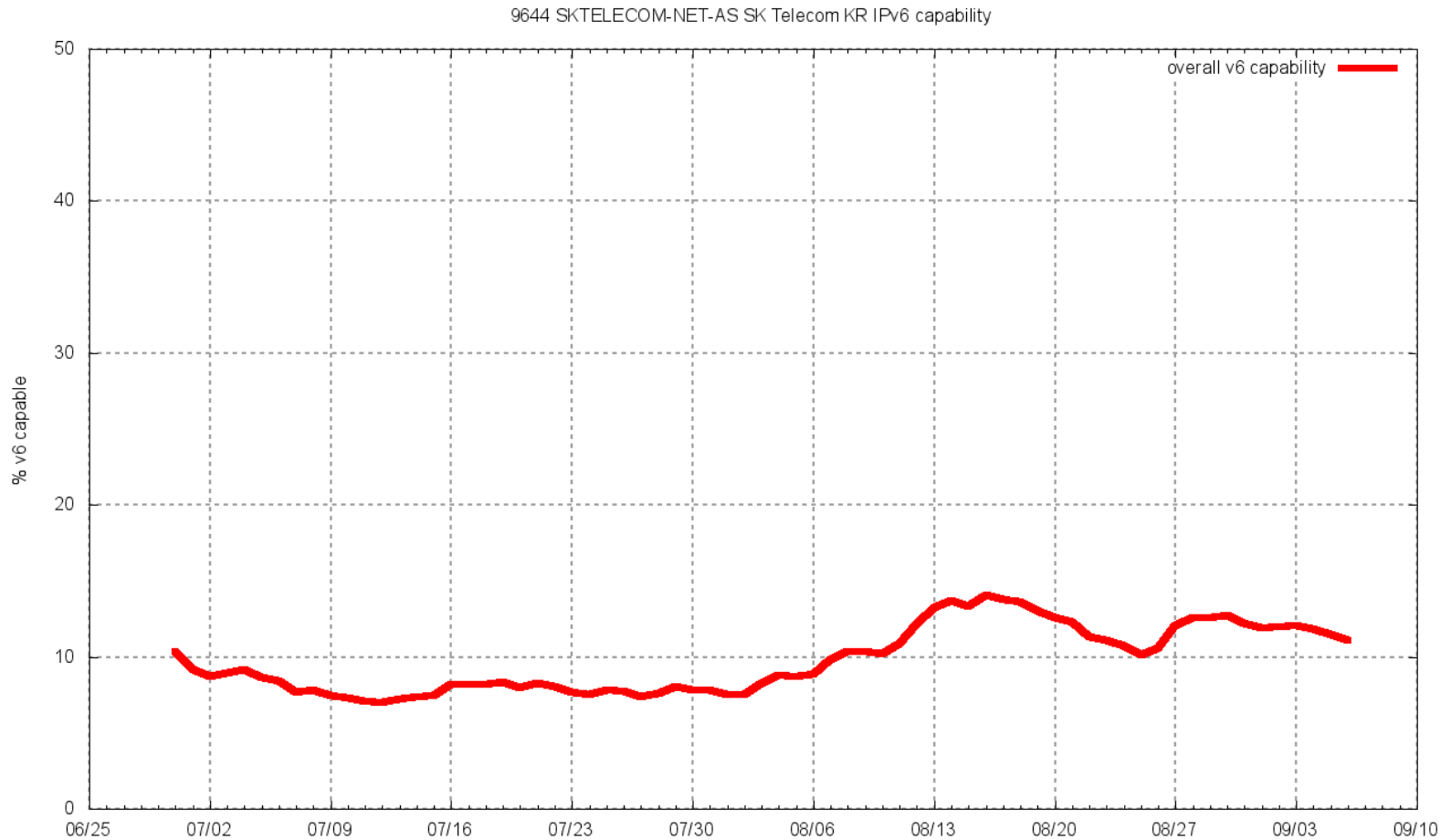
# Korea is moving!

- Early Broadband adoption nationwide
- Significant investment in technology locked to IPv4
  - No upgrade option to CPE devices deployed nationwide
  - National data network includes switching technology and other investments which block IPv6
- But one cellular provider has deployed 464xlat..

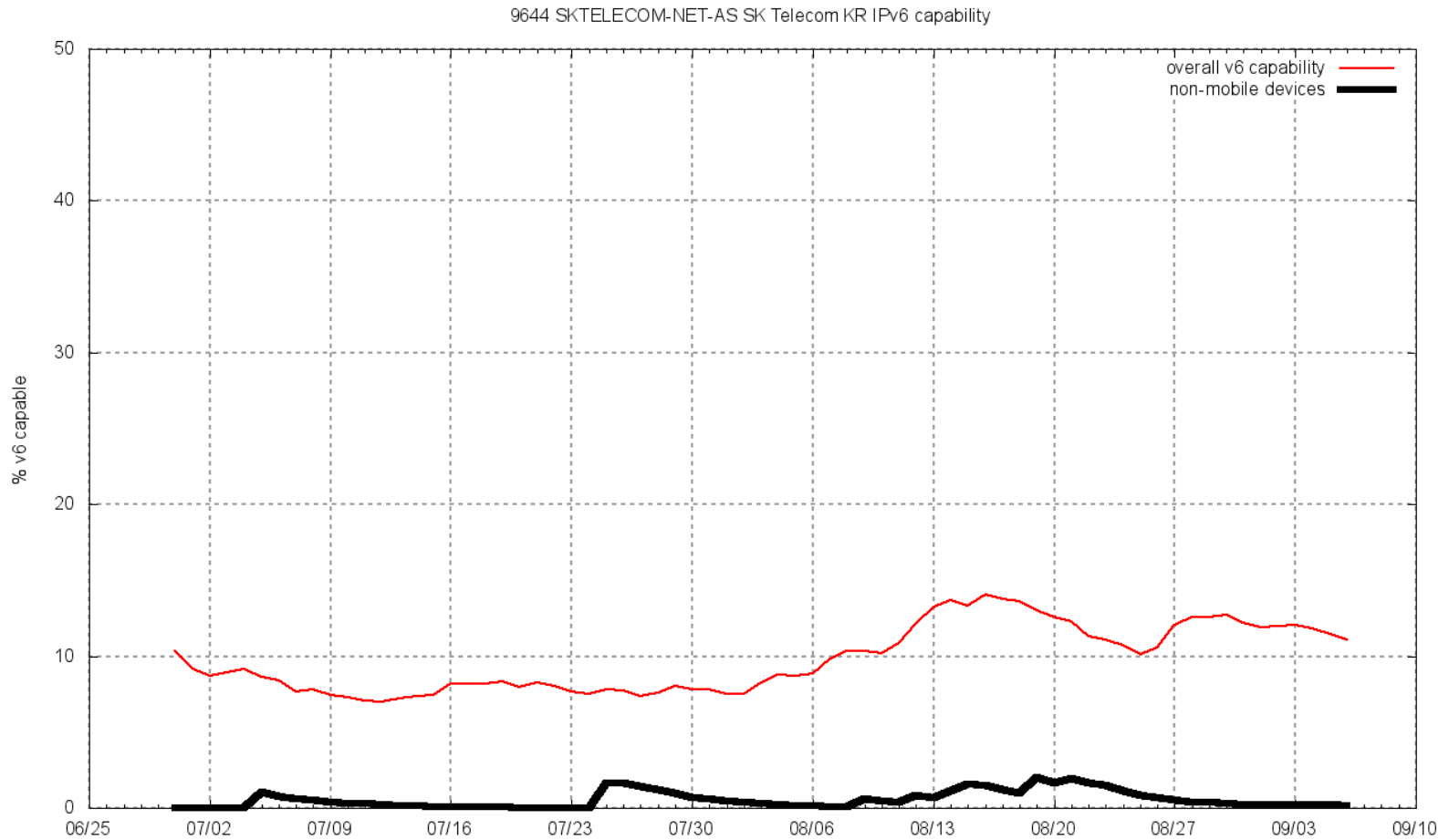
# 4<sup>th</sup> Largest userbase provider

Rank	ASN	AS Name	Users (est.)	'% Of country'	IPv6 Capable %
1	AS4766	KIXS-AS-KR Korea Telecom	19462848	45.6	0
2	AS9318	HANARO-AS Hanaro Telecom Inc.	7968011	18.67	0
3	AS17858	KRNIC-ASBLOCK-AP KRNIC	4199534	9.84	0
4	AS9644	SKTELECOM-NET-AS SK Telecom	2756148	6.46	10.66
5	AS17853	LGTELECOM-AS-KR LG Telecom	2018127	4.73	0
6	AS3786	LGDACOM LG DACOM Corporation	1280106	3	0

# S-K Telecom overall IPv6



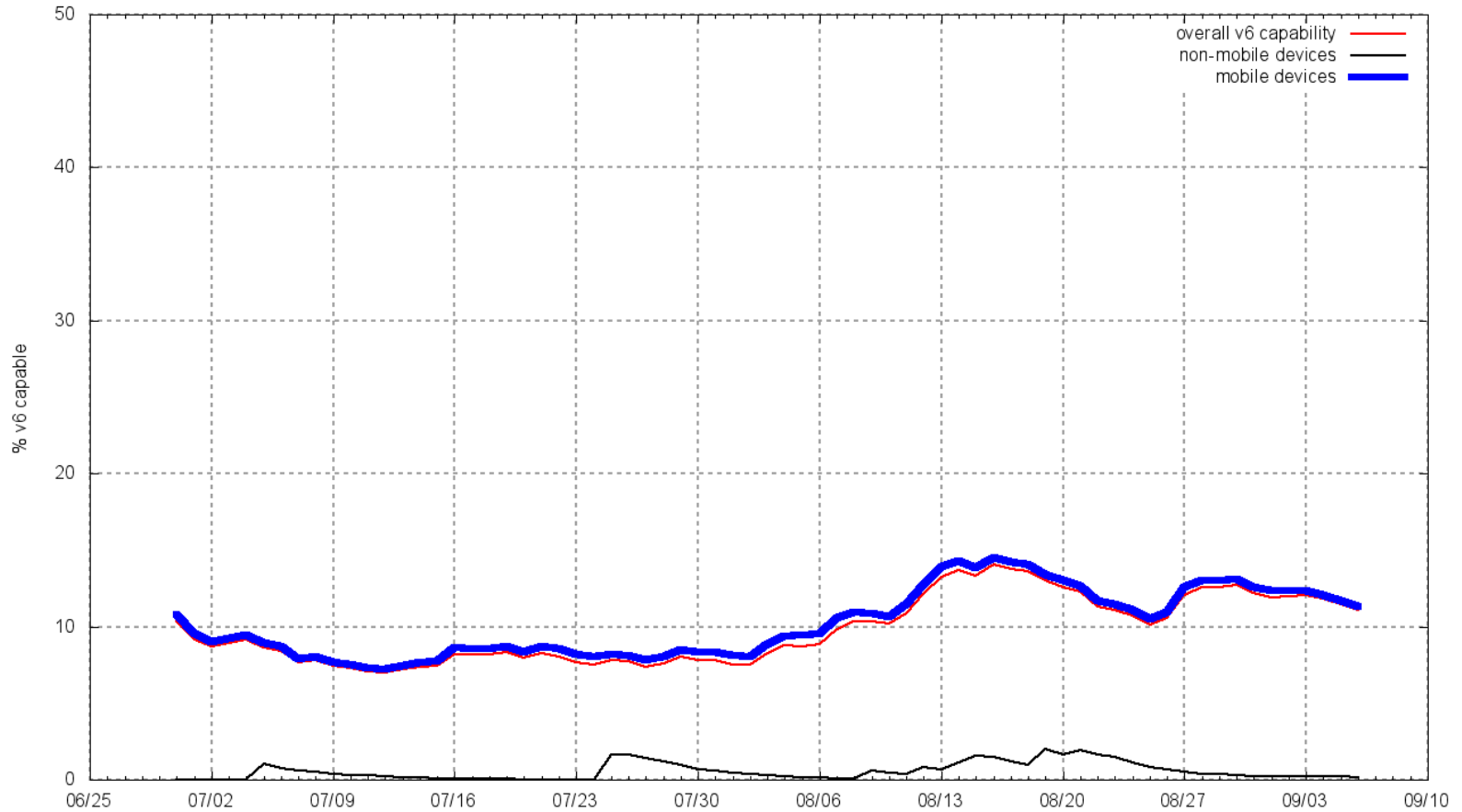
# S-K Telecom non-mobile IPv6





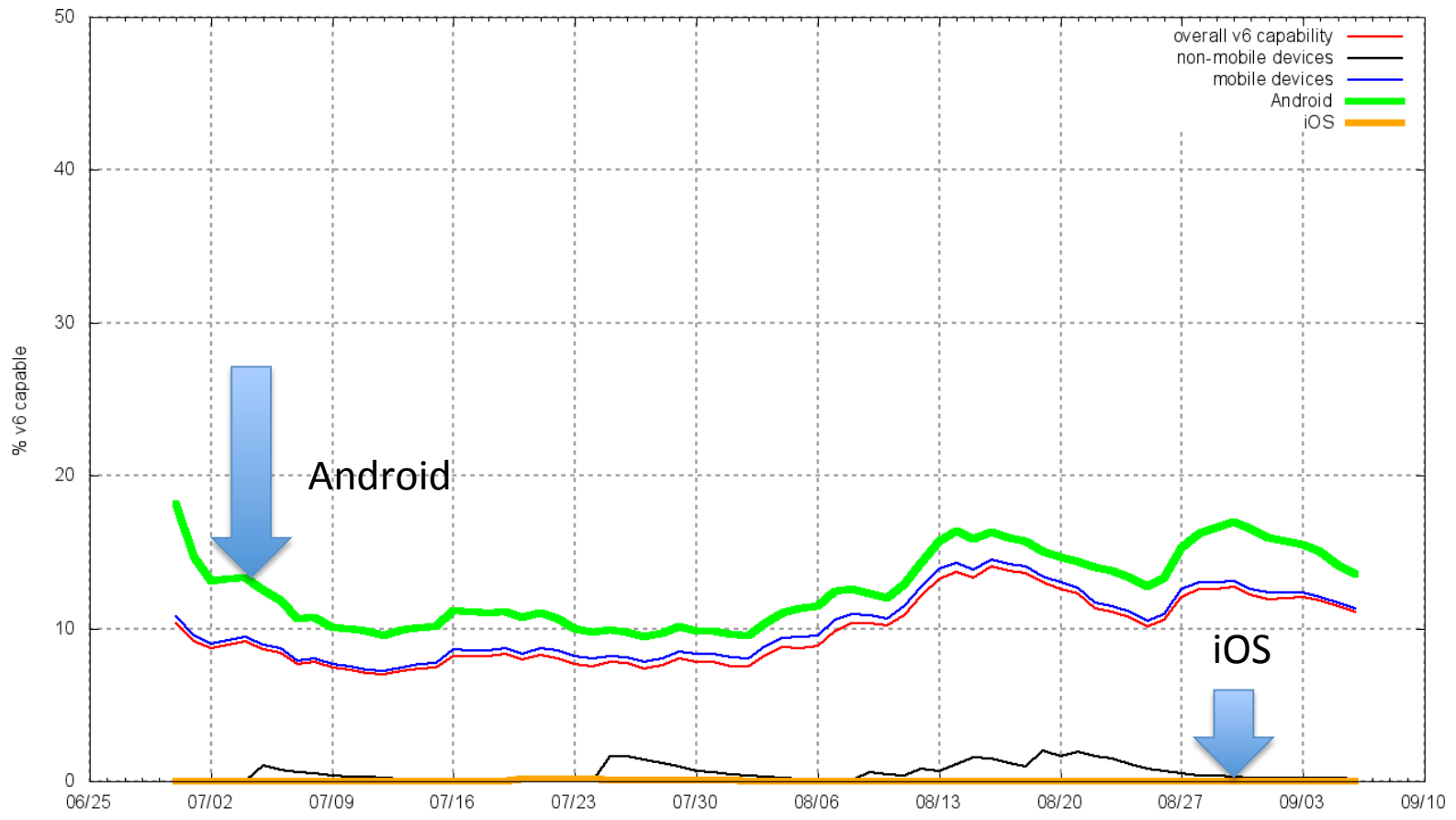
# S-K Telecom mobile IPv6

9644 SKTELECOM-NET-AS SK Telecom KR IPv6 capability



# S-K Telecom iOS/Android IPv6

9644 SKTELECOM-NET-AS SK Telecom KR IPv6 capability



# S-K Telecom

- Clear signal of 464xlat effect on iOS devices
- Lower overall penetration rate
- Technology deployment in cellular avoids pitfalls of legacy IPv4-only broadband deployments

