



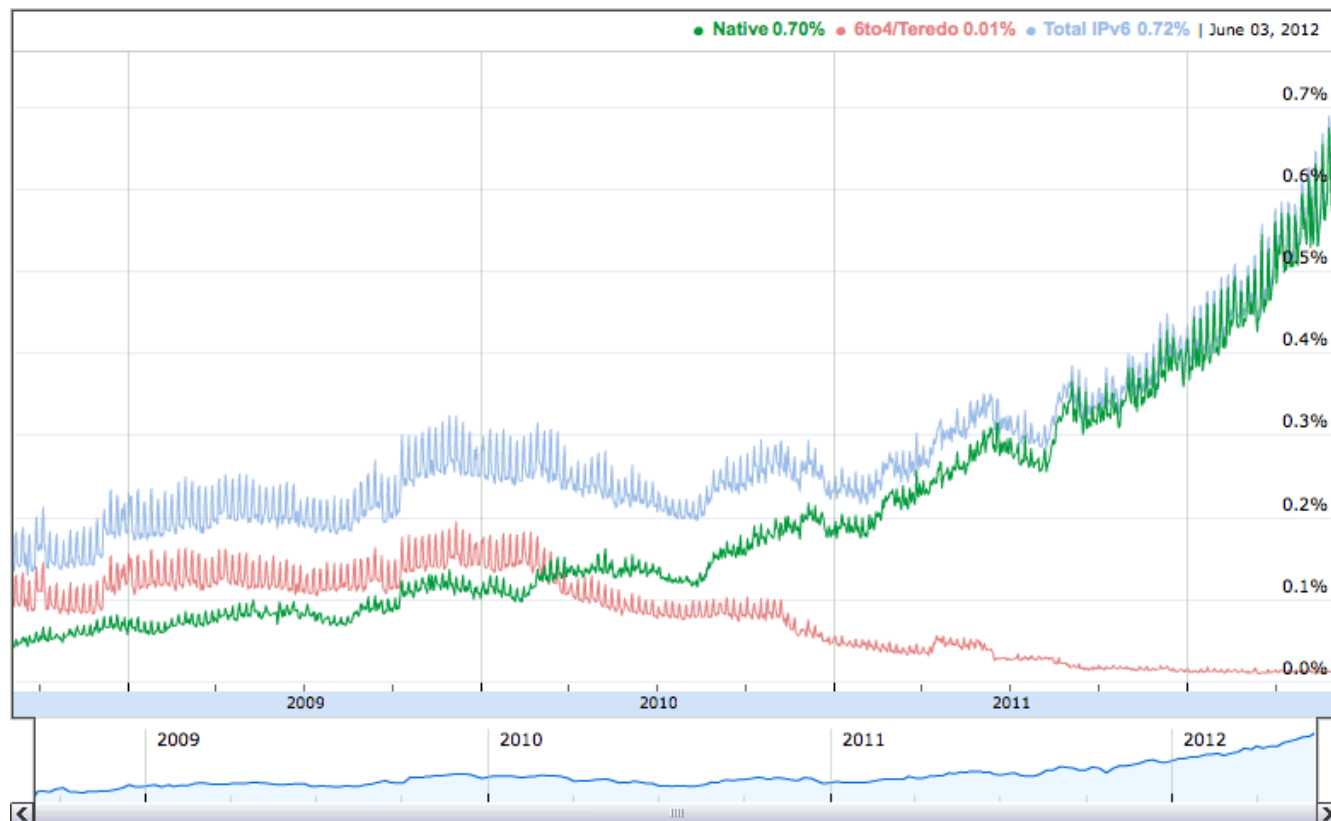
World IPv6 Launch

{ek,lorenzo}@google.com
JANOG30

Translation: Yoshinobu Matsuzaki, IIJ

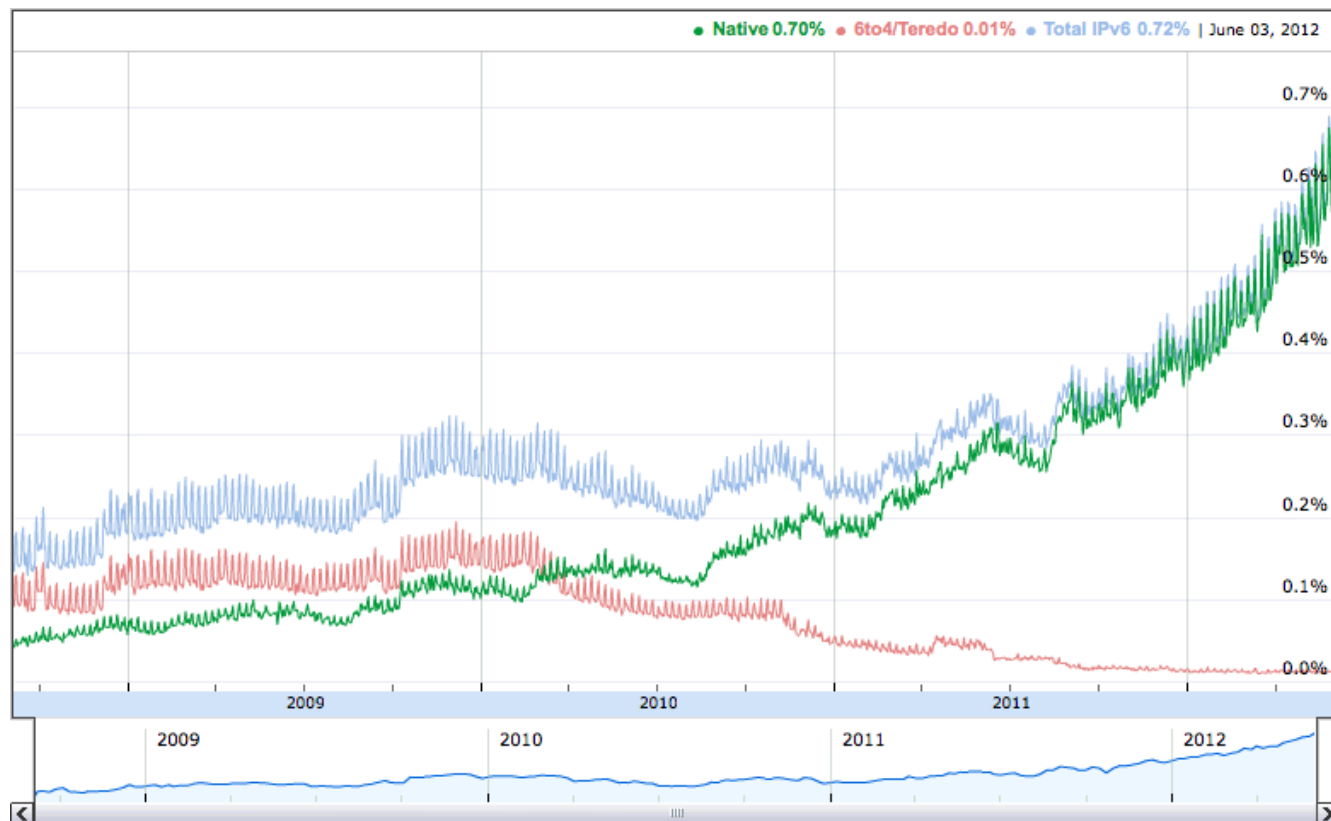
For Google

Lead-up: rapid increase in IPv6 growth



- IPv6 adoption grew by 150% (2.5x) in the last year
 - On top of already rapid IPv4 growth
- At this rate, 50% of users will have IPv6 in ~6 years

きっかけ作り: IPv6導入の急激な伸び



- 昨年はIPv6導入が150% (2.5倍) の伸び
 - 順調に伸び続けるIPv4の上に行く
- この調子で行けば、6年ぐらいで50%のユーザがIPv6を導入

Preparation

- IPv6 adoption measurements
 - Developed World IPv6 Launch committee tool
 - Provided data for www.worldipv6launch.com participant list pages
- IPv6 brokenness measurements
 - Worked with major IPv6 networks to identify issues in advance of the launch
 - Publish and update [list of networks](#) Google does not enable IPv6 for
 - Allows website operators to avoid enabling IPv6 for networks where doing so might impact users
 - Japan particularly problematic
- Outreach
 - Hangout-on-air with Vint Cerf
- Warning users who might have connectivity problems

準備

- IPv6導入状況を測定
 - World IPv6 Launch委員用のツールを作成
 - www.worldipv6launch.com の参加者リスト様にデータを提供
- IPv6の壊れ具合を測定
 - 主要なIPv6ネットワークと、事前に問題点を解析するために協力
 - GoogleがIPv6を提供しない[ネットワークリスト](#)を公開、更新
 - Webサイトの運用者が、影響を受けるユーザがいるようなネットワーク向けにIPv6を提供しないようにできる
 - 日本は特に問題がある
- アウトリーチ
 - Vint CerfがGoogle+ Hangoutsに出演して放送
- 接続性に問題があるかもしれないユーザに警告表示

Preparation: troubled resolvers

IPv6 の国別採用状況



- Worked with some networks to help resolve brokenness
 - Not scalable
 - http://www.google.com/intl/en/ipv6/statistics/data/no_aaaa.txt

準備: 問題を抱えたリゾルバ

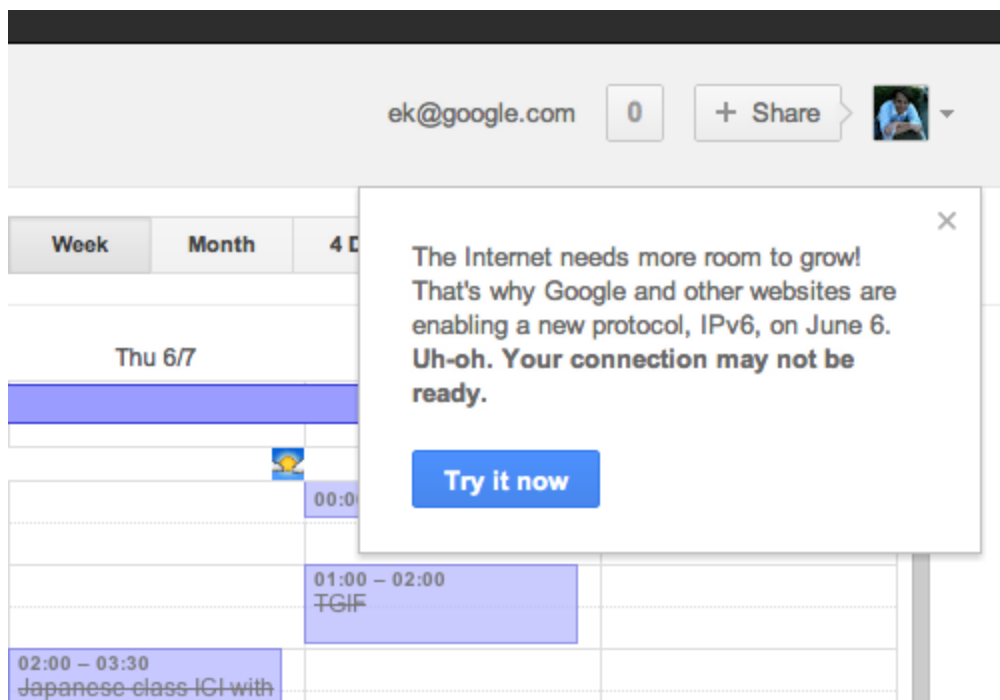
IPv6 の国別採用状況



- 幾つかのネットワークへ問題の解決を手助けするために協力
 - スケールしない
 - http://www.google.com/intl/en/ipv6/statistics/data/no_aaaa.txt