# Can we see this signal anywhere else?

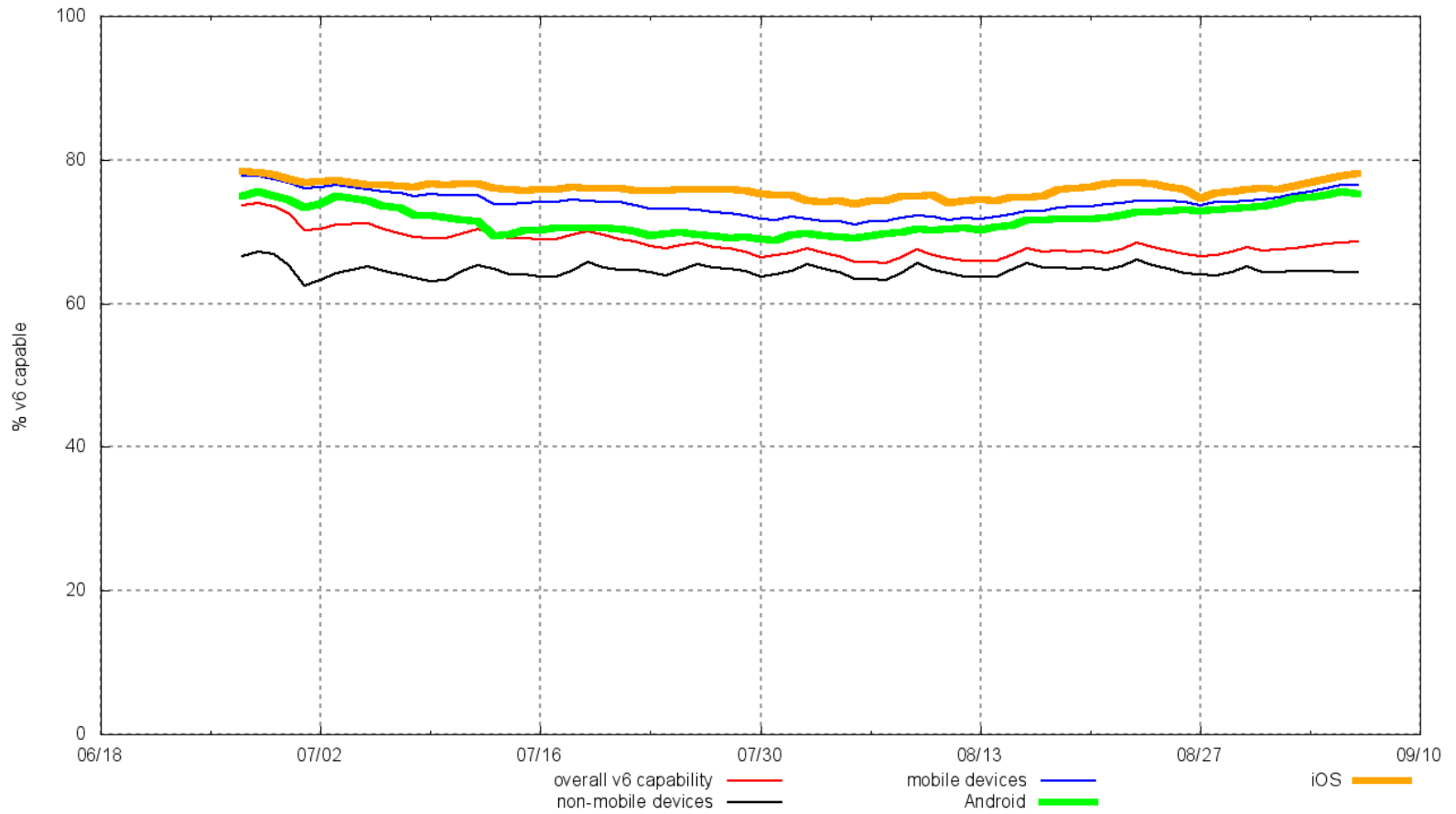
- High Android, Low iOS v6 capability is a strong signal of 464xlat deployment
- Contrast with roughly equalized IPv6 capability of true dual-stack Cellular, Cable & ADSL based deployments
  - no bias against iOS exists

# USA

- AT&T –both cellular and home service delivery
  - IPv6 deployment believed to be true dual-stack
- Verizon Cellular, some WiFi based services
  - True dual-stack IPv6 deployment on cellular/WiFi
- Comcast –large national cable provider
  - True dual-stack deployment on cable
  - Many legacy users
  - Has significant ‘triple play’ model in IPv6
- Sprint, mix of different services including T-1 backbone, Wireless, Cellular

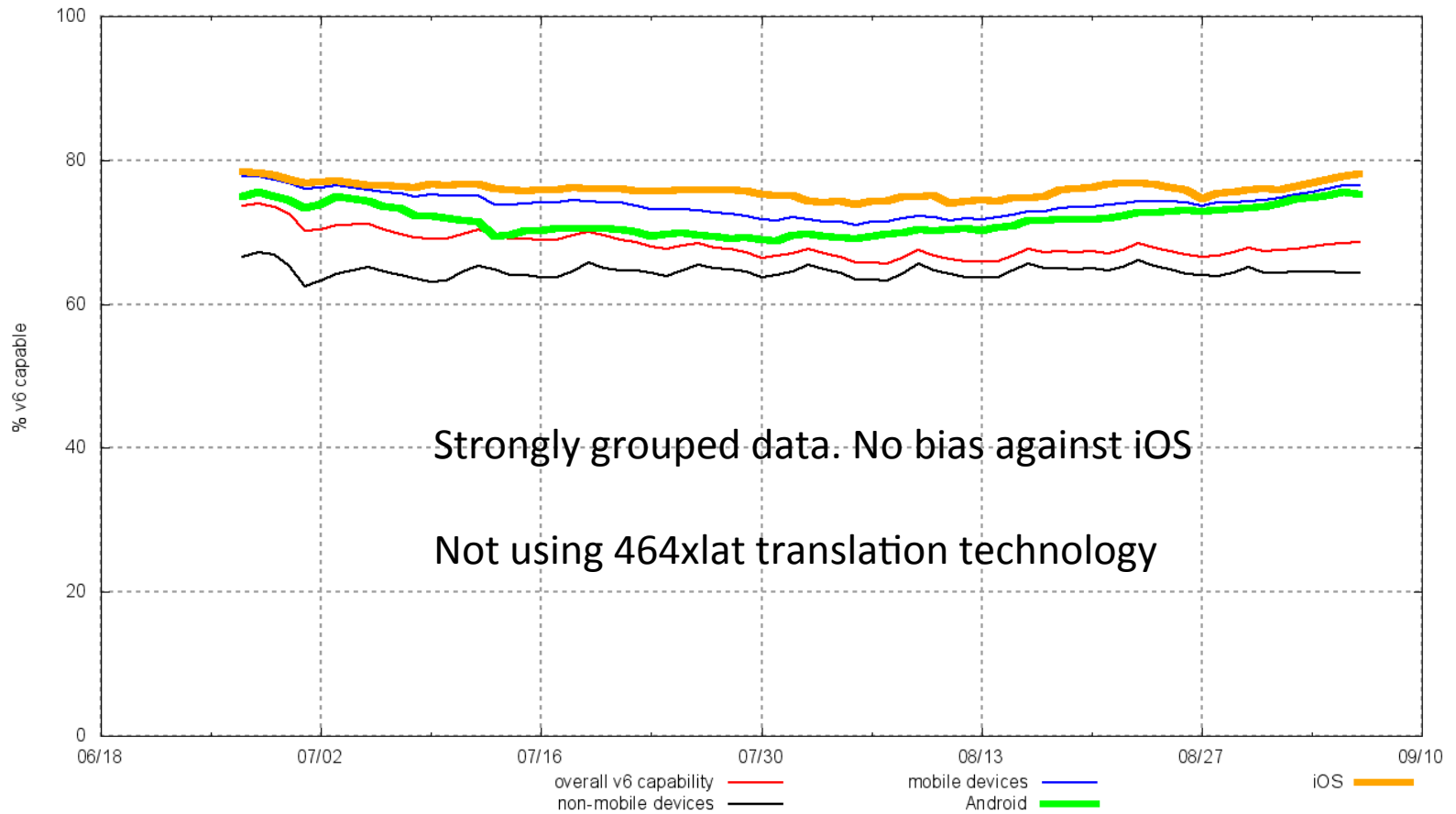
# AT&T

7018 ATT-INTERNET4 - ATT Services Inc. US IPv6 capability



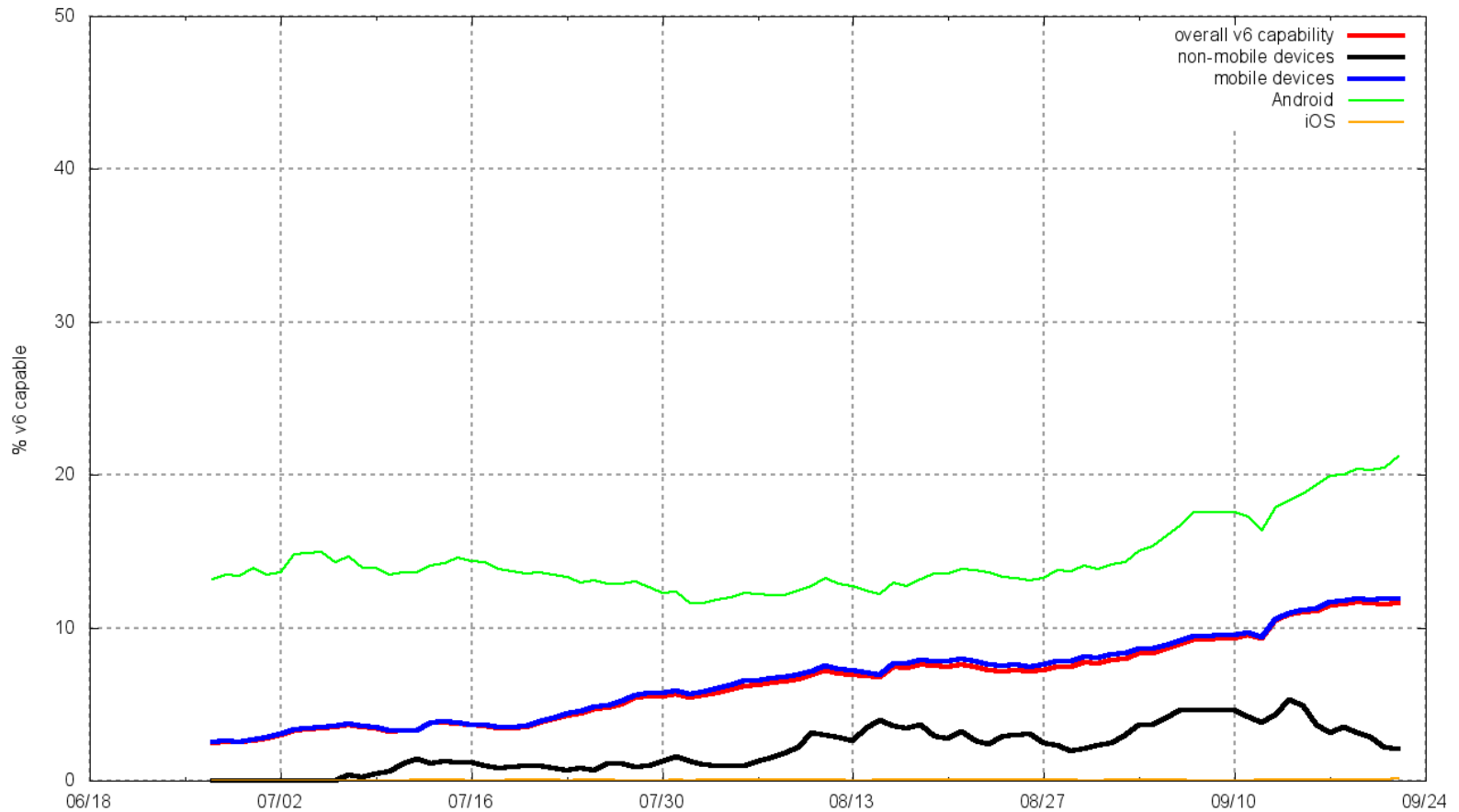
# AT&T

7018 ATT-INTERNET4 - ATT Services Inc. US IPv6 capability



# AS20057 AT&T Mobility

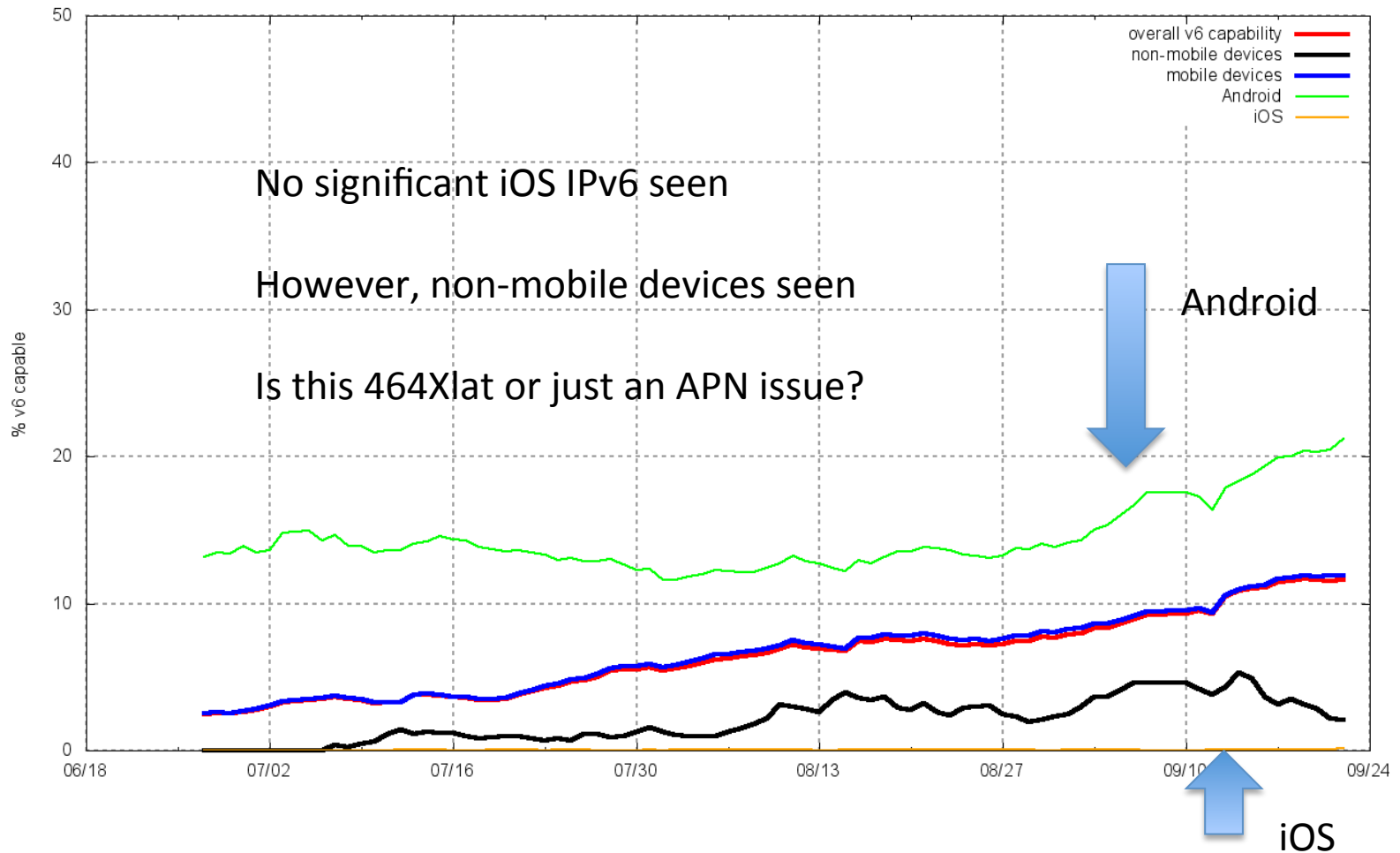
20057 ATT-MOBILITY-LLC-AS20057 - ATT Mobility LLC US IPv6 capability