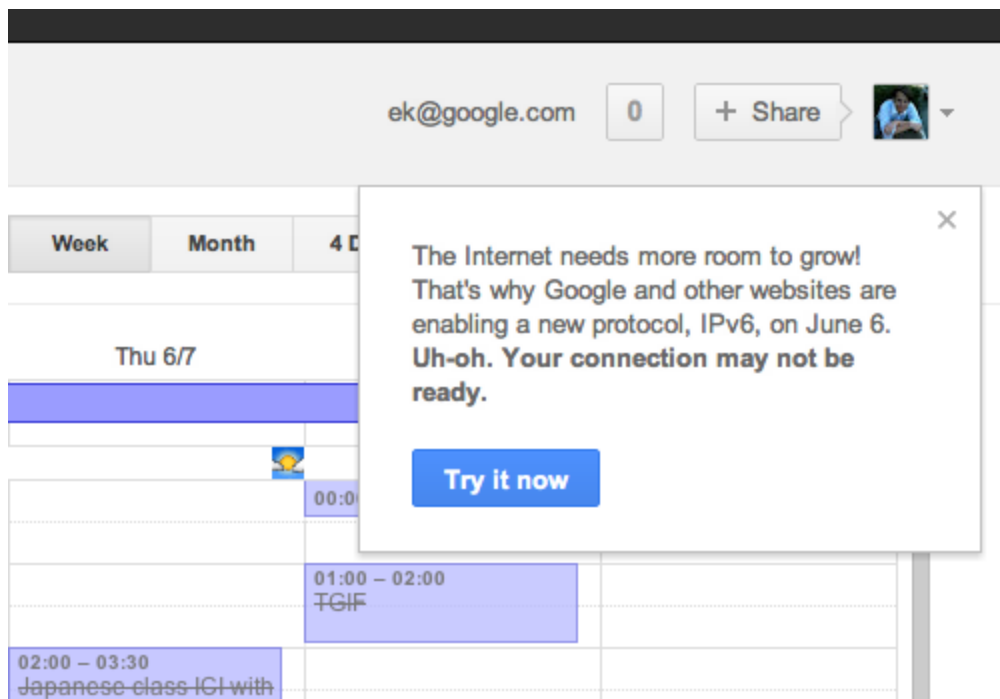
Preparation: notifying users

- Ran a notification for likely broken users
 - gmail
 - calendar
 - maps
- ipv6test.google.com
- IPv4-only help pages



準備: ユーザ通知

- 障害を抱えていそうなユーザに通知を送出
 - gmail
 - calendar
 - maps
- ipv6test.google.com
- IPv4のみのヘルプページ



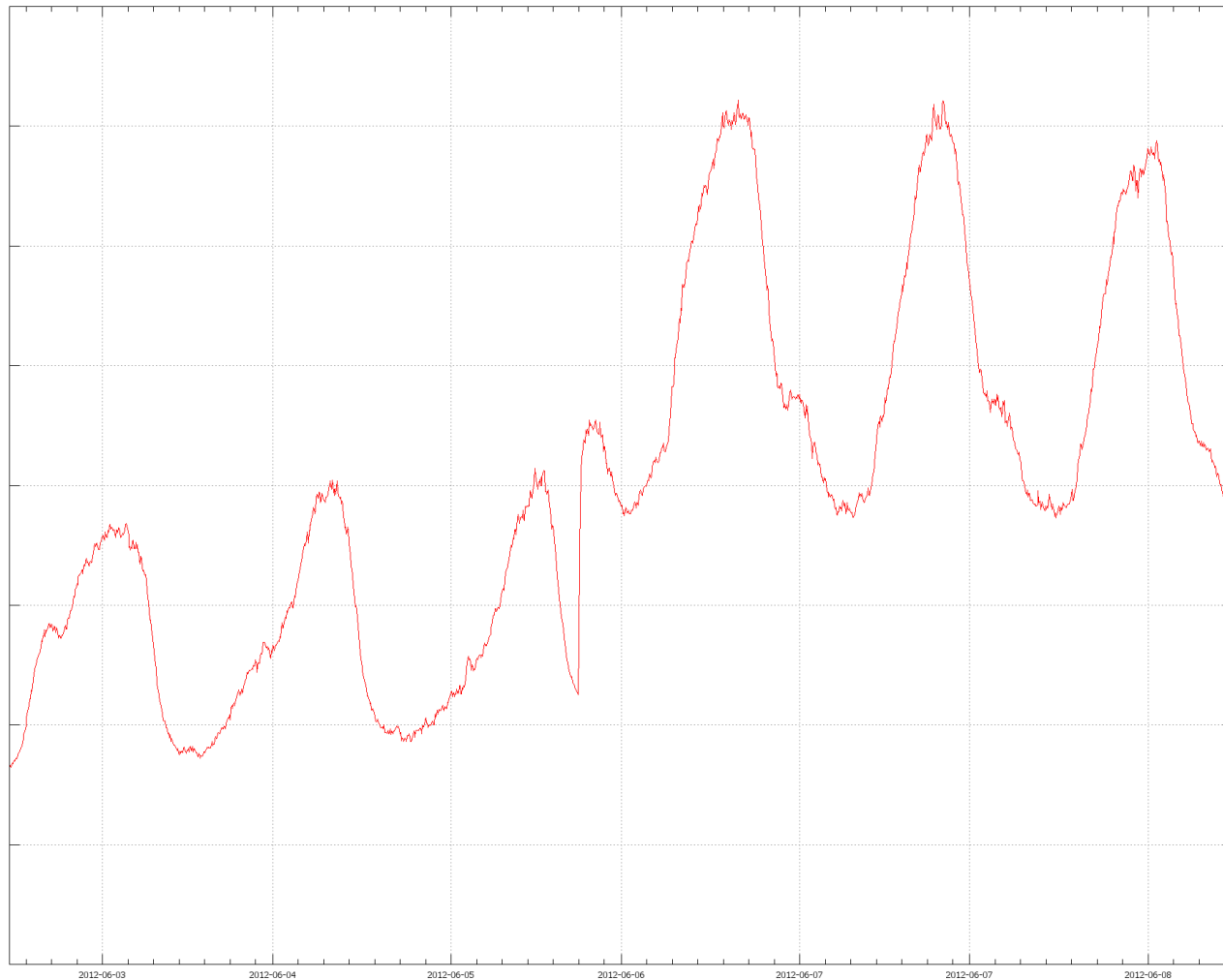
On the day

- ~75% increase in web traffic
 - Google was already serving over half the IPv6 Internet
- Less dramatic increase in high-bandwidth traffic, e.g., YouTube
 - YouTube videos have been available over IPv6 since World IPv6 Day
- Launched IPv6 support in additional services
 - AdSense and content ads
 - Inbound SMTP
 - Almost all Google services supported IPv6 already
- No major issues
 - Minor issues with ads partners, resolved during launch
 - Issues with embedded Street View clients in cars
 - Caused Street View to revert to IPv4-only