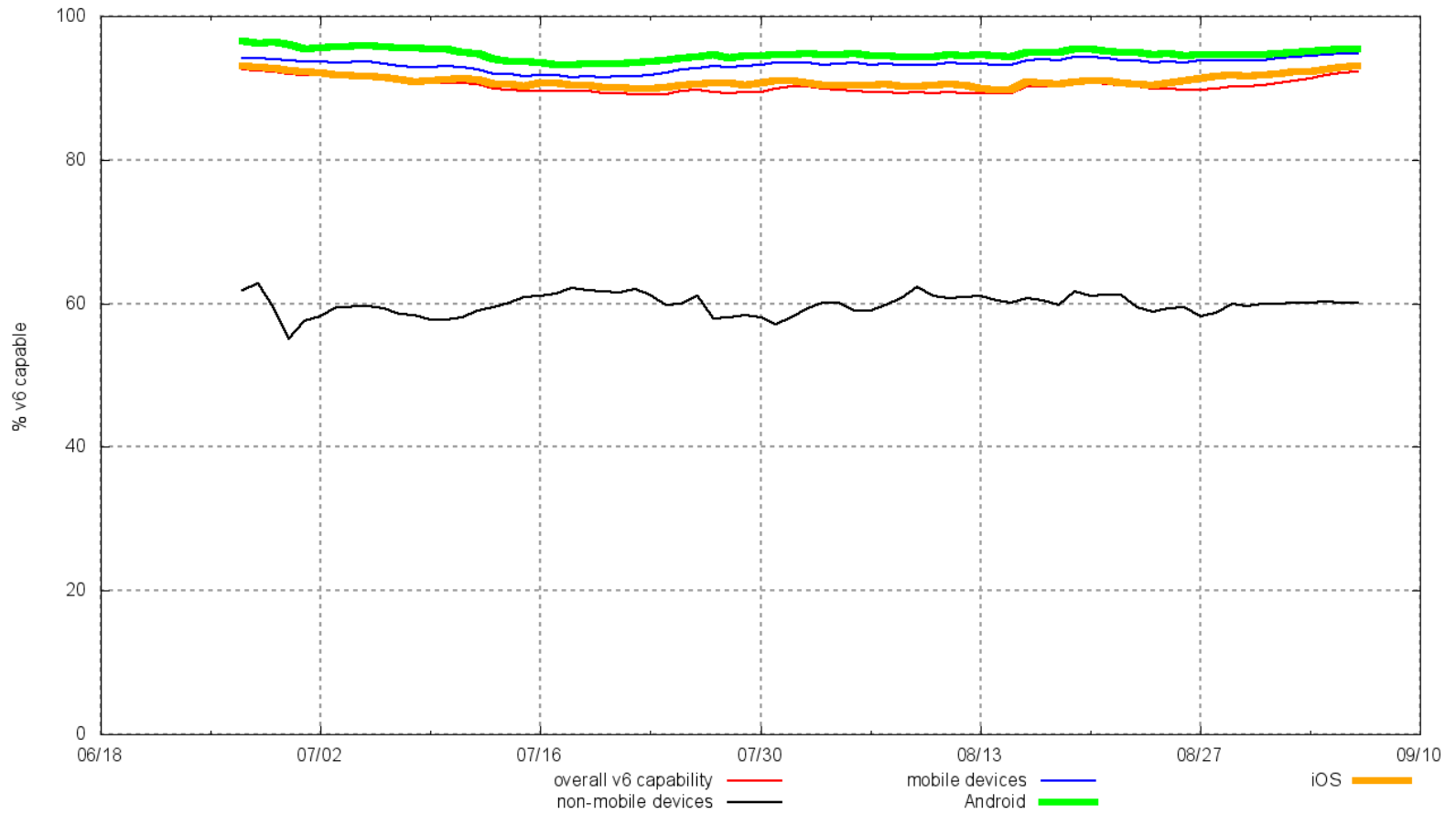
# AS20057 AT&T Mobility

20057 ATT-MOBILITY-LLC-AS20057 - ATT Mobility LLC US IPv6 capability



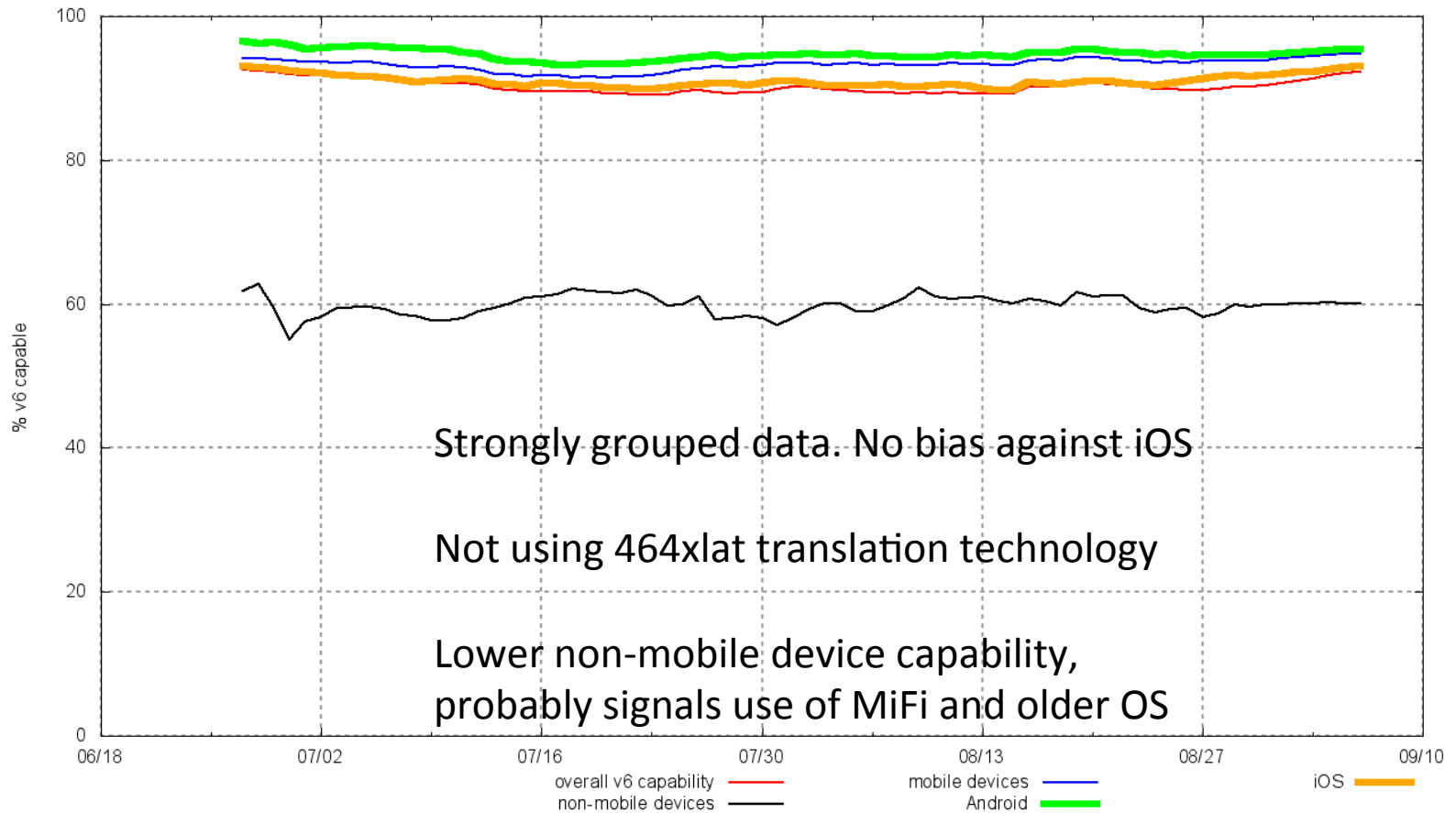
# Verizon

22394 CELLCO - Cellco Partnership DBA Verizon Wireless US IPv6 capability



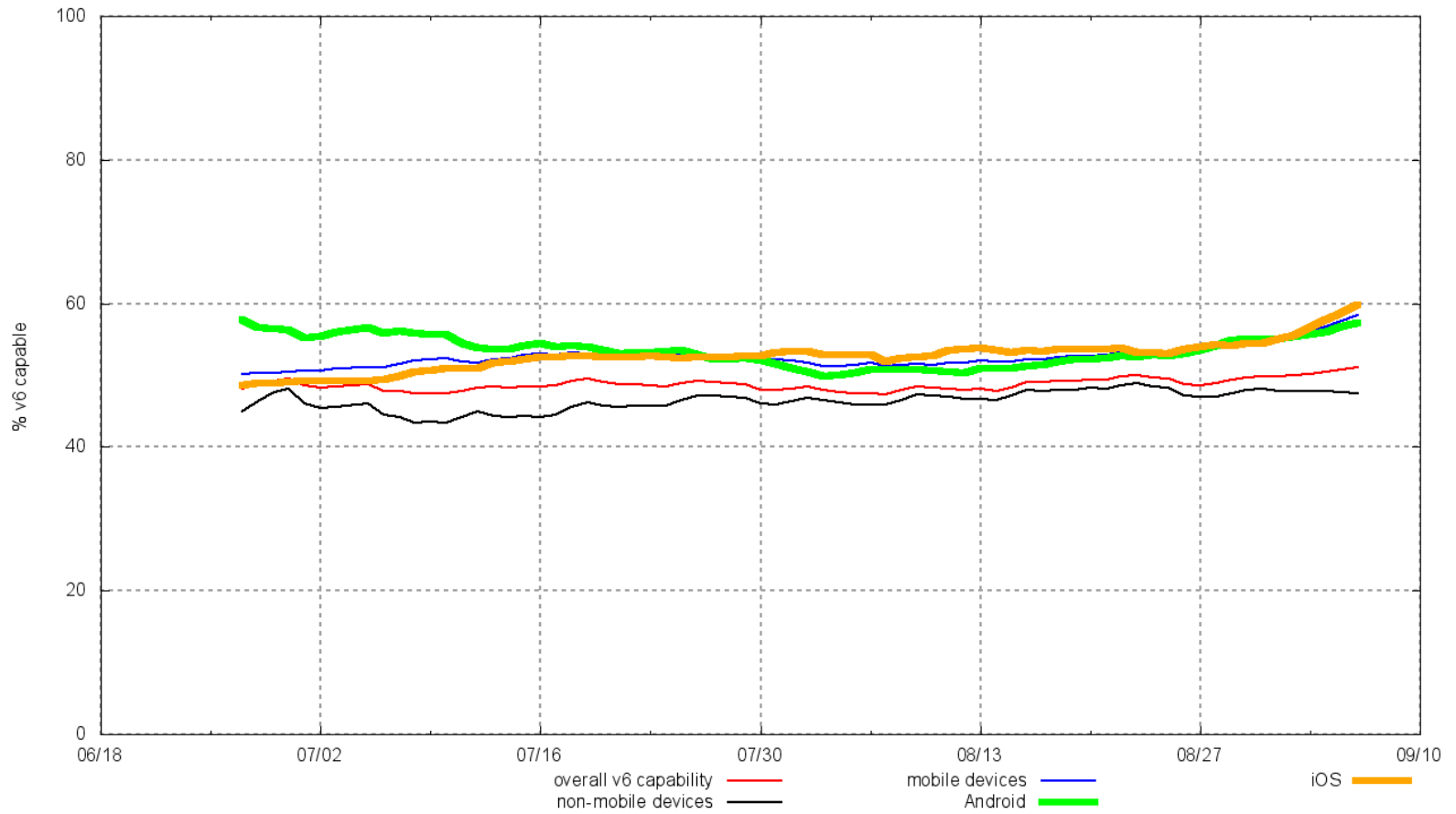
# Verizon

22394 CELLCO - Cellco Partnership DBA Verizon Wireless US IPv6 capability



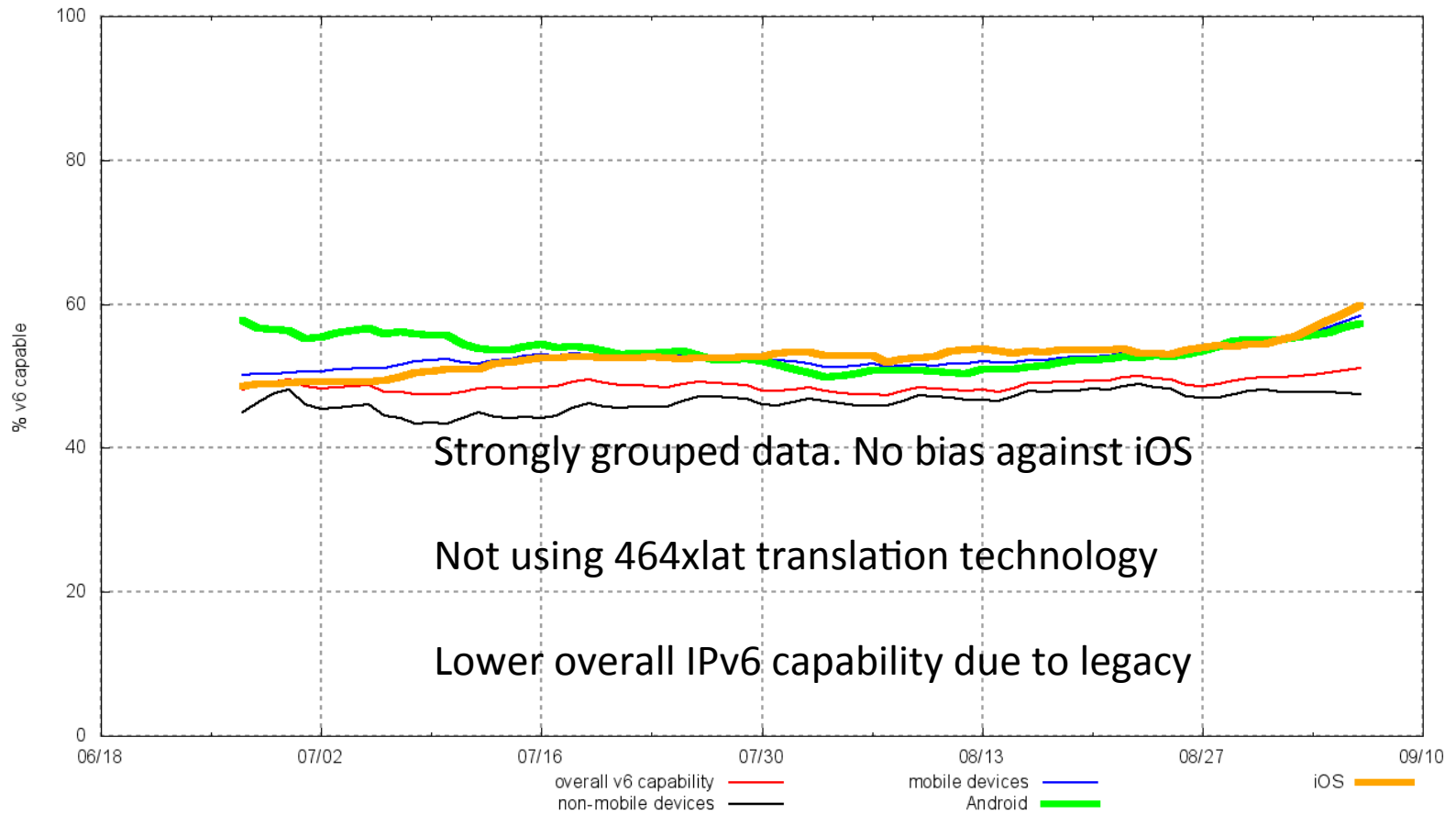
# Comcast

7922 COMCAST-7922 - Comcast Cable Communications Inc. US IPv6 capability

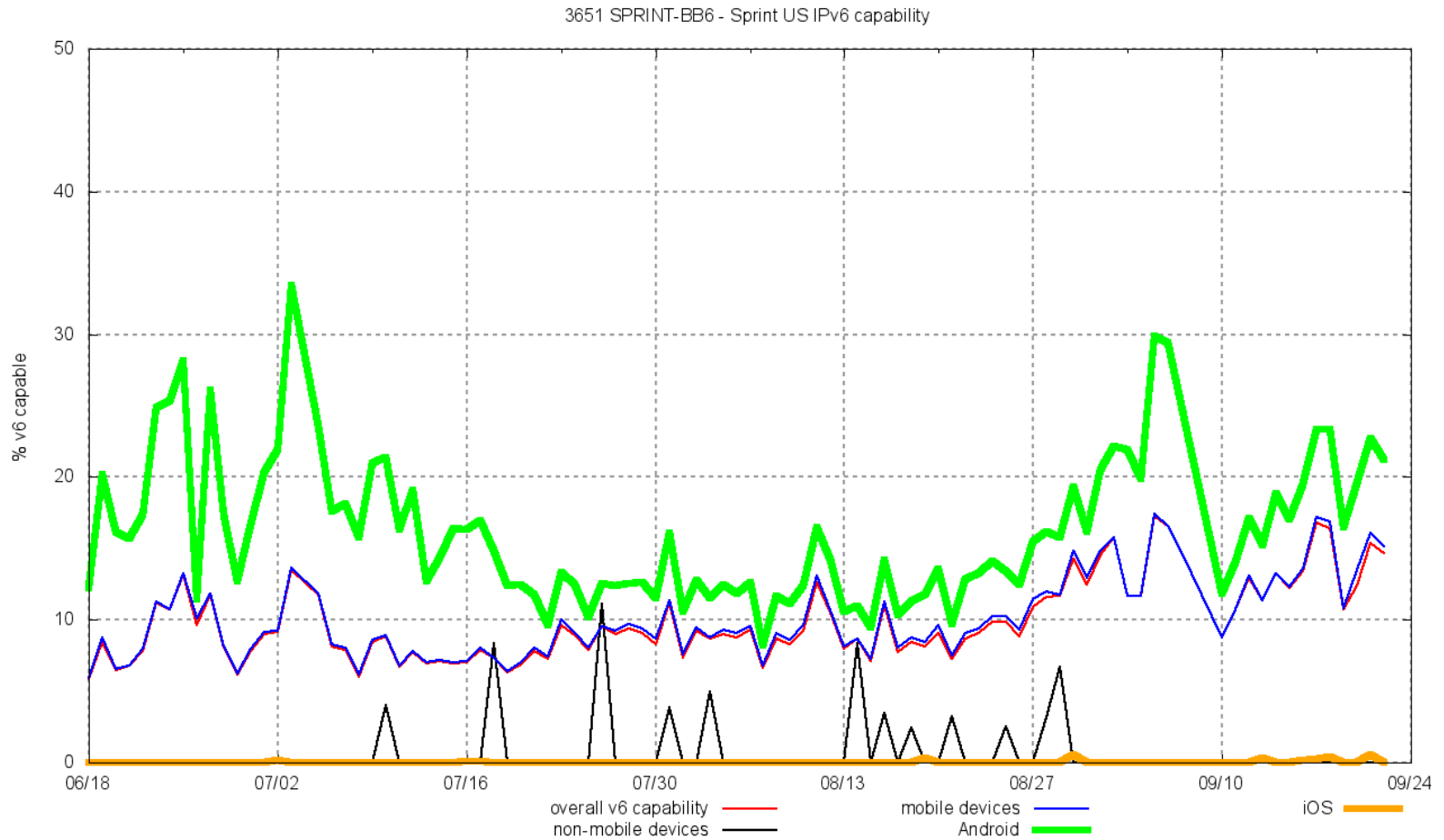


# Comcast

7922 COMCAST-7922 - Comcast Cable Communications Inc. US IPv6 capability

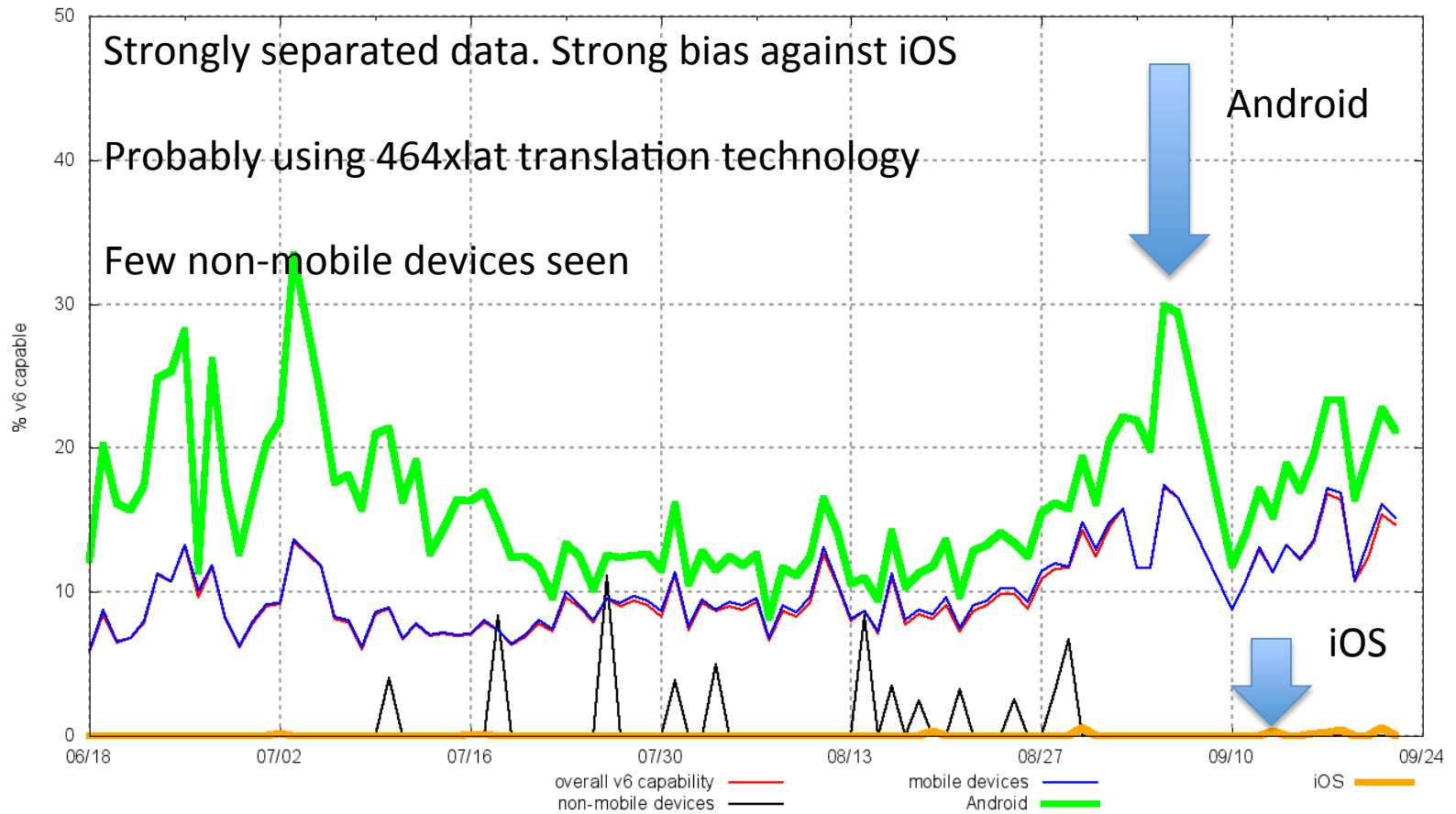