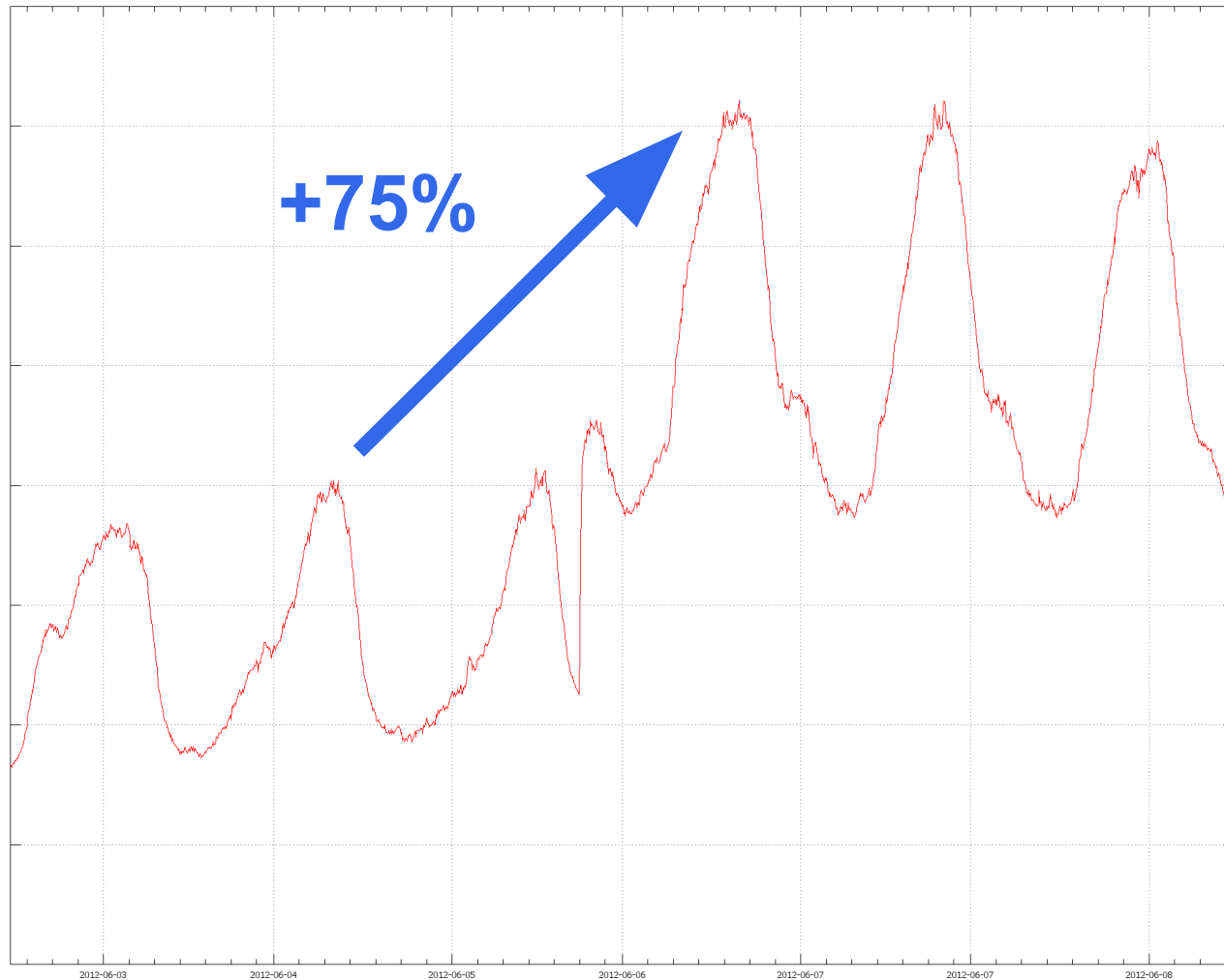
その当日

- Webトラフィックが75%程度増加
 - Googleは既に半分以上のIPv6インターネットにサービスを提供していた
- YouTubeなどの高帯域なサービスではそこまで大きな変化はなかった
 - YouTubeはWorld IPv6 Day以降、IPv6でサービスを提供していた
- サービスでIPv6サポートを追加
 - AdSense と content ads
 - SMTPの受信サーバ
 - ほとんどのGoogleサービスはIPv6をサポートしていた
- 大きな問題はなかった
 - adsパートナーと細かな問題があったが、ローンチ中に解決
 - 車に組み込まれたストリートビュークライアントで問題が
 - このせいで、ストリートビューはIPv4のみに戻されてしまった

IPv6 QPS



IPv6 QPS



Around the world

世界各国

Websites: 10% of Alexa Top 1000

Participating websites					
Show 10 entries			Search:		
	Participating Website	Global Alexa Ranking	Local Alexa Ranking (Top 500)	Country Code	Transfer Time
	www.google.com	1	1	US	0.583
	www.facebook.com	2	2	US	2.548
	www.youtube.com	3	3	US	3.358
	www.yahoo.com	4	4	US	11.525
	www.wikipedia.org	6	6	US	1.224
	www.bing.com	30	15	US	1.608
	vk.com	41	4	RU	0.558
	www.aol.com	69	19	US	2.177
	thepiratebay.se	75	15	SE	0.667
	www.uol.com.br	91	5	BR	1.492
Showing 1 to 10 of 3,003 entries			First Previous 1 2 3 4 5 Next Last		

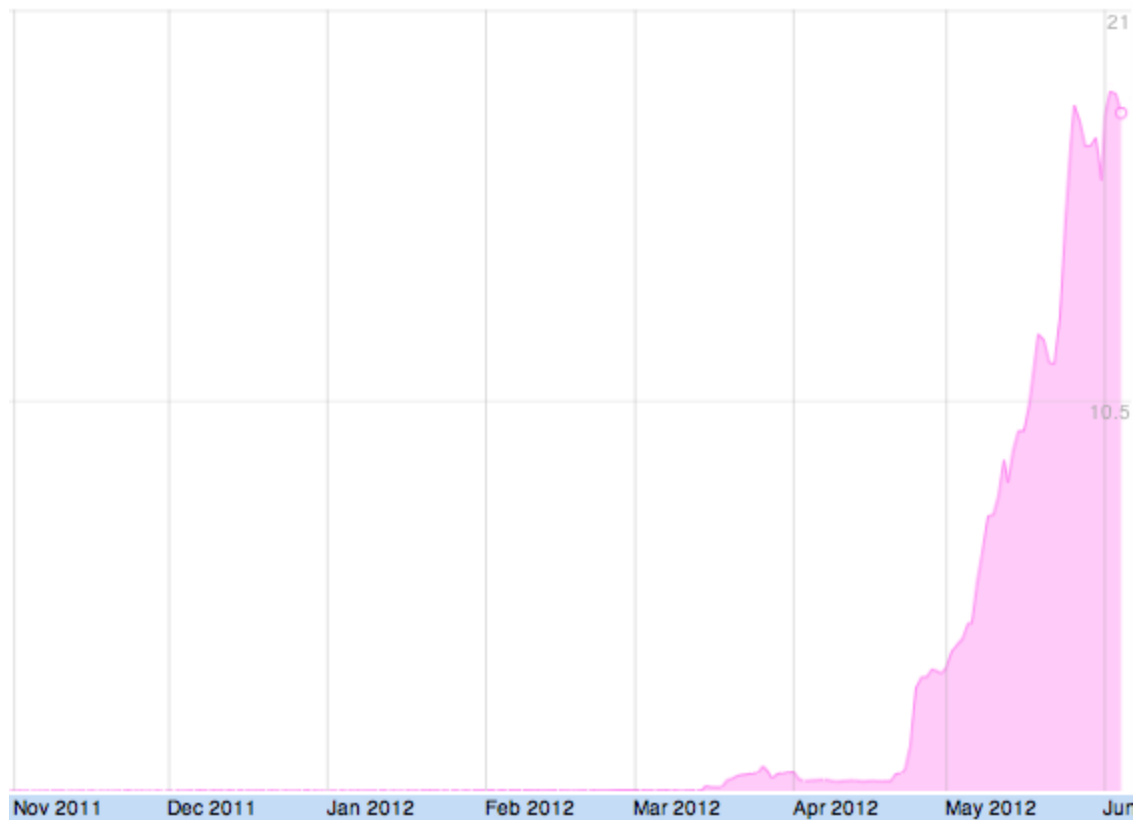
<http://www.worldipv6launch.org/measurements/>

ISPs: deployment around the world

Network operator measurements (notes)		
Show 10 entries		Search:
Participating Network	ASN(s)	IPv6 traffic
Free	12322	17.35%
ATT	6389, 7018, 7132	4.06%
KDDI	2516	10.93%
RCS & RDS	8708	16.65%
Comcast	7922, 33287, 33491, 33650, 33651, 33652, 33657, 33668	1.47%
Verizon Wireless	6167, 22394	7.36%
UniNet	4621	13.78%
CESNET	2852	14.71%
Janet	786	2.73%
Time Warner Cable	7843, 10796, 11351, 11426, 11427, 12271, 20001	0.20%
Showing 1 to 10 of 69 entries		
First Previous 1 2 3 4 5 Next Last		

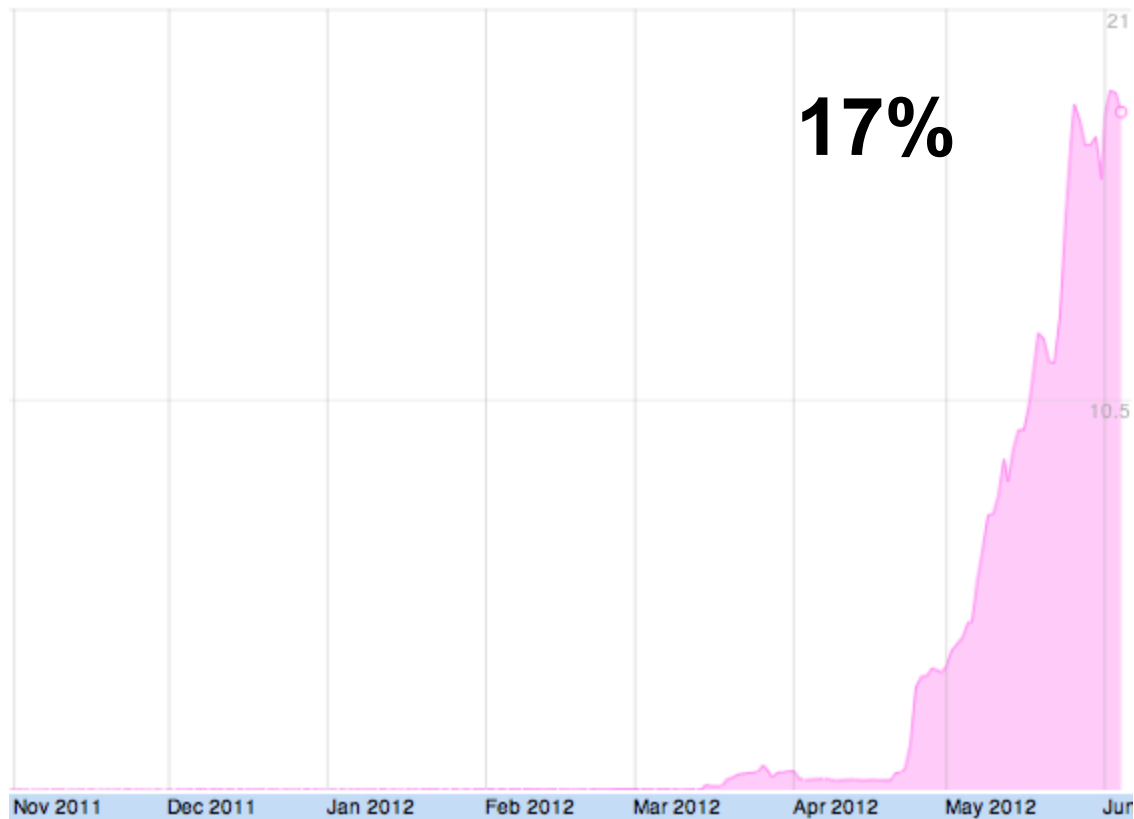
<http://www.worldipv6launch.org/measurements/>