# AS3651 Sprint BB6



# AS3651 Sprint BB6

3651 SPRINT-BB6 - Sprint US IPv6 capability

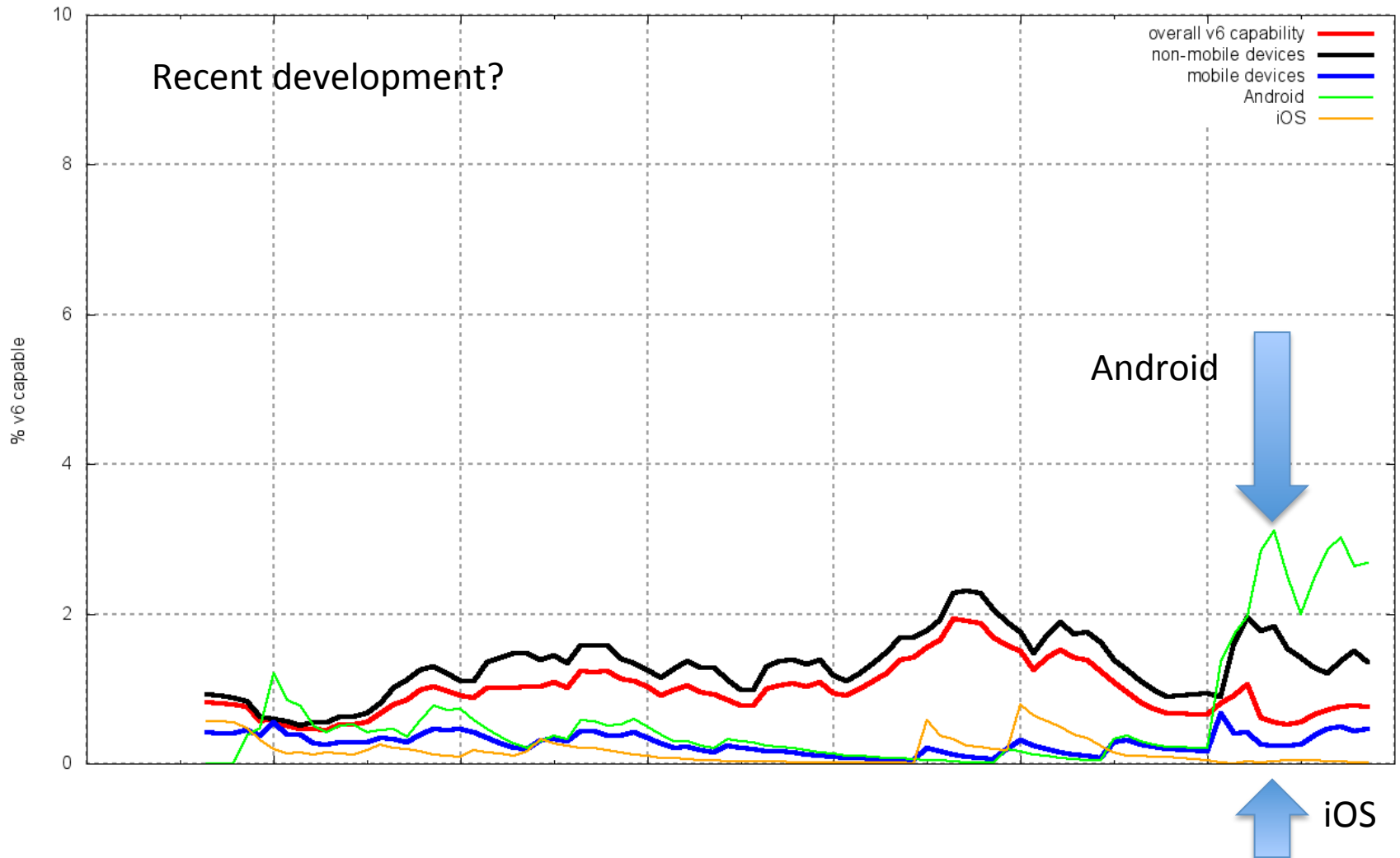


# Anywhere else?

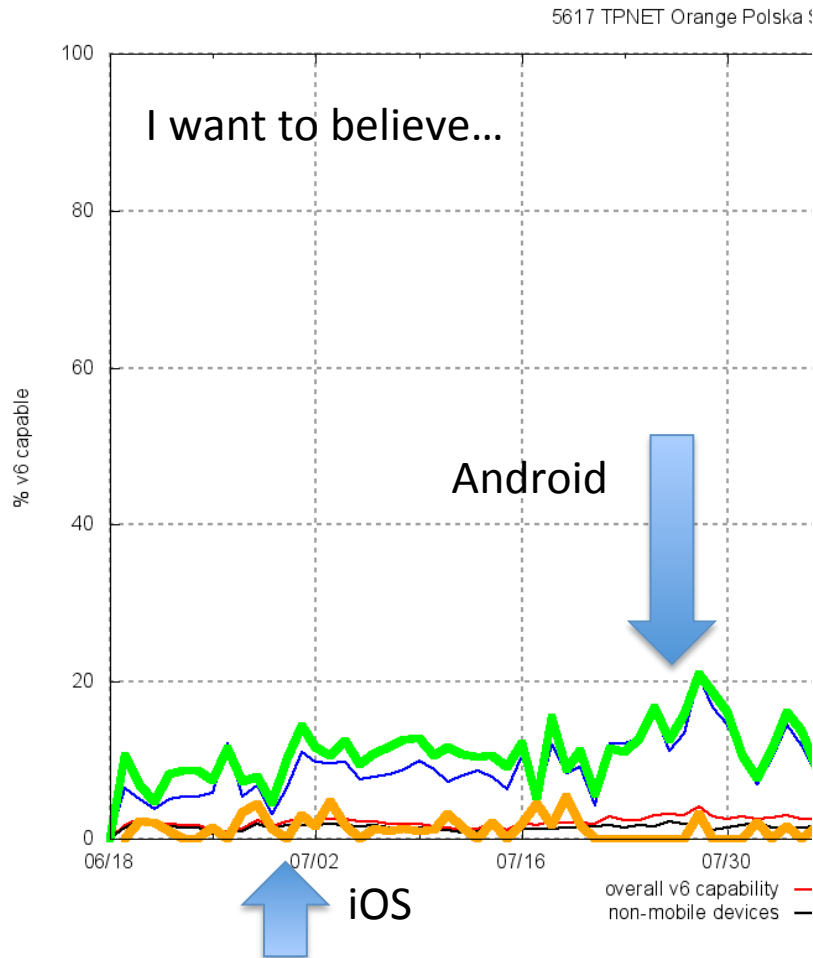
- Can we see signals in any other ASN?
- China Unicom
- Orange Poland



# China Unicom

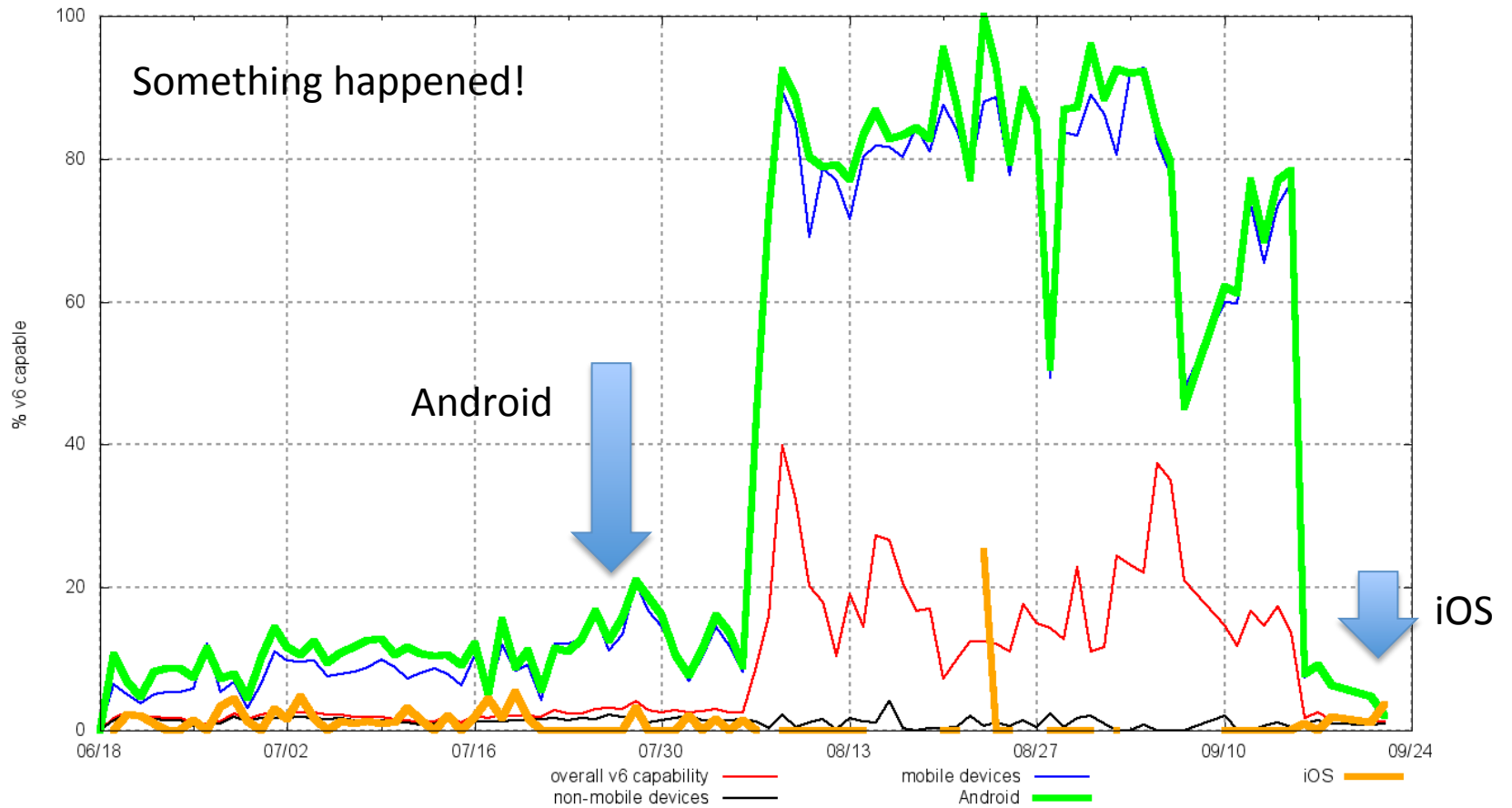


# Orange Poland



# Orange Poland

5617 TPNET Orange Polska Spolka Akcyjna PL IPv6 capability



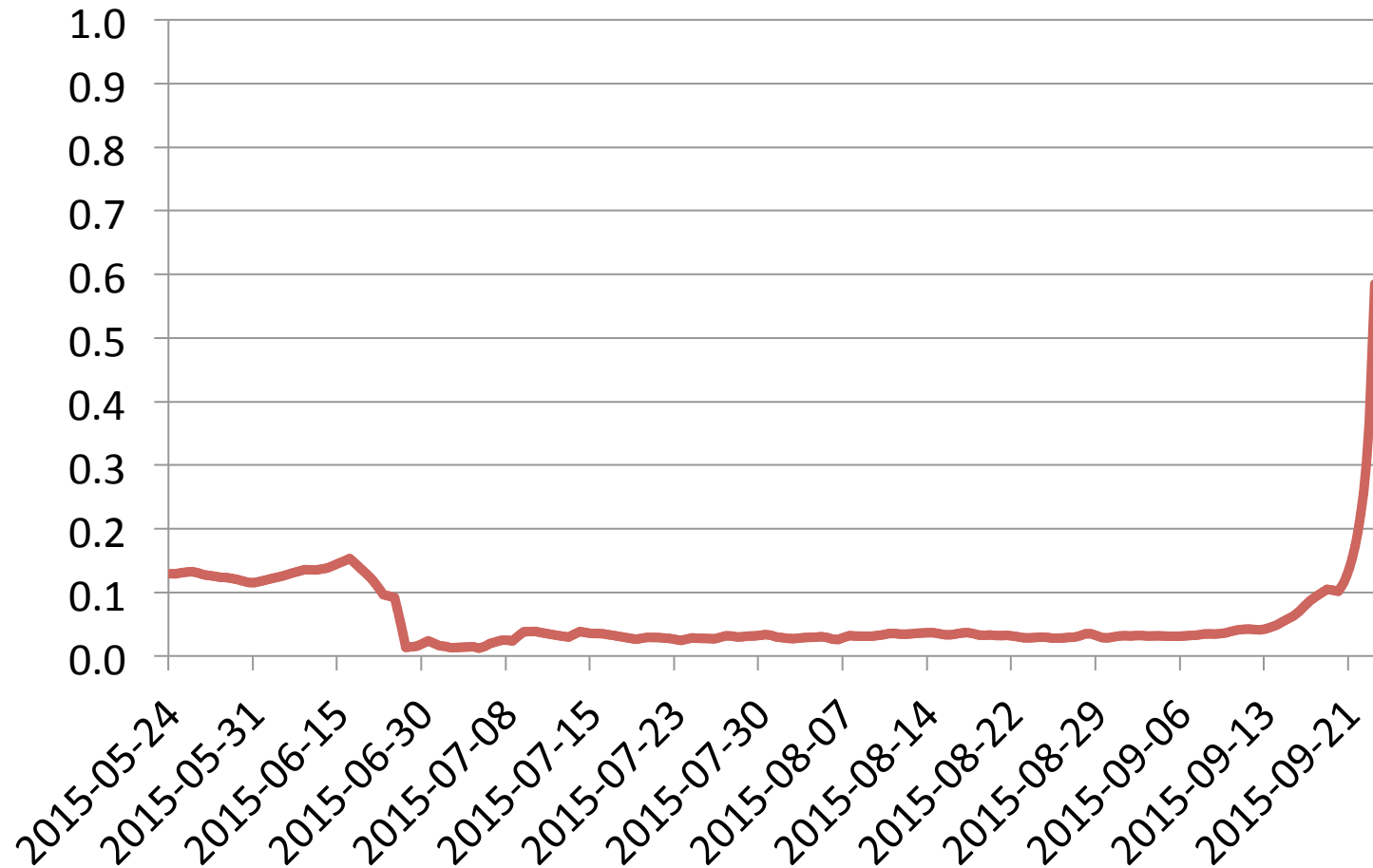
# LacNIC region

- Lets drill down into the LAC region footprint
- Find the top IPv6 enabled ASN across the membership
- Find the largest eyeball count ASN across the region
- Can we see significant deployment?