Native: RCS & RDS



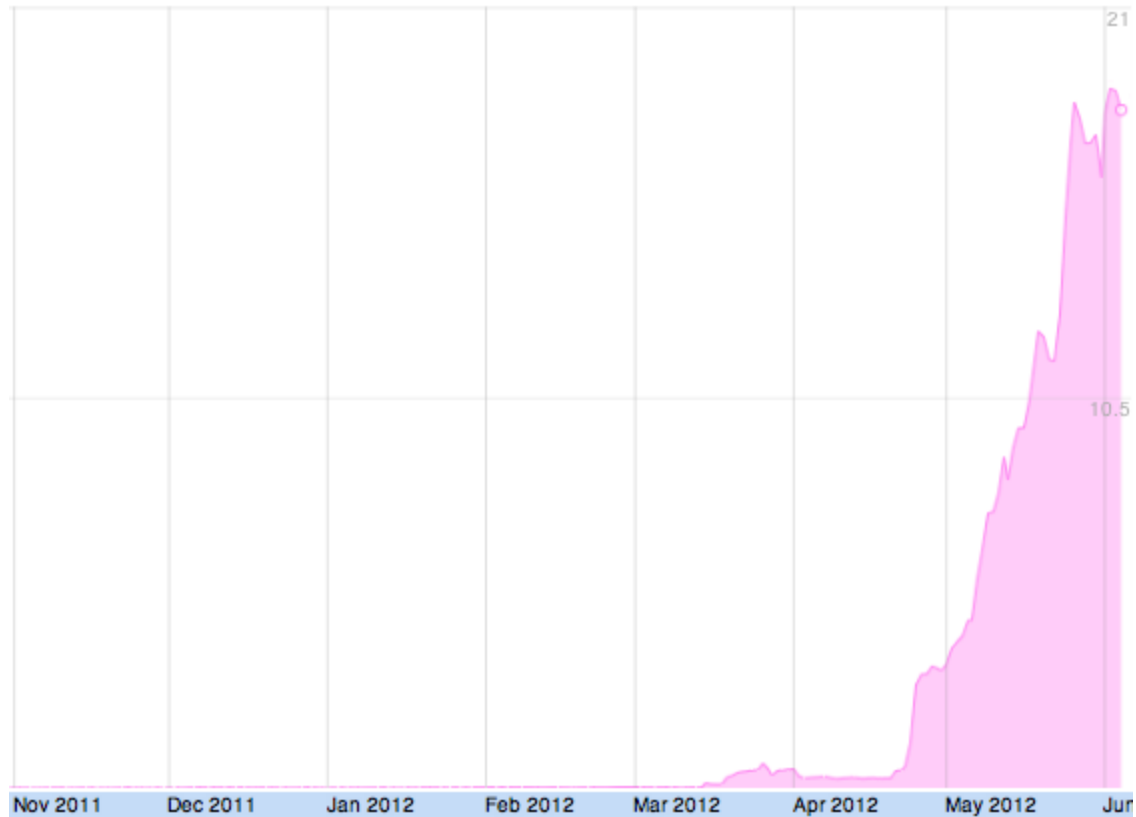
- Fiber and cable ISP in Romania

Native: RCS & RDS



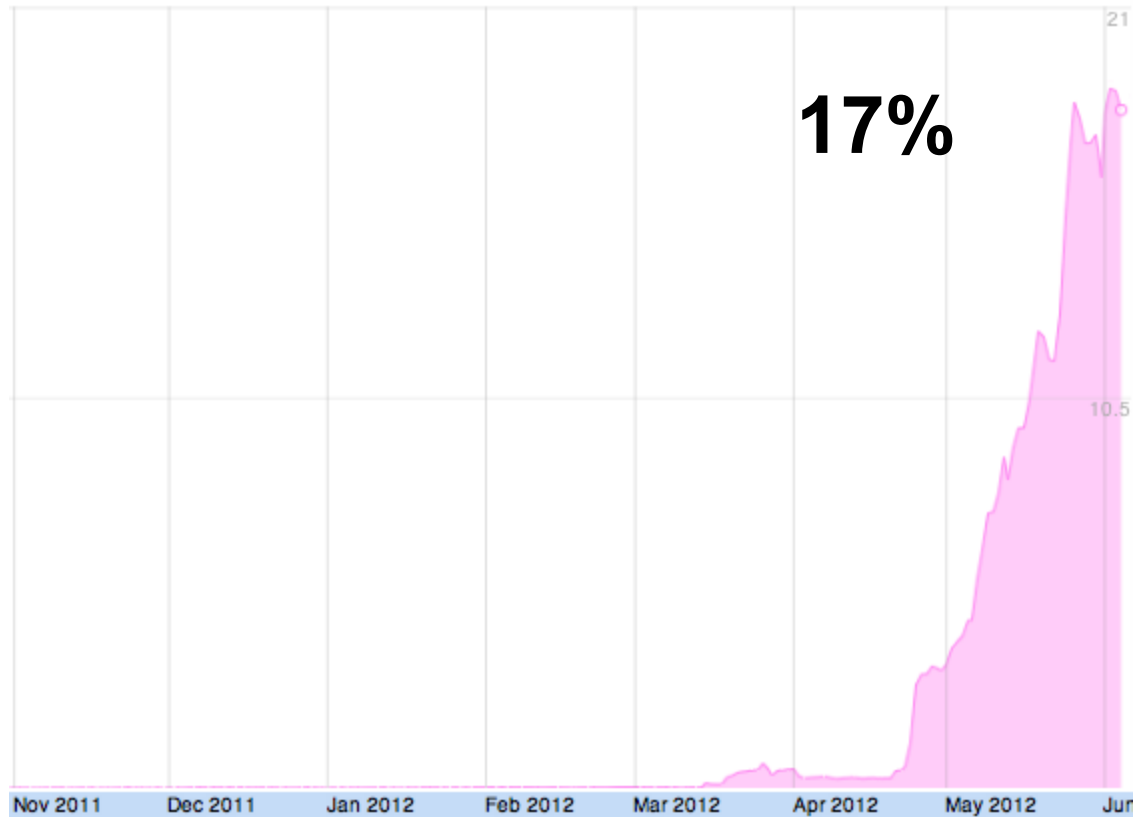
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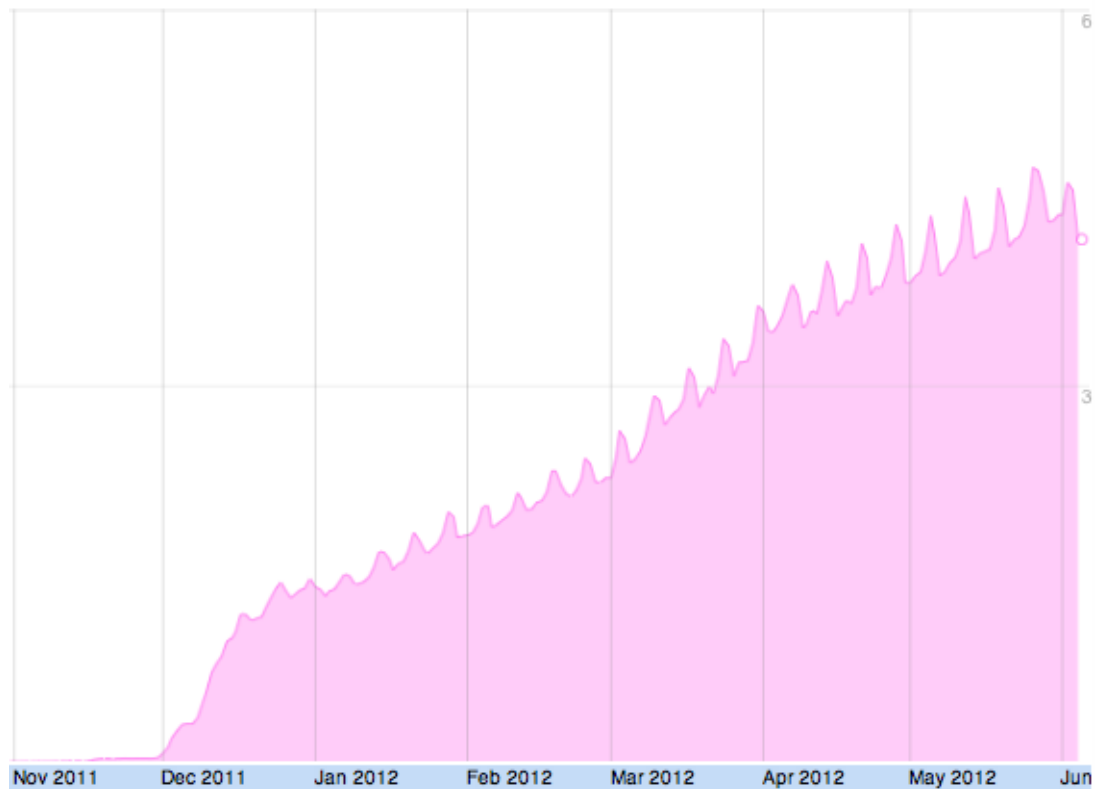
- ルーマニアのファイバ&ケーブルISP

Native: RCS & RDS



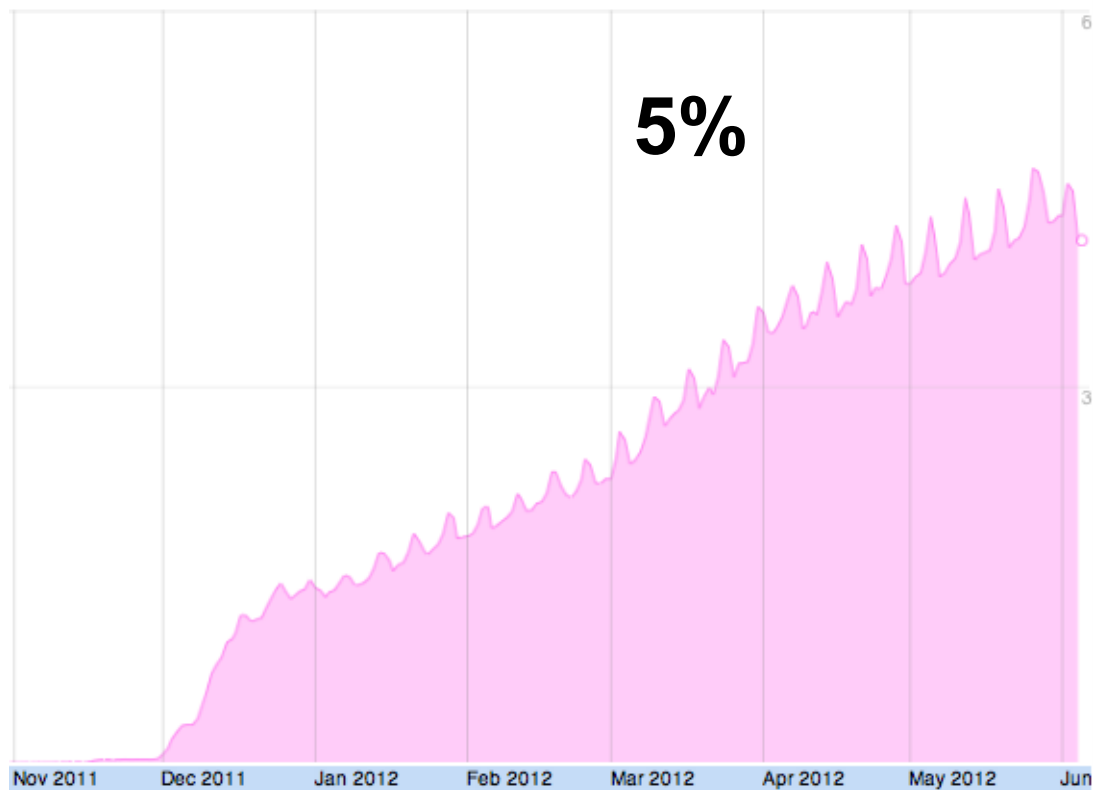
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DSL 6rd: AT&T