# LAC region, significant v6 capability

ASN	Entity name from WHOIS	CC	%cc	v6 capable (%)	samples
AS6147	Telefonica del Peru S.A.A.	PE	80.66	20.55	1686871
AS14420	CORPORACION NACIONAL DE TELECOMUNICACIONES - CNT EP	EC	45.16	12.89	390164
AS28573	NET Servios de Comunicacao S.A.	BR	24.1	11.9	877320
AS27839	Comteco Ltda	BO	19.98	16.76	51056
AS18881	Global Village Telecom	BR	17.04	15.87	620268
AS27699	TELEFNICA BRASIL S.A	BR	8.67	2.53	315593
AS14868	COPEL Telecom S.A.	BR	0.45	5.42	16298
AS28580	CILNET Comunicacao e Informatica LTDA.	BR	0.14	2.97	5054
AS1797	Uruguay, Universidad de la Republica	UY	0.1	32.16	227
AS28027	Escuela Superior Politecnica del Litoral	EC	0.07	34.75	587
AS53135	Nettel Telecomunicaes Ltda.	BR	0.05	2.93	1641
AS2716	Universidade Federal do Rio Grande do Sul	BR	0.05	17.7	1774
AS61440	Digital Energy Technologies Chile SpA	CL	0.05	18.28	651

# IPv6 Capability:UY



# IPv6 capability by ASN

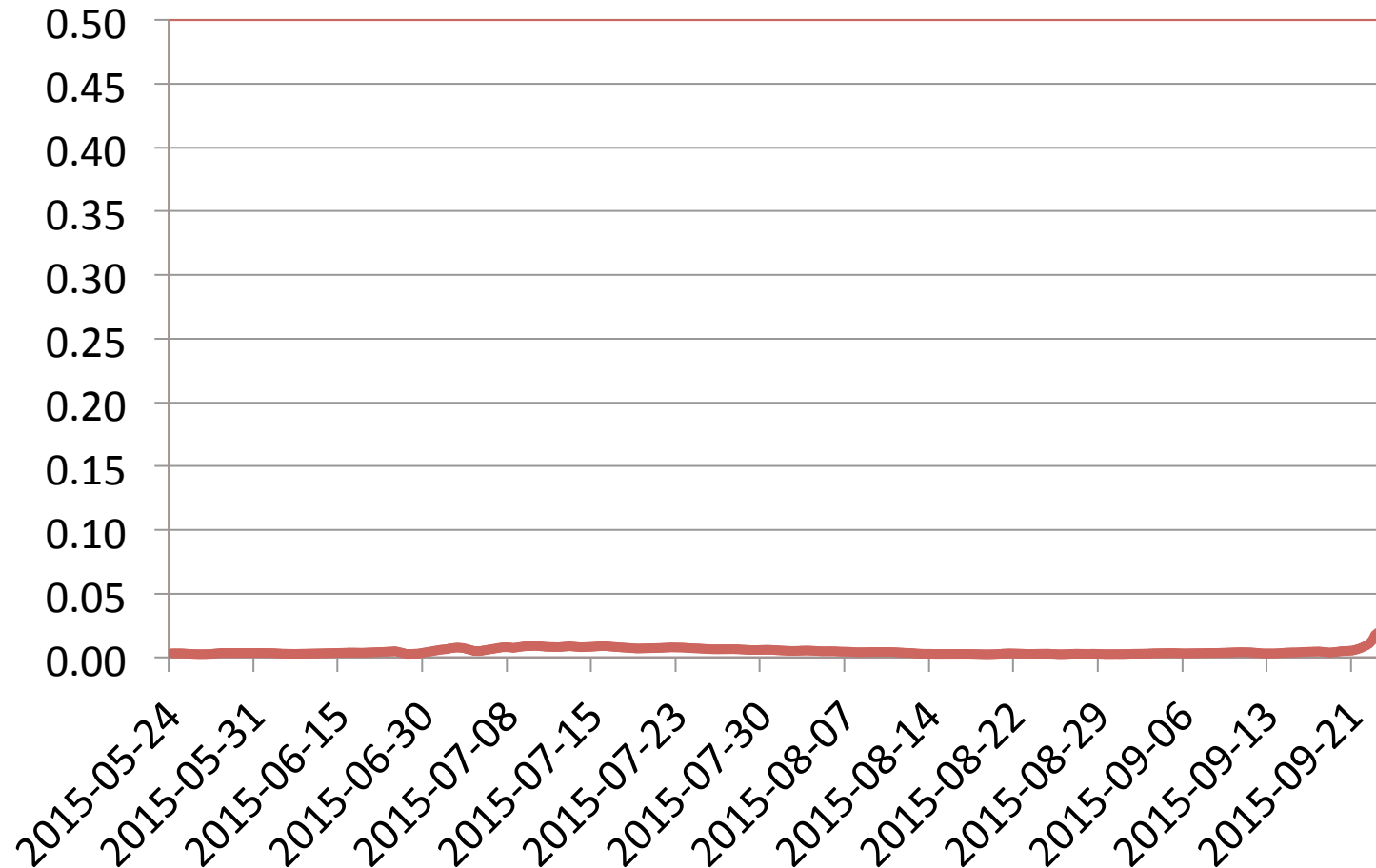
ASN	AS Name	IPv6 Capable	IPv6 Preferred	# Samples
AS1797	Uruguay , Universidad de la Republica	12.02%	11.86%	649
AS20255	Tecnowind S.A.	0.03%	0.02%	10692
AS6057	ANTEL	0.00%	0.00%	704642
AS19422	Telefonica Moviles del Uruguay SA	0.00%	0.00%	8788
AS52366	Lunamen S.A.	0.00%	0.00%	120
AS52241	Lunamen S.A.	0.00%	0.00%	1357
AS20002	Telstar S.A.	0.00%	0.00%	484
AS14234	ZONAMERICA	0.00%	0.00%	1683

# ASN ranked by eyeball share

ASN	AS Name	IPv6 Capable	IPv6 Preferred	Eyeball share
AS6057	ANTEL	0.00%	0.00%	96.73%
AS20255	Tecnowind S.A.	0.03%	0.02%	1.47%
AS19422	Telefonica Moviles del Uruguay SA	0.00%	0.00%	1.21%
AS14234	ZONAMERICA	0.00%	0.00%	0.23%
AS52241	Lunamen S.A.	0.00%	0.00%	0.19%
AS1797	Uruguay , Universidad de la Republica	12.02%	11.86%	0.09%
AS20002	Telstar S.A.	0.00%	0.00%	0.07%
AS52366	Lunamen S.A.	0.00%	0.00%	0.02%



# IPv6 Capability:VE



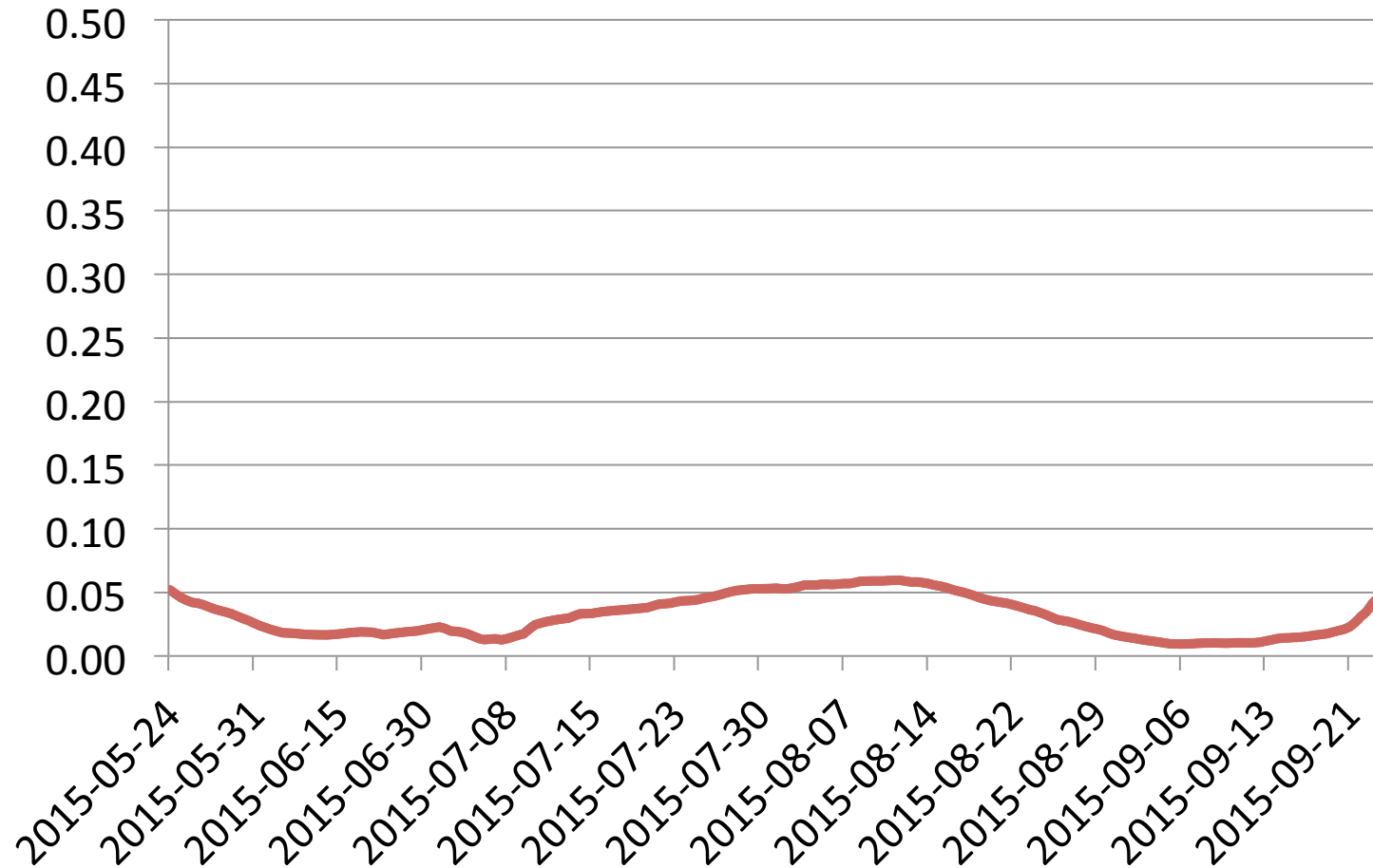
# IPv6 capability by ASN

ASN	AS Name	IPv6 Capable	IPv6 Preferred	# Samples
AS27808	Centro Nacional de Tecnologas de Informacin (CNTI)	32.64%	30.57%	193
AS19192	Universidad Central de Venezuela	3.21%	3.13%	2489
AS20312	Fundacin Centro Nacional de Innovacin Tecnolgica (CENIT)	1.07%	1.04%	3188
AS28007	Gold Data C.A.	0.65%	0.63%	14016
AS22313	Supercable	0.03%	0.00%	18499
AS27717	Corporacion Digitel C.A.	0.02%	0.00%	71724
AS27889	Telecomunicaciones MOVILNET	0.02%	0.00%	19182
AS6306	TELEFONICA VENEZOLANA, C.A.	0.01%	0.00%	145437
AS8048	CANTV Servicios, Venezuela	0.01%	0.00%	4893564
AS21826	Corporacin Telemic C.A.	0.01%	0.00%	585387

# ASN ranked by eyeball share

ASN	AS Name	IPv6 Capable	IPv6 Preferred	Eyeball share
AS8048	CANTV Servicios, Venezuela	0.01%	0.00%	83.56%
AS21826	Corporacin Telemic C.A.	0.01%	0.00%	10.00%
AS6306	TELEFONICA VENEZOLANA, C.A.	0.01%	0.00%	2.48%
AS27717	Corporacion Digitel C.A.	0.02%	0.00%	1.22%
AS11562	Net Uno, C.A.	0.00%	0.00%	0.80%
AS27889	Telecomunicaciones MOVILNET	0.02%	0.00%	0.33%
AS22313	Supercable	0.03%	0.00%	0.32%
AS28007	Gold Data C.A.	0.65%	0.63%	0.24%
AS52281	Omnivision C.A.	0.00%	0.00%	0.19%
AS52320	GlobeNet Cabos Submarinos VZLA, S.A.	0.00%	0.00%	0.18%

# IPv6 Capability:CL



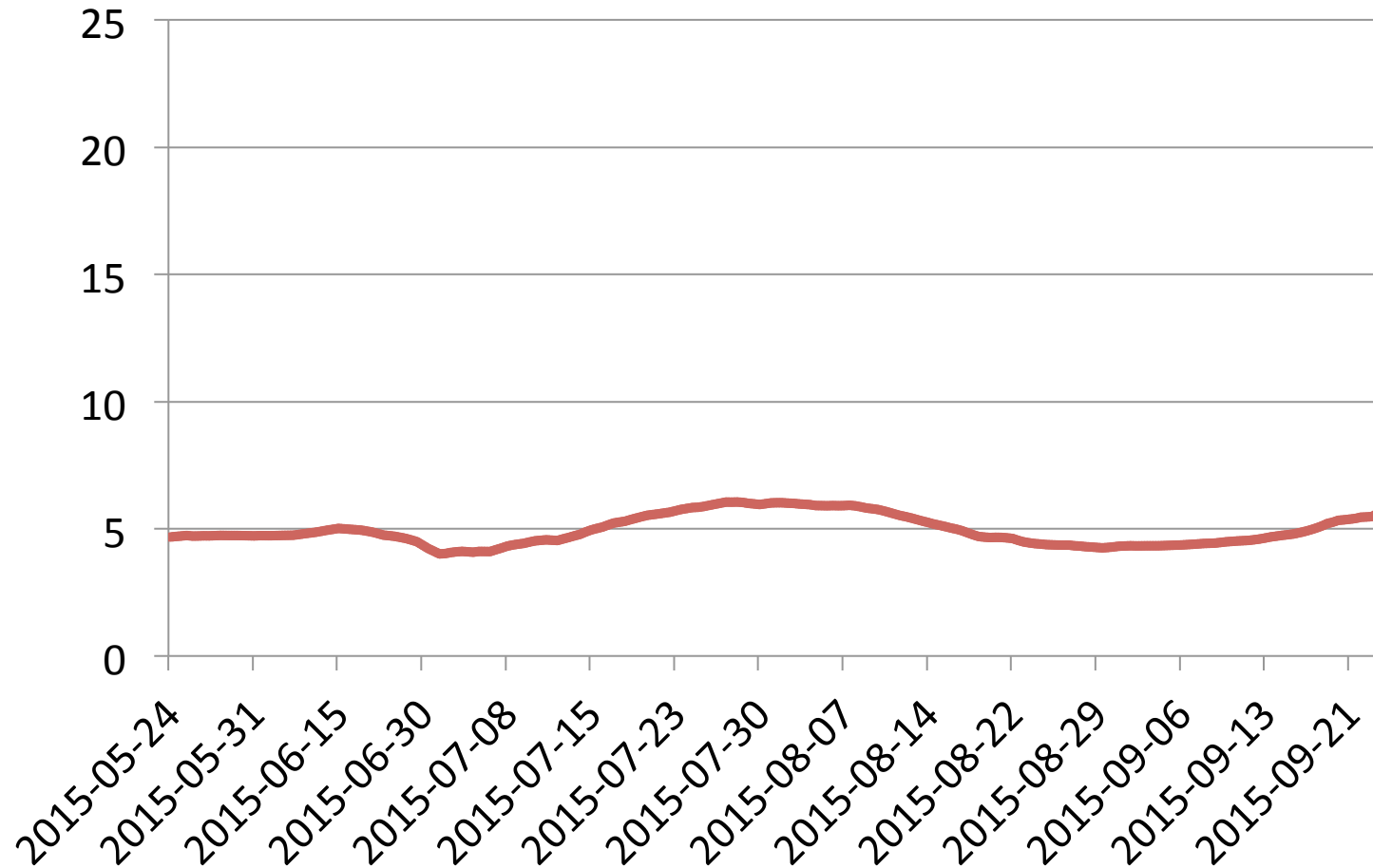
# IPv6 capability by ASN

ASN	AS Name	IPv6 Capable	IPv6 Preferred	# Samples
AS52489	TELEFNICA CHILE S.A.	56.15%	56.11%	2675
AS20191	Pontificia Universidad Catolica de Chile	1.61%	1.56%	5511
AS27659	Ingeniera e Informtica Asociada Ltda (IIA Ltda)	0.50%	0.47%	3429
AS11340	Red Universitaria Nacional	0.29%	0.26%	10266
AS14318	PSINet Chile	0.21%	0.00%	468
AS14259	Gtd Internet S.A.	0.19%	0.19%	70118
AS6429	Telmex Chile Internet S.A.	0.05%	0.01%	43762
AS27995	CLARO CHILE S.A.	0.05%	0.00%	36420
AS27925	Entel PCS Telecomunicaciones S.A.	0.03%	0.00%	178833
AS27836	Smartcom	0.02%	0.00%	14930

# ASN ranked by eyeball share

ASN	AS Name	IPv6 Capable	IPv6 Preferred	Eyeball share
AS7418	TELEFNICA CHILE S.A.	0.00%	0.00%	32.12%
AS22047	VTR BANDA ANCHA S.A.	0.00%	0.00%	30.83%
AS6535	Telmex Servicios Empresariales S.A.	0.00%	0.00%	8.46%
AS14117	Telefonica del Sur S.A.	0.00%	0.00%	6.10%
AS6471	ENTEL CHILE S.A.	0.00%	0.00%	4.14%
AS27925	Entel PCS Telecomunicaciones S.A.	0.03%	0.00%	3.86%
AS27680	TELEFONICA MOVIL DE CHILE S.A.	0.02%	0.00%	2.76%
AS18822	Manquehuenet	0.00%	0.00%	1.60%
AS27901	Pacifico Cable S.A.	0.00%	0.00%	1.59%
AS14259	Gtd Internet S.A.	0.19%	0.19%	1.51%

# IPv6 Capability:EC



# IPv6 capability by ASN

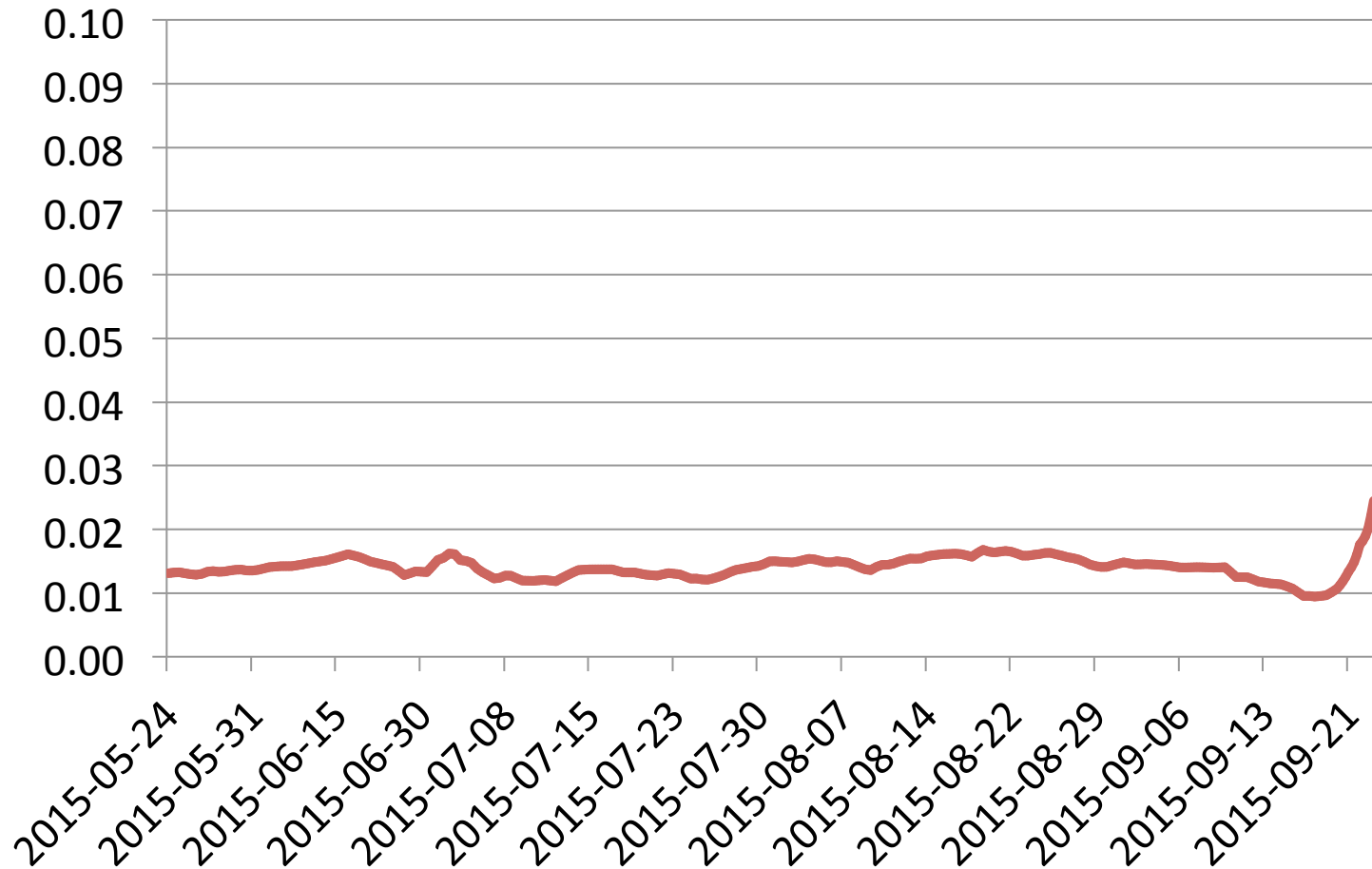
ASN	AS Name	IPv6 Capable	IPv6 Preferred	# Samples
AS28027	Escuela Superior Politecnica del Litoral	36.80%	36.51%	1671
AS52343	Universidad Tecnologica Equinoccial	36.63%	3.30%	303
AS14420	CORPORACION NACIONAL DE TELECOMUNICACIONES - CNT EP	10.71%	10.11%	1172850
AS263174	NOVANET	1.03%	0.26%	388
AS27947	Telconet S.A	0.22%	0.21%	363647
AS262212	Escuela Politecnica Nacional	0.21%	0.10%	964
AS52238	SPEEDYCOM	0.03%	0.00%	6438
AS27668	ETAPA EP	0.01%	0.01%	107239
AS23487	CONECCEL	0.01%	0.00%	82712
AS22724	PUNTONET S.A.	0.01%	0.00%	92353



# ASN ranked by eyeball share

ASN	AS Name	IPv6 Capable	IPv6 Preferred	Eyeball share
AS14420	CORPORACION NACIONAL DE TELECOMUNICACIONES - CNT EP	10.71%	10.11%	47.29%
AS27947	Telconet S.A	0.22%	0.21%	14.66%
AS14522	Satnet	0.00%	0.00%	11.47%
AS27738	Ecuadortelecom S.A.	0.00%	0.00%	7.63%
AS27668	ETAPA EP	0.01%	0.01%	4.32%
AS22724	PUNTONET S.A.	0.01%	0.00%	3.72%
AS23487	CONECCEL	0.01%	0.00%	3.33%
AS19114	Otecel S.A.	0.00%	0.00%	2.70%
AS28006	CORPORACION NACIONAL DE TELECOMUNICACIONES - CNT EP	0.00%	0.00%	2.01%
AS27765	TRANSNEXA S.A. E.M.A.	0.01%	0.01%	0.78%

# IPv6 Capability:AR



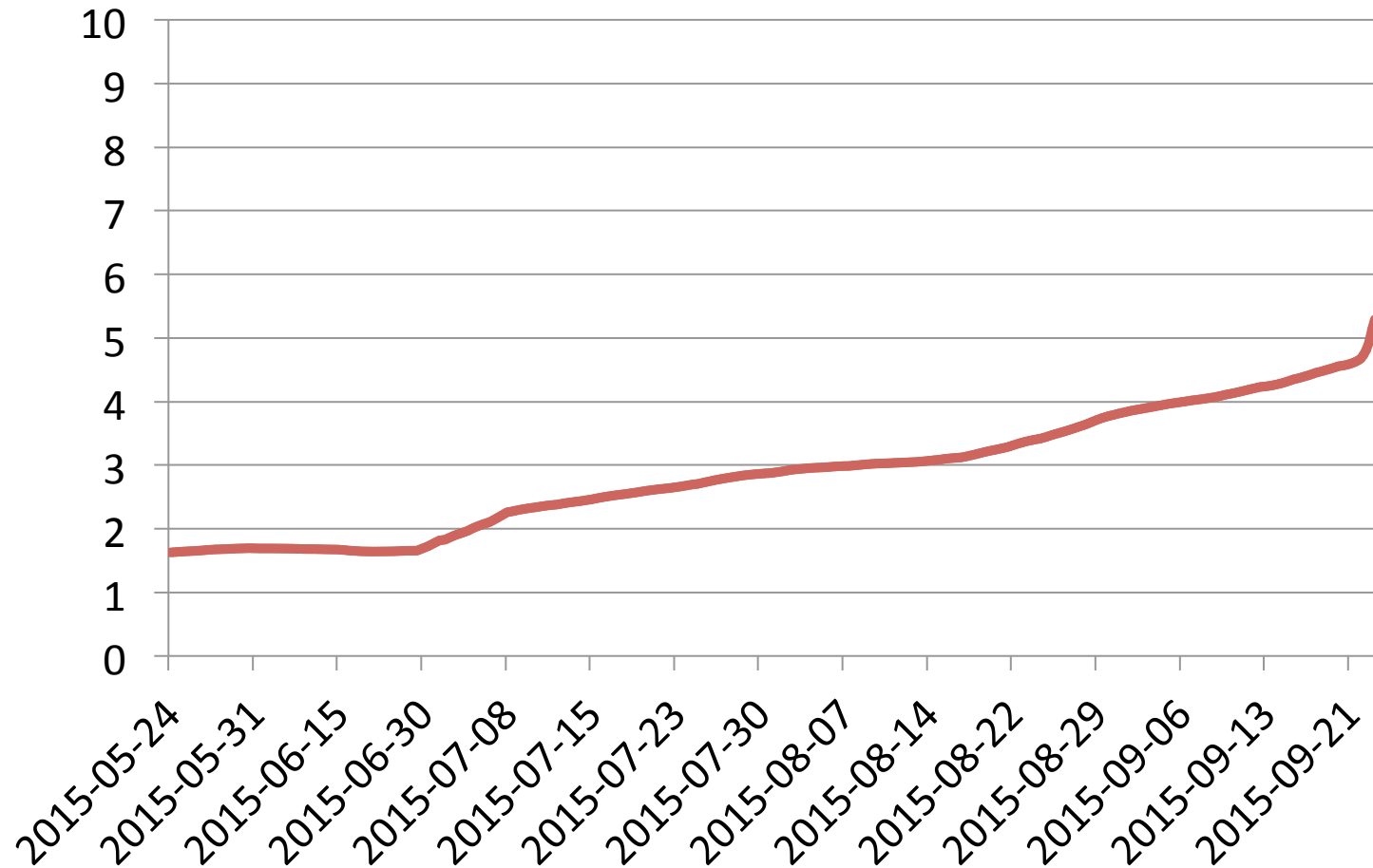
# IPv6 capability by ASN

ASN	AS Name	IPv6 Capable	IPv6 Preferred	# Samples
AS3449	Universidad Nacional de Buenos Aires	4.23%	4.23%	213
AS11815	Cooperativa Telefonica de V.G.G. Ltda.	0.98%	0.96%	16071
AS27790	Universidad Nacional de Cordoba	0.86%	0.49%	816
AS5692	Universidad Nacional de La Plata	0.47%	0.47%	634
AS27988	Servicios y Telecomunicaciones S.A.	0.38%	0.00%	261
AS28026	Grape S.A.	0.37%	0.37%	542
AS27883	Universidad Tecnologica Nacional	0.36%	0.36%	280
AS27875	Universidad Nacional de Cuyo	0.25%	0.25%	399
AS16814	NSS S.A.	0.16%	0.15%	52399
AS3597	Fundacin InnovaT	0.13%	0.13%	784

# ASN ranked by eyeball share

ASN	AS Name	IPv6 Capable	IPv6 Preferred	Eyeball share
AS7303	Telecom Argentina S.A.	0.00%	0.00%	25.75%
AS22927	Telefonica de Argentina	0.00%	0.00%	23.53%
AS10318	CABLEVISION S.A.	0.04%	0.02%	15.46%
AS10481	Prima S.A.	0.02%	0.01%	7.12%
AS27747	Telecentro S.A.	0.05%	0.05%	5.85%
AS11664	Techtel LMDS Comunicaciones Interactivas S.A.	0.01%	0.00%	1.86%
AS20207	Gigared S.A.	0.01%	0.01%	1.66%
AS19037	AMX Argentina S.A.	0.02%	0.00%	1.31%
AS27813	Teledifusora S.A.	0.00%	0.00%	1.06%
AS16814	NSS S.A.	0.16%	0.15%	0.82%

# IPv6 Capability:BR



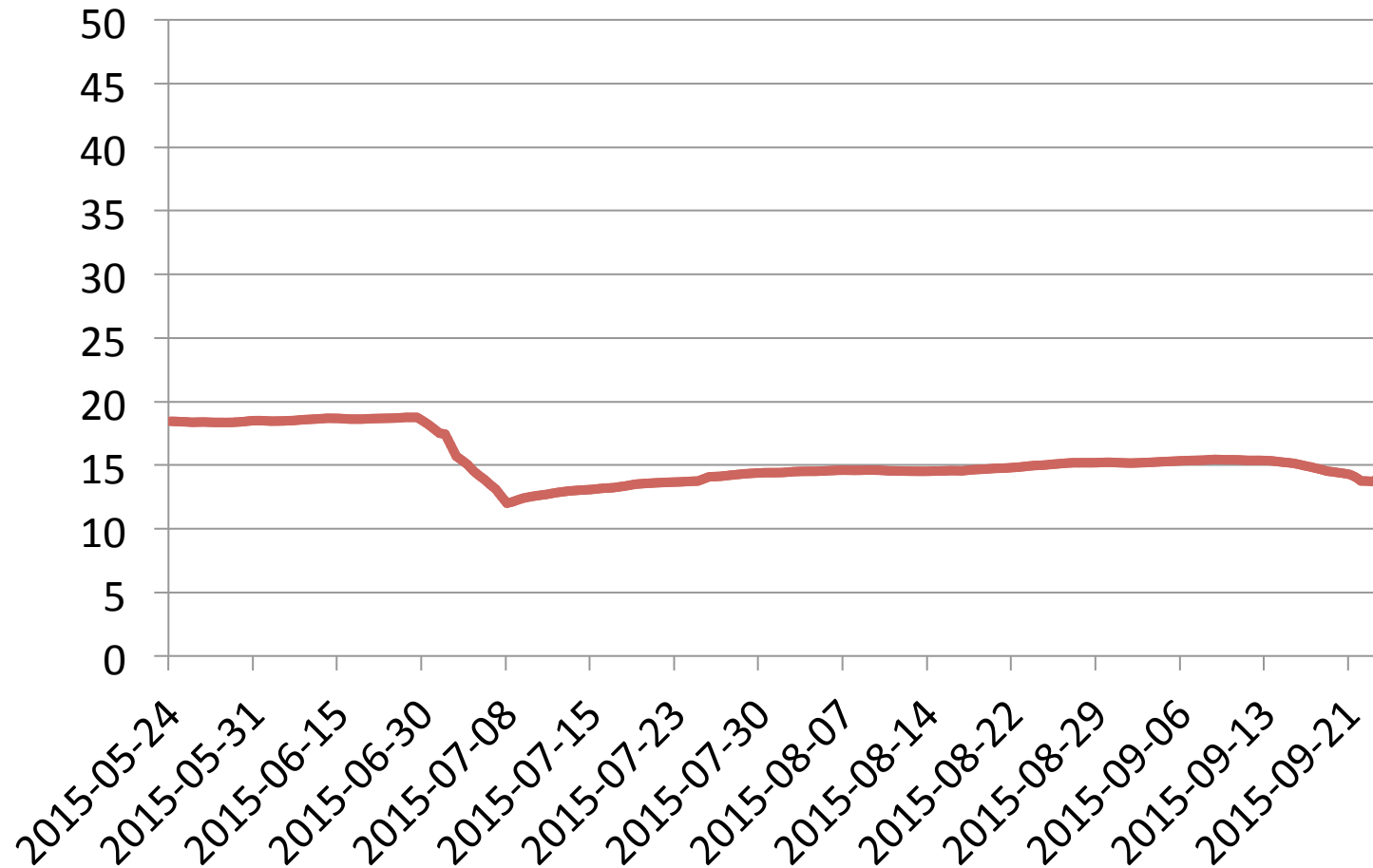
# IPv6 capability by ASN

ASN	AS Name	IPv6 Capable	IPv6 Preferred	# Samples
AS53046	UNIVERSIDADE ESTADUAL DE PONTA GROSSA	87.74%	80.19%	106
AS263083	FUNDACAO PARQUE TECNOLOGICO ITAIPU - BRASIL	82.35%	81.57%	255
AS263300	Universidade Federal de Santa Catarina	44.67%	43.88%	1397
AS11706	Terra Networks Brasil S.A.	26.84%	24.74%	190
AS53166	UNIVERSIDADE ESTADUAL PAULISTA	25.68%	21.58%	2391
AS262441	Fund. Vale do Taquari de Educ. e Desenvolv. Social	22.93%	22.93%	641
AS52694	N. A. INFORMATICA LTDA	18.12%	14.77%	149
AS2716	Universidade Federal do Rio Grande do Sul	16.21%	15.68%	5249
AS52985	Microsoft Informatica Ltda	16.10%	6.78%	118
AS52888	UNIVERSIDADE FEDERAL DE SAO	12.80%	12.06%	504