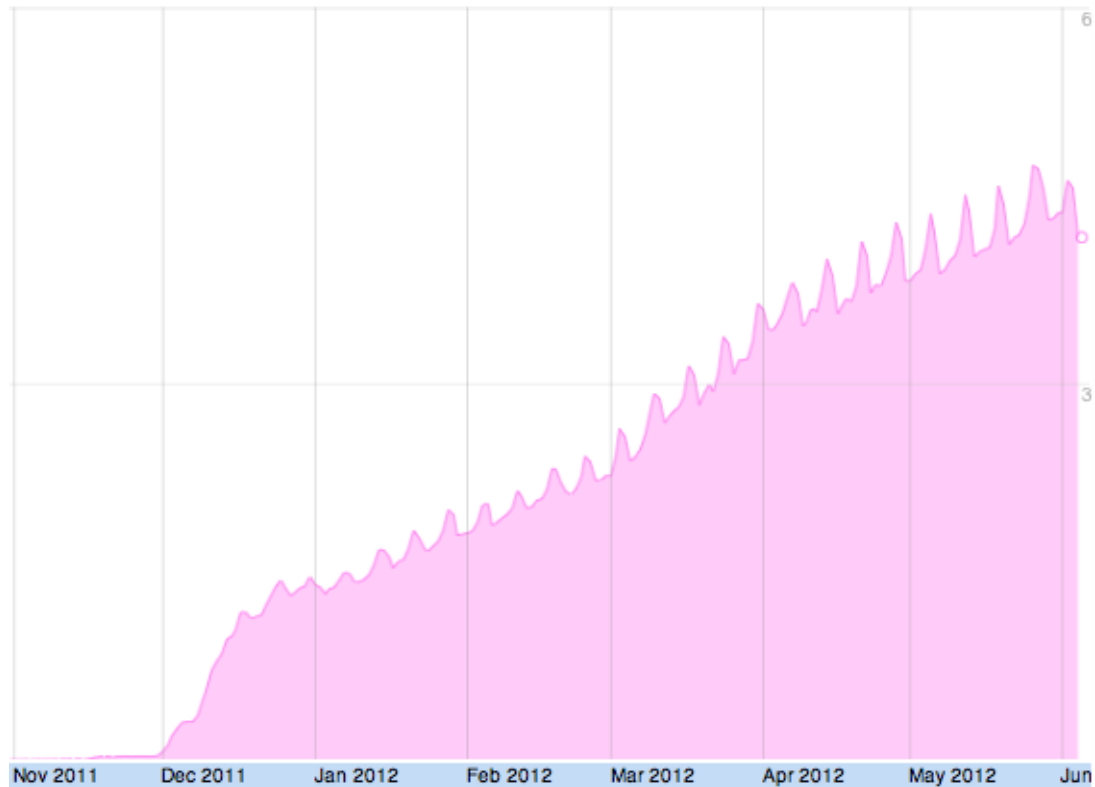
- Enabled IPv6 for 1 million subscribers
 - Could reach [5 million by EOY 2012](#)

DSL 6rd: AT&T



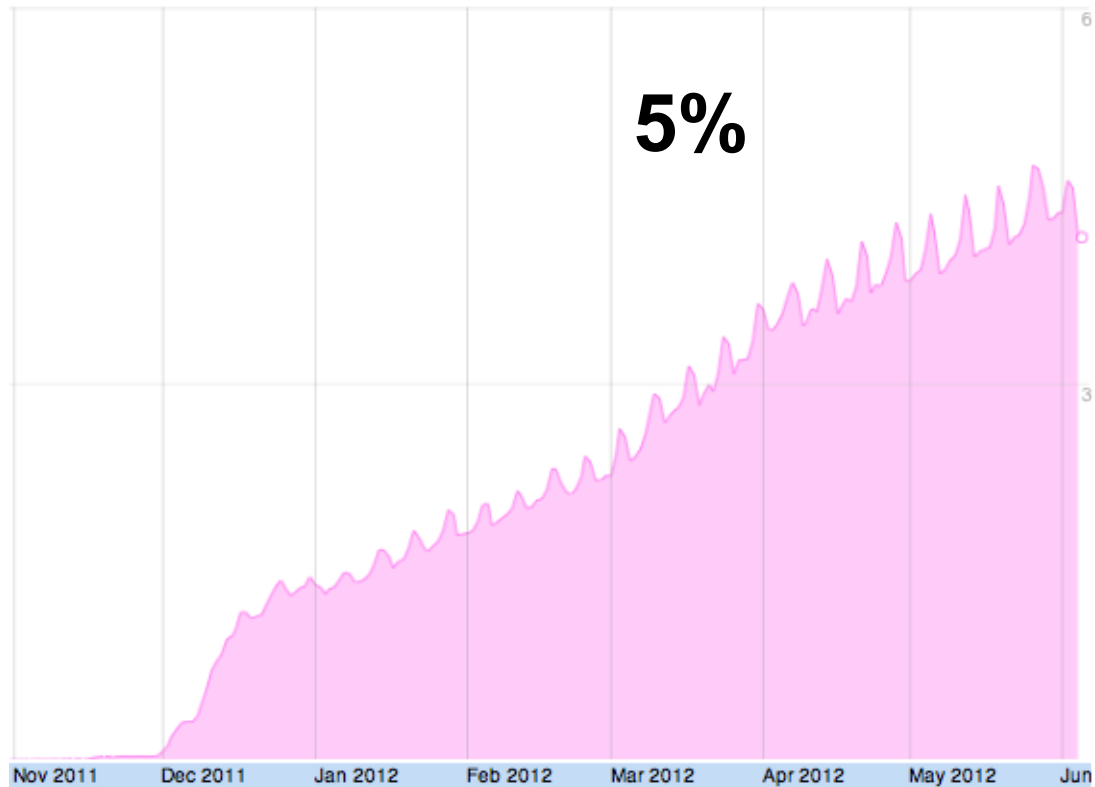
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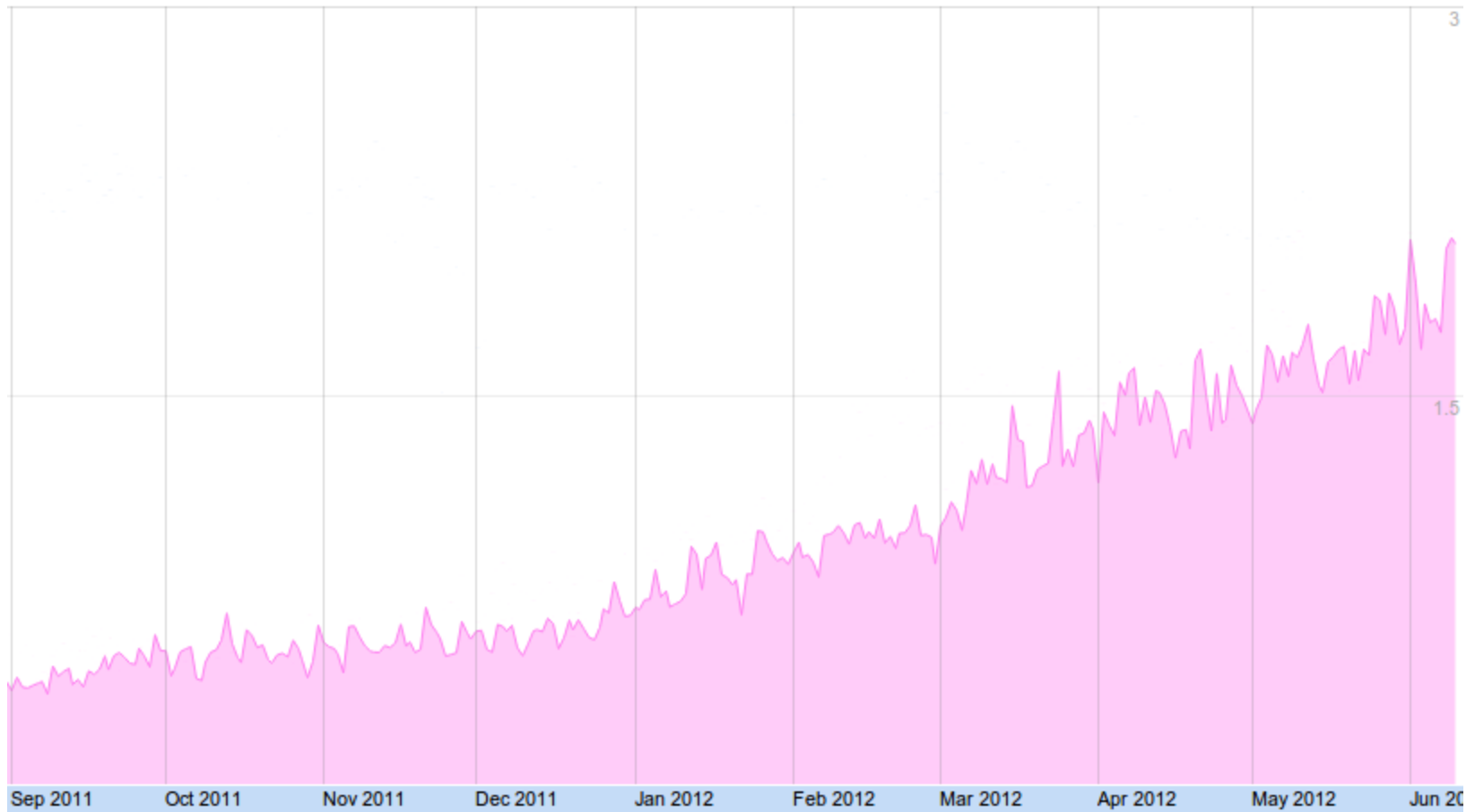
- 100万人のユーザにIPv6を提供した
 - 2012年末には500万人に達するかも