# ASN ranked by eyeball share

ASN	AS Name	IPv6 Capable	IPv6 Preferred	Eyeball share
AS28573	NET Servios de Comunicacao S.A.	9.44%	9.01%	22.43%
AS18881	Global Village Telecom	8.73%	7.42%	16.95%
AS7738	Telemar Norte Leste S.A.	0.43%	0.41%	11.62%
AS27699	TELEFNICA BRASIL S.A	2.77%	2.40%	9.79%
AS8167	Brasil Telecom SA - Filial Distrito Federal	0.22%	0.19%	7.56%
AS26599	TELEFNICA BRASIL S.A	2.41%	2.11%	1.98%
AS53006	ALGAR TELECOM SA	0.01%	0.01%	1.40%
AS13591	Brasil Telecom Comunicacao Multimidia	0.00%	0.00%	1.23%
AS26615	Tim Celular S.A.	0.03%	0.02%	1.15%
AS4230	EMPRESA BRASILEIRA DE TELECOMUNICAES SA-EMBRATEL	0.04%	0.03%	0.57%

# IPv6 Capability:PE





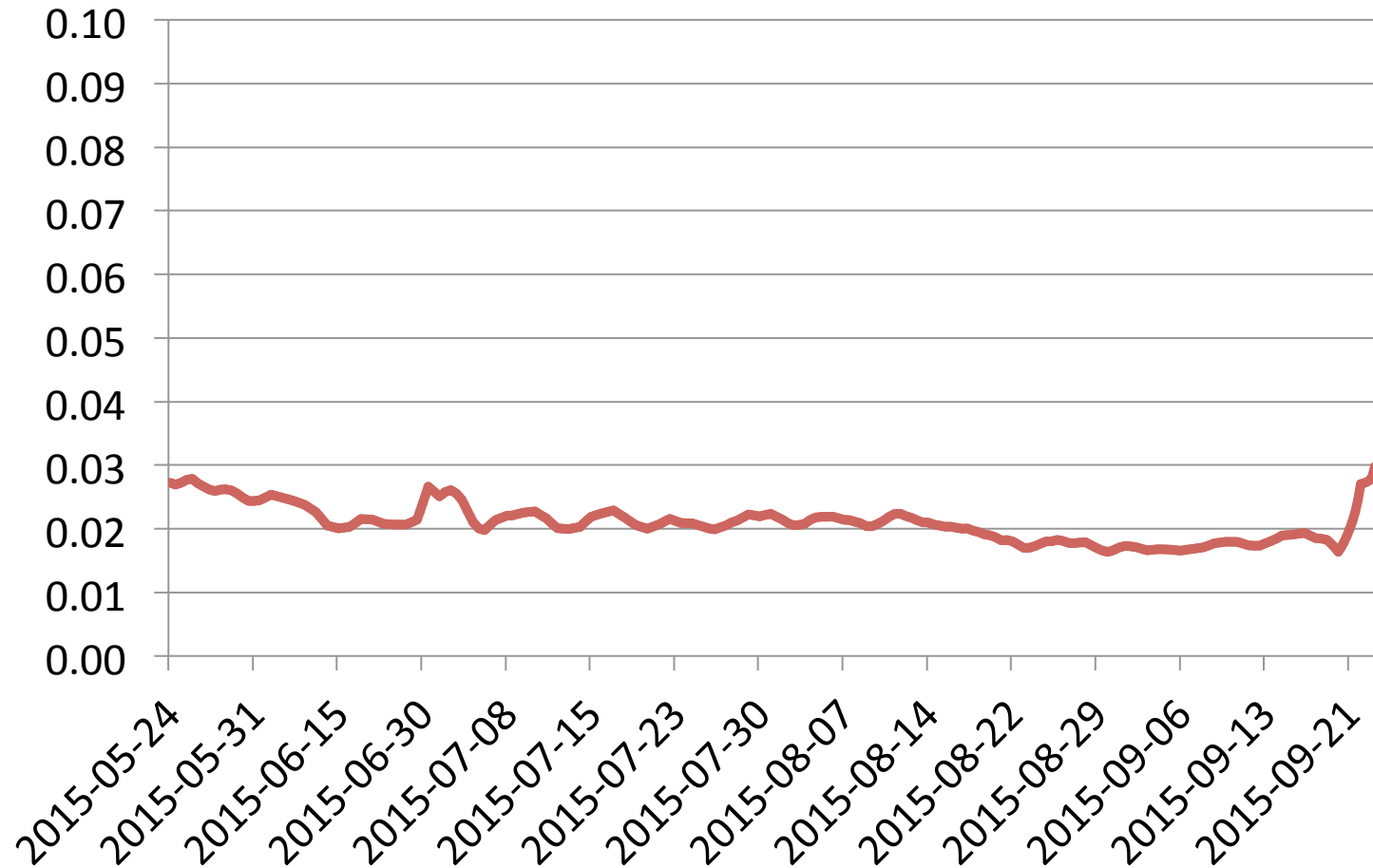
# IPv6 capability by ASN

ASN	AS Name	IPv6 Capable	IPv6 Preferred	# Samples
AS6147	Telefonica del Peru S.A.A.	17.73%	17.05%	5235389
AS262210	VIETTEL PER S.A.C.	0.15%	0.05%	30409
AS19180	AMERICATEL PERU S.A.	0.15%	0.12%	29509
AS27843	OPTICAL TECHNOLOGIES S.A.C.	0.13%	0.11%	39820
AS262253	ECONOCABLE MEDIA SAC	0.13%	0.08%	44603
AS3132	Red Cientifica Peruana	0.09%	0.09%	2220
AS28032	INTERNEXA PERU S.A	0.07%	0.03%	9841
AS262235	NETLINE PERU SA	0.07%	0.07%	1449
AS21575	ENTEL PERU S.A.	0.03%	0.00%	15449
AS22411	WIGO S.A.	0.03%	0.03%	3142

# ASN ranked by eyeball share

ASN	AS Name	IPv6 Capable	IPv6 Preferred	Eyeball share
AS6147	Telefonica del Peru S.A.A.	17.73%	17.05%	81.26%
AS12252	America Movil Peru S.A.C.	0.02%	0.02%	15.04%
AS262253	ECONOCABLE MEDIA SAC	0.13%	0.08%	0.69%
AS52400	Olo del Peru S.A.C	0.00%	0.00%	0.62%
AS27843	OPTICAL TECHNOLOGIES S.A.C.	0.13%	0.11%	0.62%
AS262210	VIETTEL PER S.A.C.	0.15%	0.05%	0.47%
AS19180	AMERICATEL PERU S.A.	0.15%	0.12%	0.46%
AS263224	EMPRESA DE TELECOMUNICACIONES MULTIMEDIA ALFA	0.00%	0.00%	0.26%
AS21575	ENTEL PERU S.A.	0.03%	0.00%	0.24%
AS28032	INTERNEXA PERU S.A	0.07%	0.03%	0.15%

# IPv6 Capability:CO



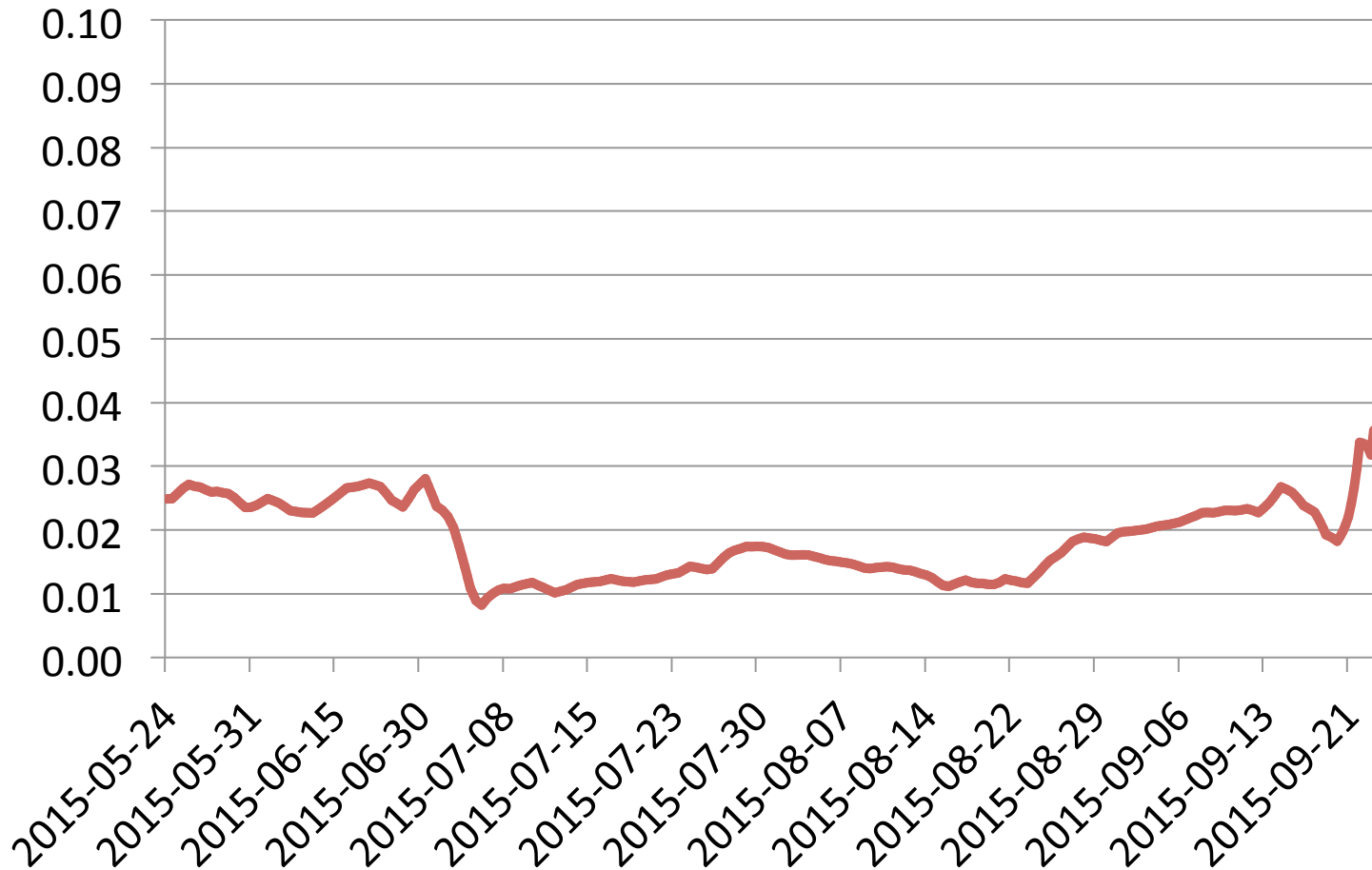
# IPv6 capability by ASN

ASN	AS Name	IPv6 Capable	IPv6 Preferred	# Samples
AS263202	BANSAT SAS	49.69%	45.34%	322
AS26619	Flycom Comunicaciones	0.74%	0.00%	2578
AS14080	Telmex Colombia S.A.	0.17%	0.16%	138181
AS27855	AXESAT S.A	0.14%	0.00%	2184
AS27975	SYNAPSIS COLOMBIA SAS	0.12%	0.12%	2533
AS19429	ETB - Colombia	0.06%	0.01%	764972
AS3816	COLOMBIA TELECOMUNICACIONES S.A. ESP	0.05%	0.05%	1220329
AS27831	Colombia Mvil	0.01%	0.01%	39728
AS26611	COMCEL S.A.	0.01%	0.00%	43088
AS27921	COLOMBIA TELECOMUNICACIONES S.A. ESP	0.01%	0.00%	12834

# ASN ranked by eyeball share

ASN	AS Name	IPv6 Capable	IPv6 Preferred	Eyeball share
AS10620	Telmex Colombia S.A.	0.00%	0.00%	30.26%
AS13489	EPM Telecomunicaciones S.A. E.S.P.	0.00%	0.00%	23.69%
AS3816	COLOMBIA TELECOMUNICACIONES S.A. ESP	0.05%	0.05%	18.01%
AS19429	ETB - Colombia	0.06%	0.01%	11.29%
AS27695	EDATEL S.A. E.S.P	0.00%	0.00%	3.45%
AS14080	Telmex Colombia S.A.	0.17%	0.16%	2.04%
AS262186	TV AZTECA SUCURSAL COLOMBIA	0.00%	0.00%	2.01%
AS22368	TELEBUCARAMANGA S.A. E.S.P.	0.00%	0.00%	1.70%
AS8163	Metrotel SA ESP	0.00%	0.00%	1.56%
AS10299	EMCATEL	0.00%	0.00%	1.26%

# IPv6 Capability:MX



# IPv6 capability by ASN

ASN	AS Name	IPv6 Capable	IPv6 Preferred	# Samples
AS2549	Universidad de Guadalajara	40.51%	39.16%	2671
AS13679	Centros Culturales de Mexico, A.C.	38.59%	38.59%	412
AS28503	GSAT COMUNICACIONES SA DE CV	13.22%	13.22%	242
AS278	Universidad Nacional Autonoma de Mexico	1.02%	0.96%	8934
AS262913	Konecta de Mexico, S. de R.L. de C.V.	0.36%	0.00%	2235
AS28400	SECRETARIA DE COMUNICACIONES Y TRANSPORTES COORDINACION DE LA SOCIEDAD DE LA INFORMACION Y EL CONOCI	0.12%	0.12%	16819
AS4493	Universidad de Sonora	0.11%	0.00%	916
AS28526	Universidad Autonoma del Estado de Mexico	0.09%	0.00%	1091
AS14178	Megacable Comunicaciones de Mexico, S.A. de C.V.	0.07%	0.07%	10710

# ASN ranked by eyeball share

ASN	AS Name	IPv6 Capable	IPv6 Preferred	Eyeball share
AS8151	Uninet S.A. de C.V.	0.00%	0.00%	60.90%
AS13999	Mega Cable, S.A. de C.V.	0.00%	0.00%	10.27%
AS28548	Cablevisin, S.A. de C.V.	0.00%	0.00%	4.73%
AS6503	Axtel, S.A.B. de C.V.	0.00%	0.00%	3.68%
AS28509	Cablemas Telecomunicaciones SA de CV	0.00%	0.00%	3.47%
AS11888	Television Internacional, S.A. de C.V.	0.00%	0.00%	2.93%
AS22884	TOTAL PLAY TELECOMUNICACIONES SA DE CV	0.00%	0.00%	2.55%
AS28554	Cablemas Telecomunicaciones SA de CV	0.00%	0.00%	1.81%
AS16960	Cablevision Red, S.A de C.V.	0.03%	0.02%	1.29%
AS6332	Telefonos del Noroeste, S.A. de C.V.	0.00%	0.00%	1.12%