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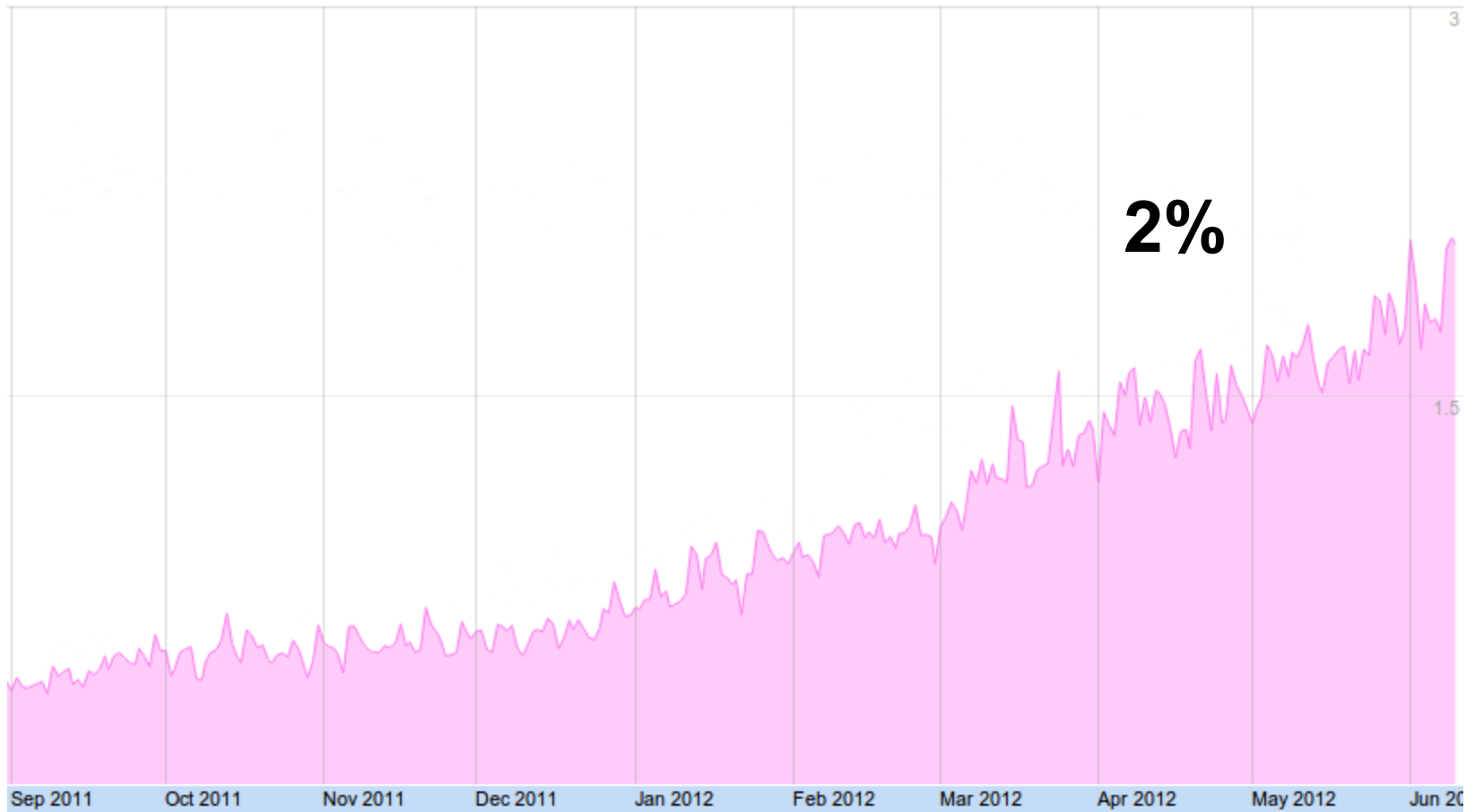


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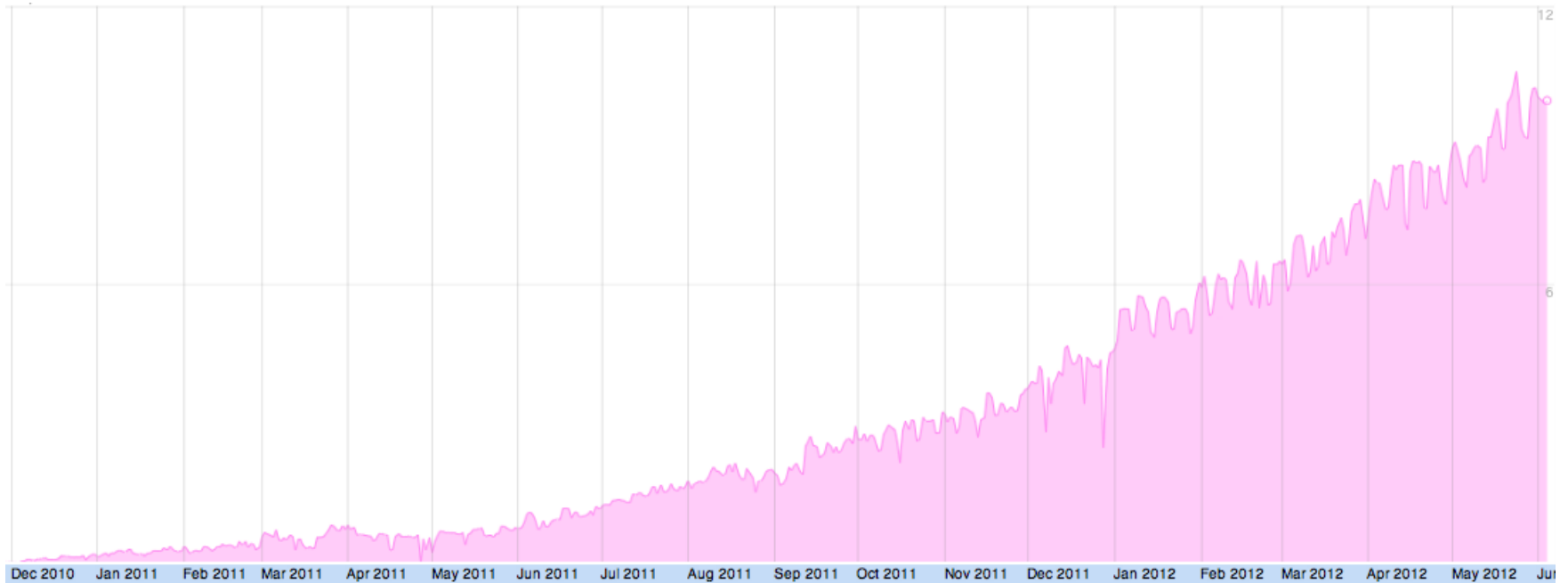
DSL PPP: Internode



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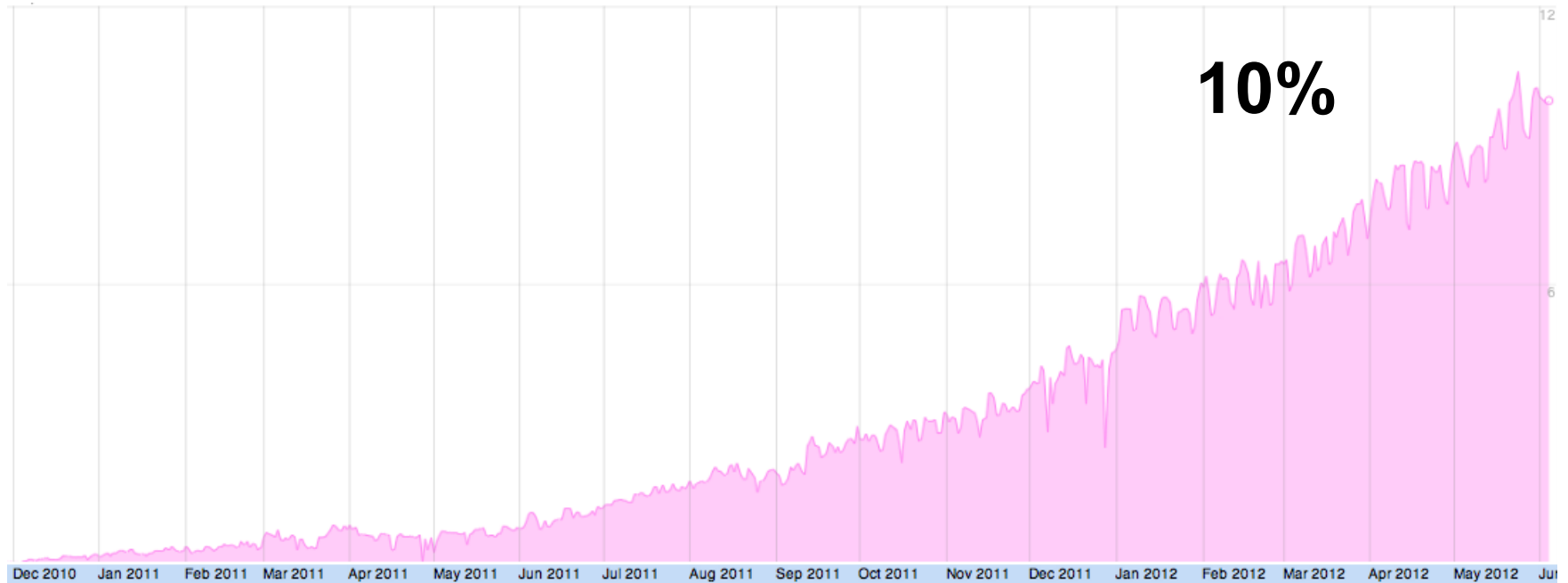


LTE: Verizon Wireless



- ~60% Android

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Whole ecosystem

- World IPv6 Launch participants
 - 3000+ websites
 - 60+ ISPs
 - 4 home router vendors
- Real traffic
 - AT&T: "For our IPv6 enabled customers, we're seeing **more than 20 percent of traffic** transition to IPv6..."
- Real deployments
 - everywhere around the world
 - on every access technology