# Regional Round-up

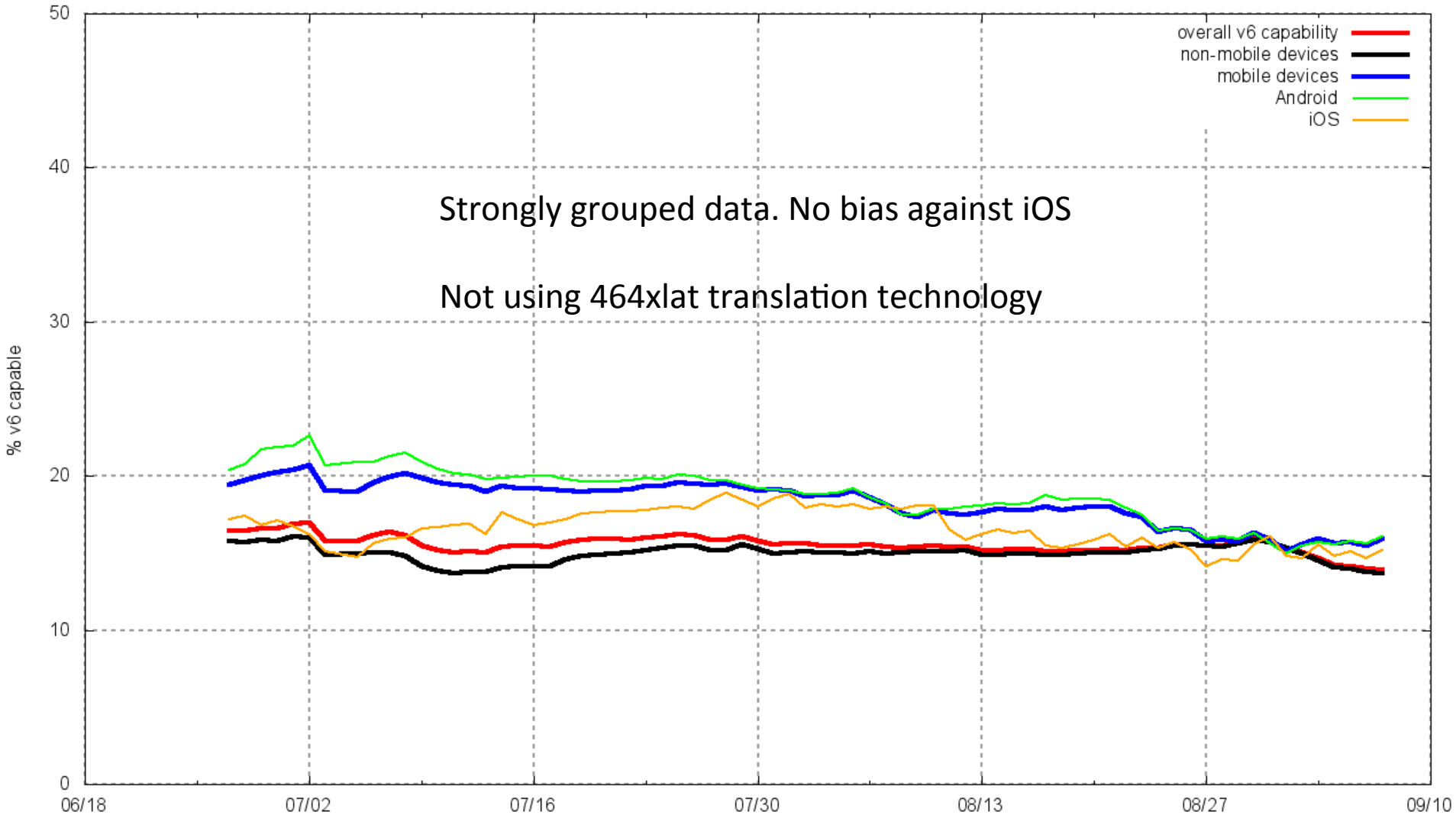
- No strong signs of capability or volume in Caribbean.
- Limited signs of capability, low volume, Central America
  - MX,GT show some signs, but predominantly in tertiary education sector
- South America has strong signs
  - Significant deployments in PE, EC, BR
  - Interesting signal in CO, Ku Band Satellite Internet
  - UY,CL,VE,AR not moving

# Low iOS presence

- We \*believe\* that the relative cost of iOS devices in LAC region is high
- ‘Apple-tax’: consistent worldwide pricing
  - Some economic factors in different national economies (import taxes, foreign currency controls)
- Android devices much more price-variant
  - High and low end units available from a range of providers including trading relationships in BRICS

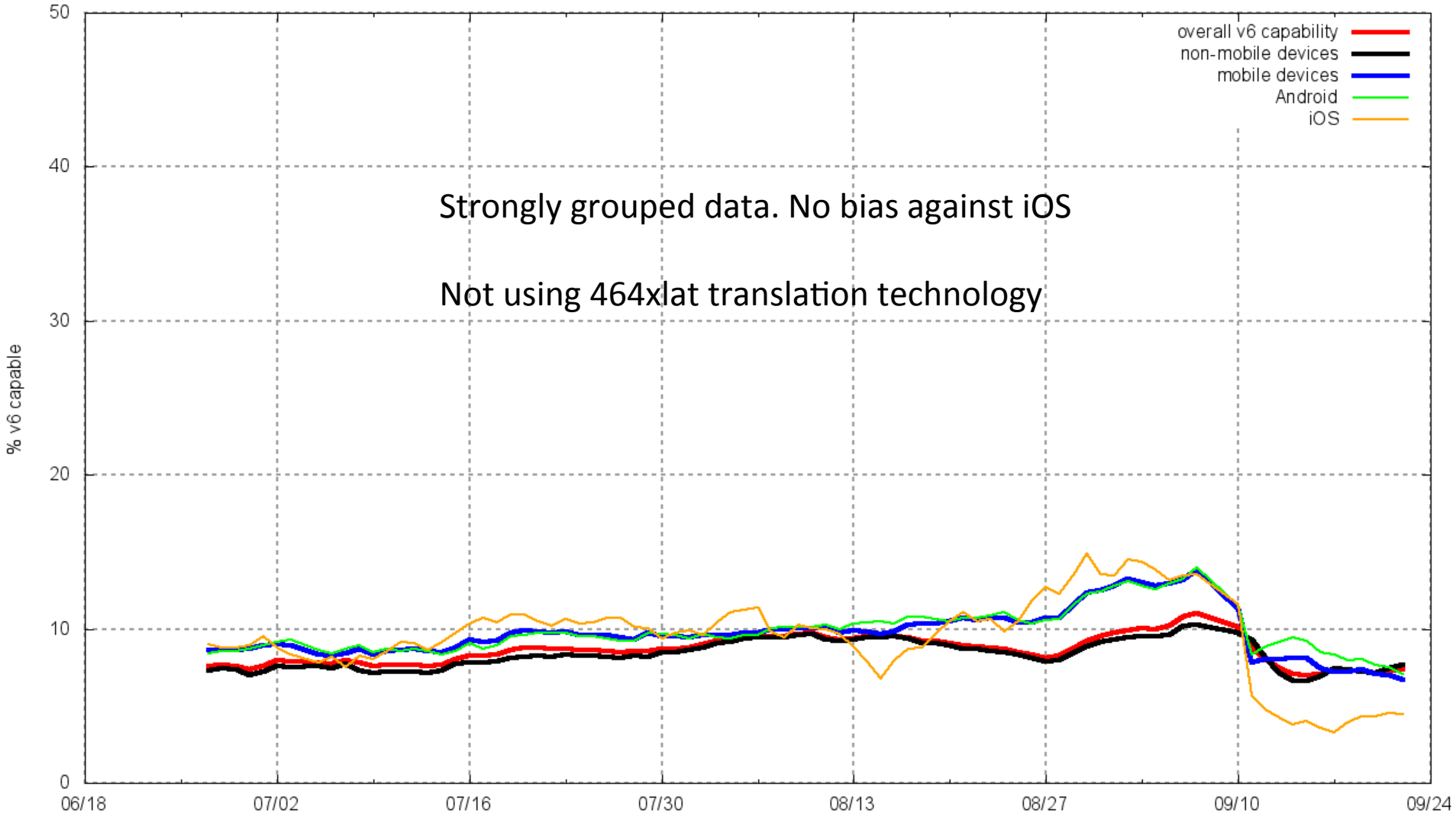
# AS6147 Telefonica Del Peru

6147 Telefonica del Peru S.A.A. PE IPv6 capability



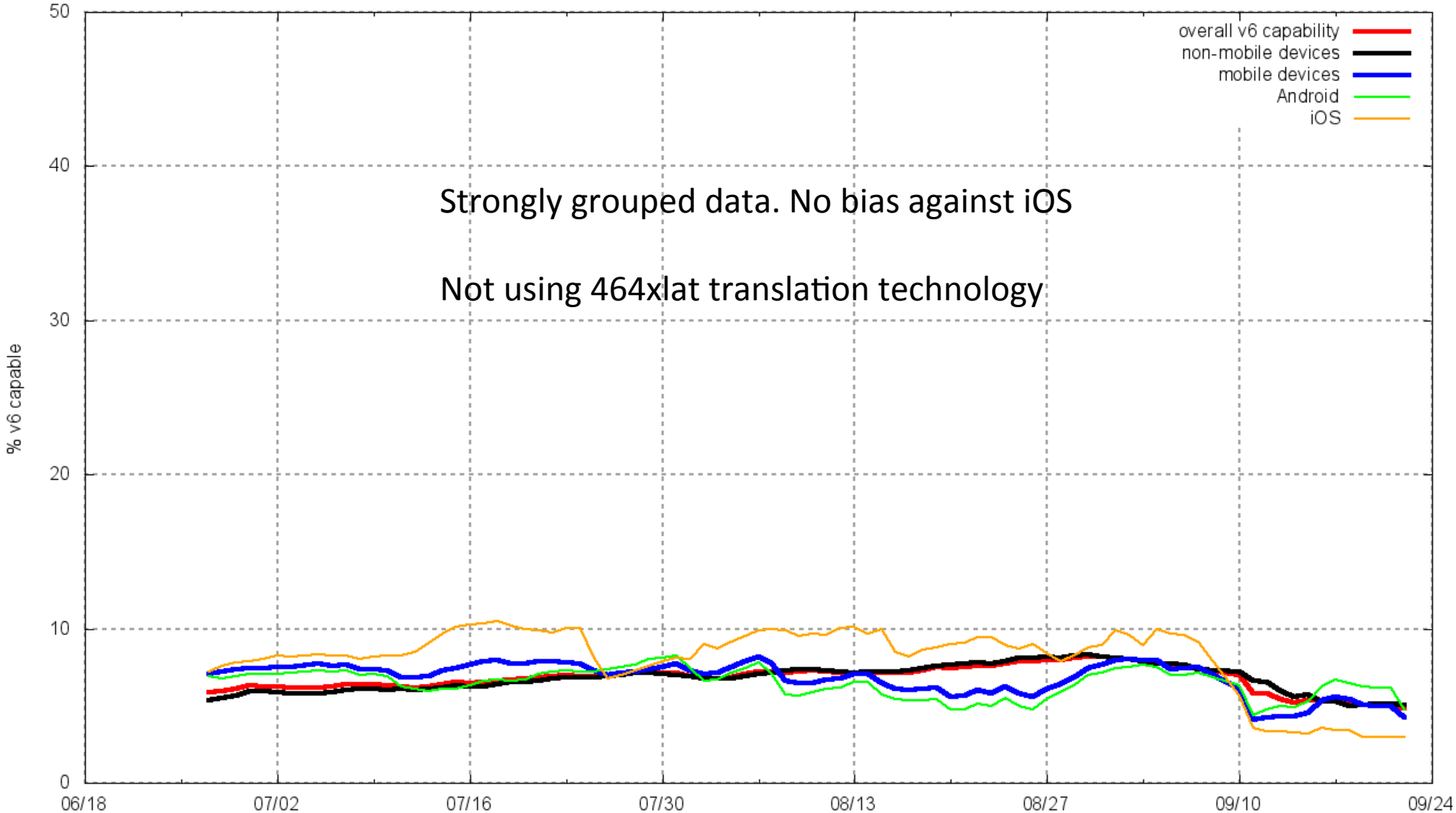
# AS14420 CNT EP. Ecuador

14420 CORPORACION NACIONAL DE TELECOMUNICACIONES - CNT EP EC IPv6 capability



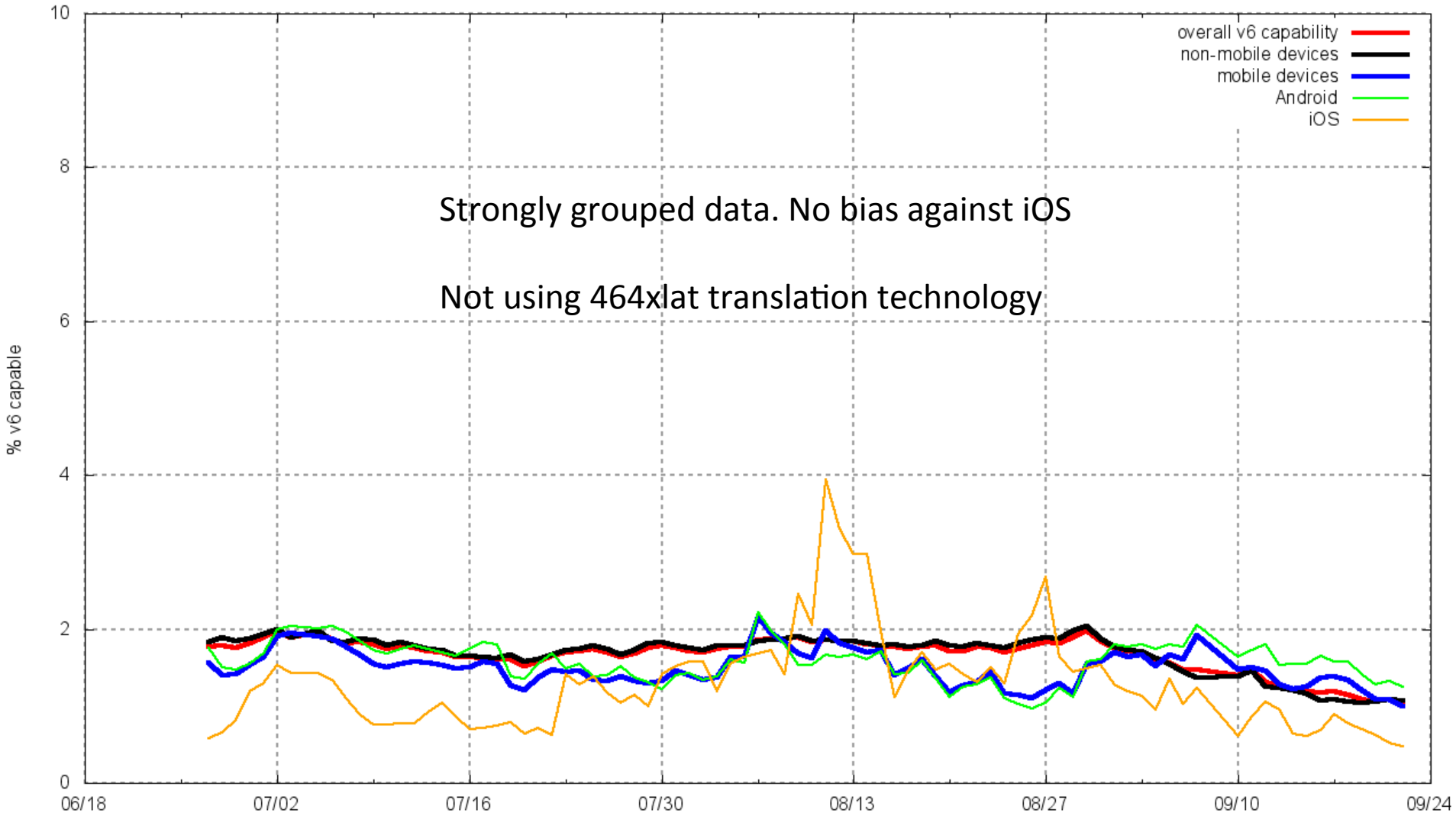
# AS28573 NET Servicos, Brasil

28573 NET Servicos de Comunicacao S.A. BR IPv6 capability



# AS27699 Telefnica Brasil

27699 TELEFNICA BRASIL S.A BR IPv6 capability



# If little iOS.. Then XLAT can work!

- Low penetration of iOS means that 464Xlat is not a barrier to significant customer volume
- If it makes sense economically to favour a transition mechanism like 464Xlat, the evidence is that it works, and will reduce pressure on your IPv4 address bindings on any NAT/CGN
- However, no signs of significant deployment of XLAT in LAC region

# Conclusions

- Significant nation-scale IPv6 is being deployed in the LAC region
- Its not happening everywhere, consistently
- Millions of people in South America are already IPv6 enabled
- Tertiary Education networks continue to explore IPv6 in economies with low uptake
- Transition mechanisms aren't being used, it looks to be true dual-stack
  - But this could change as Cellular Carriers get involved



# Conclusions

- APNIC has moved away from a dependency on Flash and gained insight into more devices
- APNIC is now able to see inside Mobile & Cellular networks, and see significant deployment differences emerge from transition method, technologies
- Transition mechanisms like 464xlat work and can boost IPv6 capability in the right circumstances
  - Reduces pressure on CGN/NAT address devices
  - Cannot support iOS, which may not matter in some markets

# Thank You!

- Thanks to Oscar Robles for allowing me to have a residency at the LacNIC office
  - Carlos Cagnazzo, the R&D Team, LacNIC staff
- Thanks to Google, ISC, RIPE NCC for hosting and assistance with the research programme
- If you are interested in IPv6 measurements there is a lot to talk about over a beer...

Thank You!