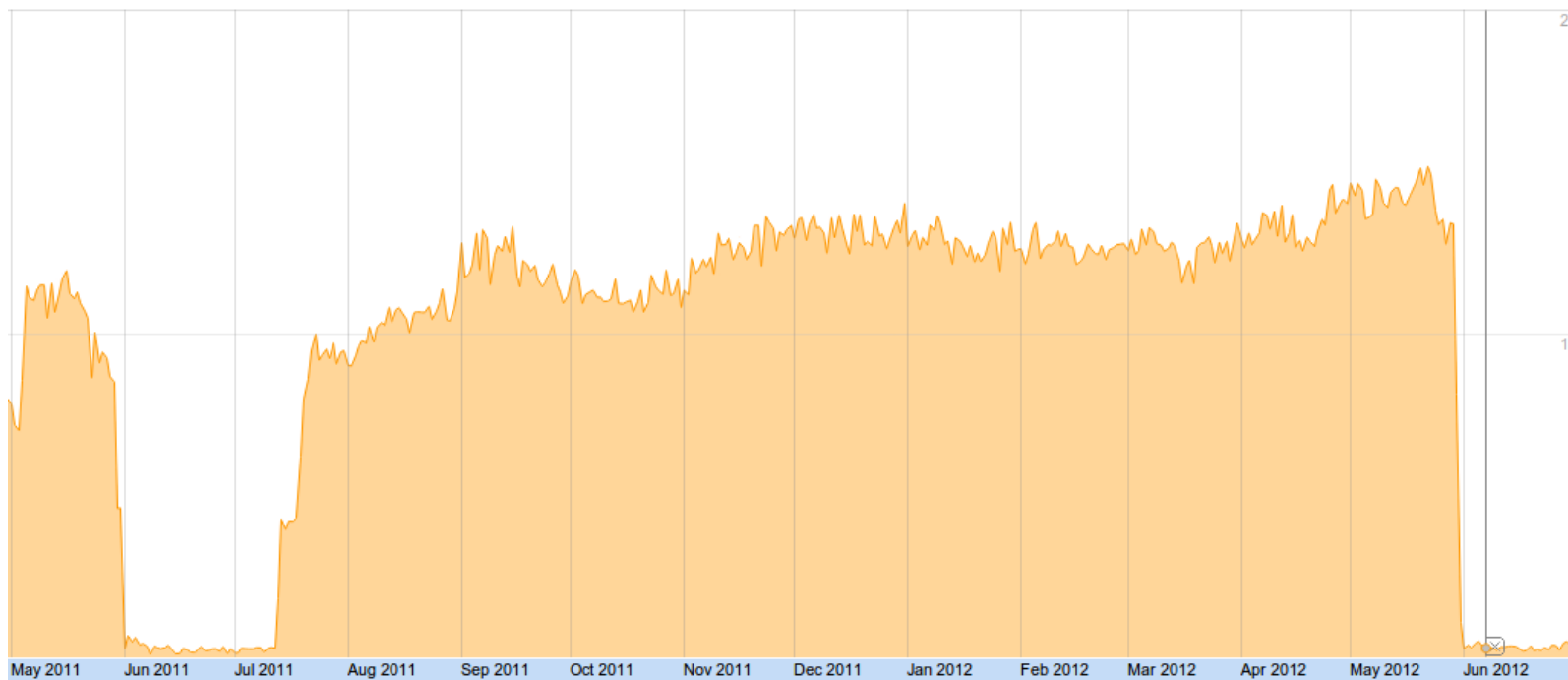
全体像

- World IPv6 Launchの参加者
 - 3000以上のWebサイト
 - 60以上のISP
 - 4社のホームルータベンダ
- 実際のトラフィック
 - AT&T: 我々の観測ではIPv6対応のカスタマで、20%以上のトラフィックがIPv6に移行している --- "For our IPv6 enabled customers, we're seeing **more than 20 percent of traffic** transition to IPv6..."
- 実際の展開
 - 世界中のあらゆるところで
 - あらゆる接続性で

Meanwhile, in Japan

ところで日本

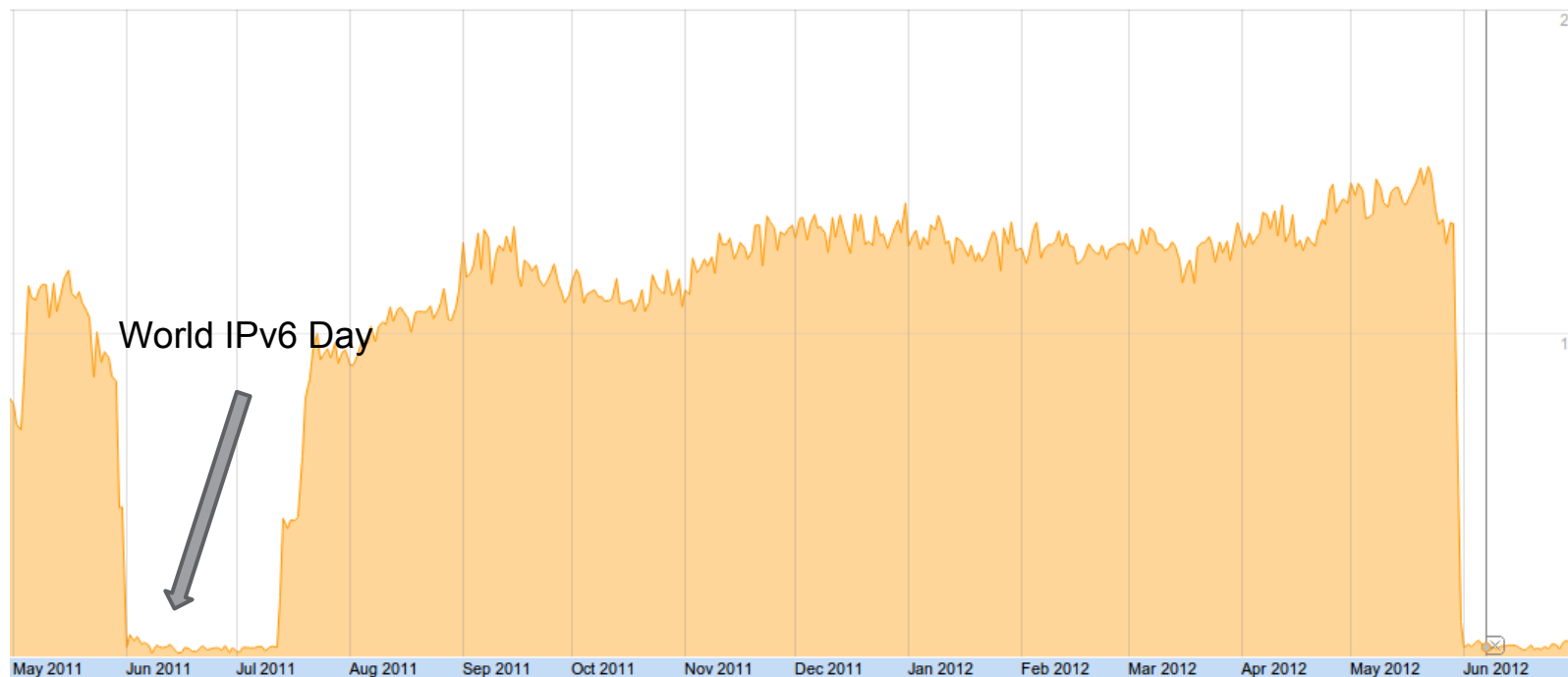
AAAA filtering: not a real fix



A major Japanese FLETS ISP

- The underlying problem doesn't go away
- Impossible to know when to stop AAAA filtering

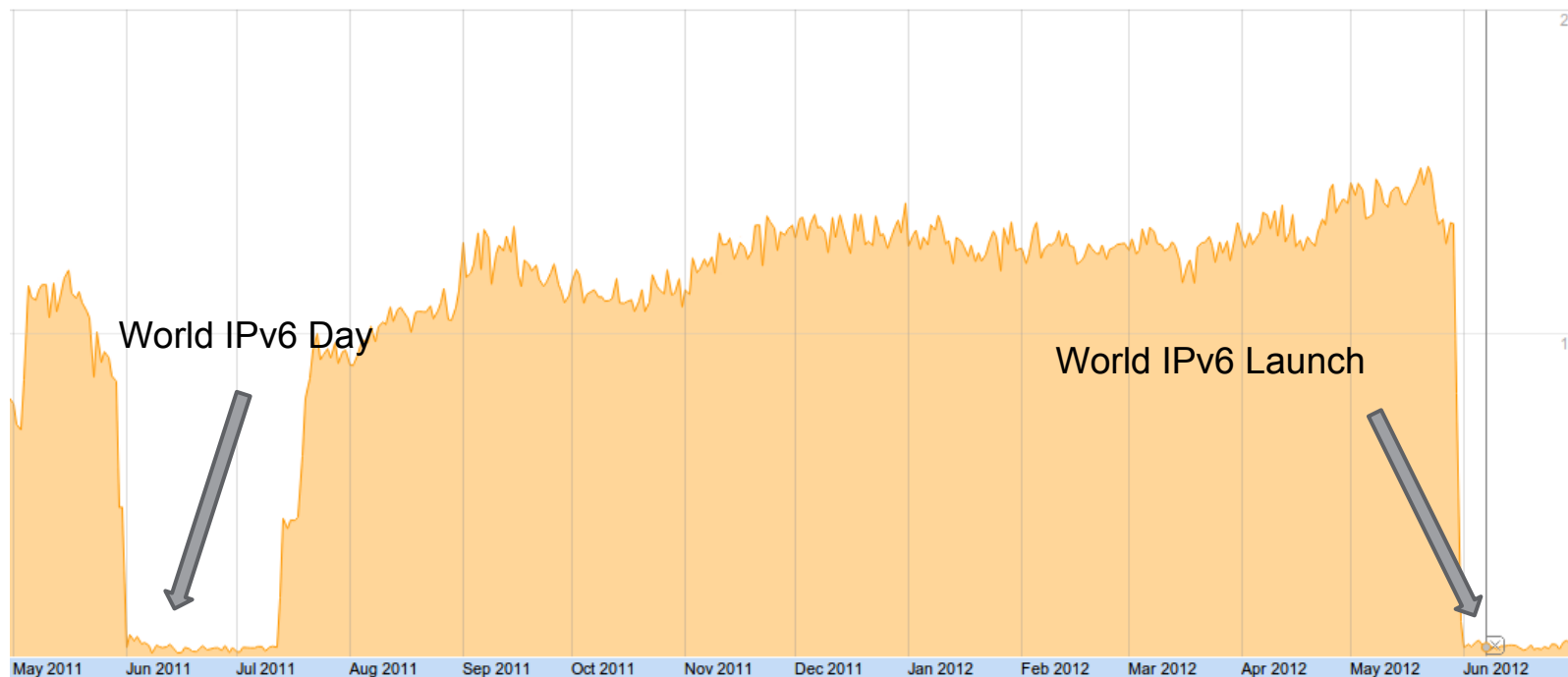
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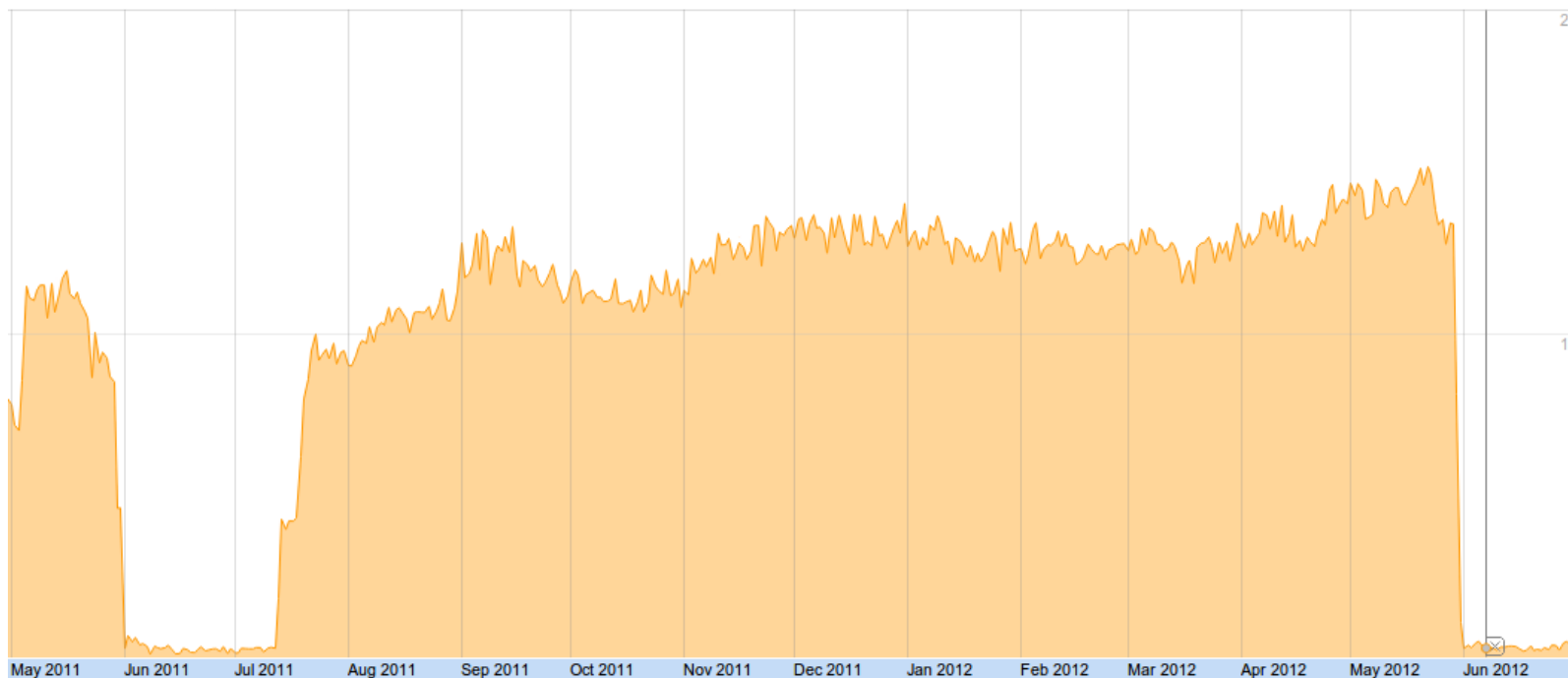
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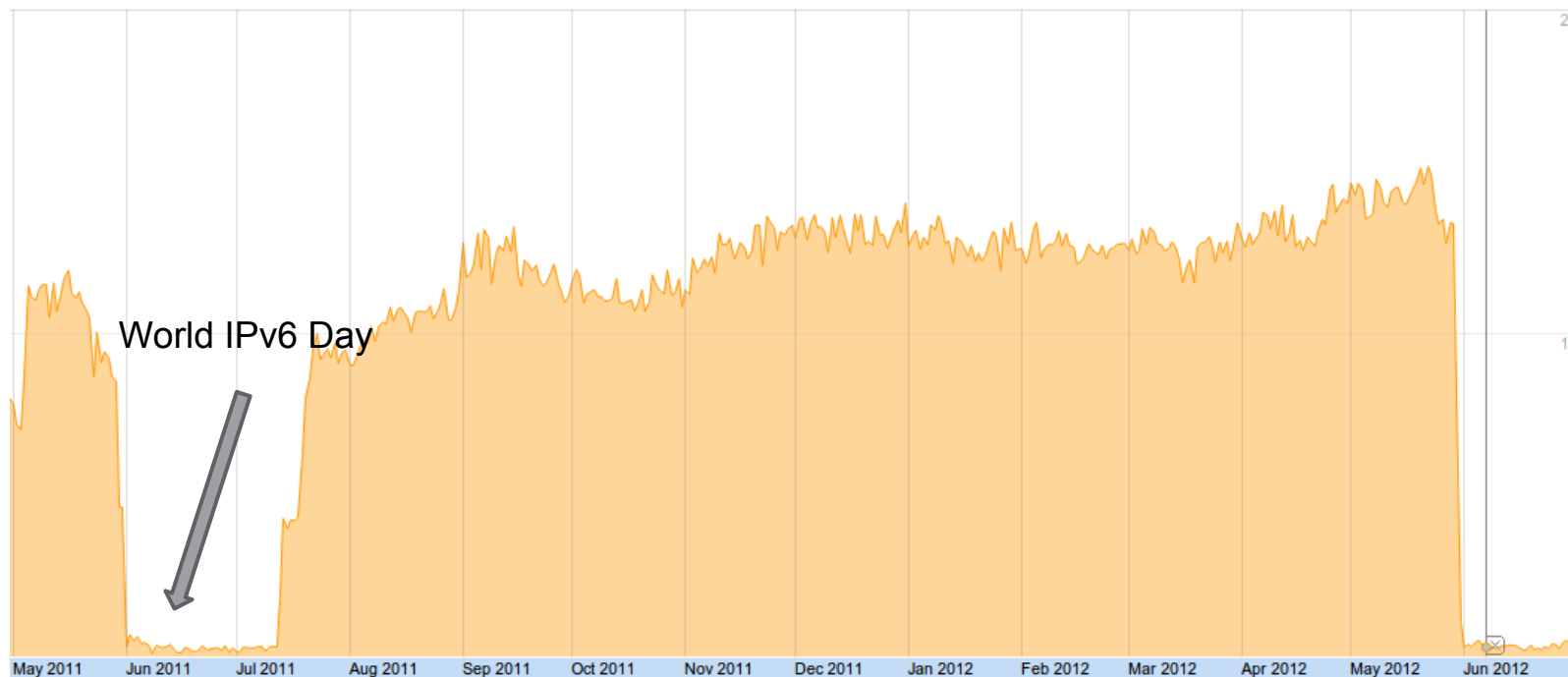
AAAA filtering: 根本解決ではない



フレッツサービスを足回りにする日本の有名なISP

- 根本的な問題は解決していない
- いつAAAA filteringを止めていいか分かりようがない

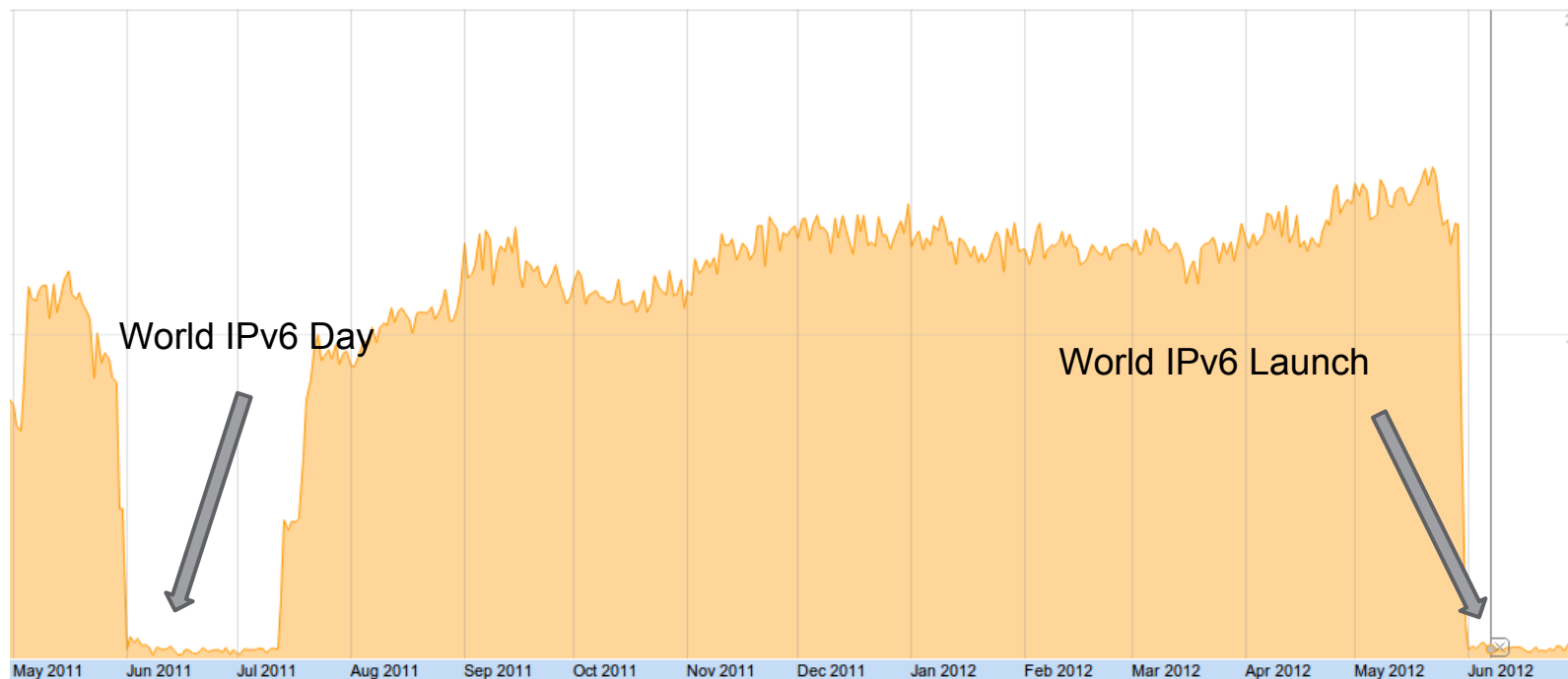
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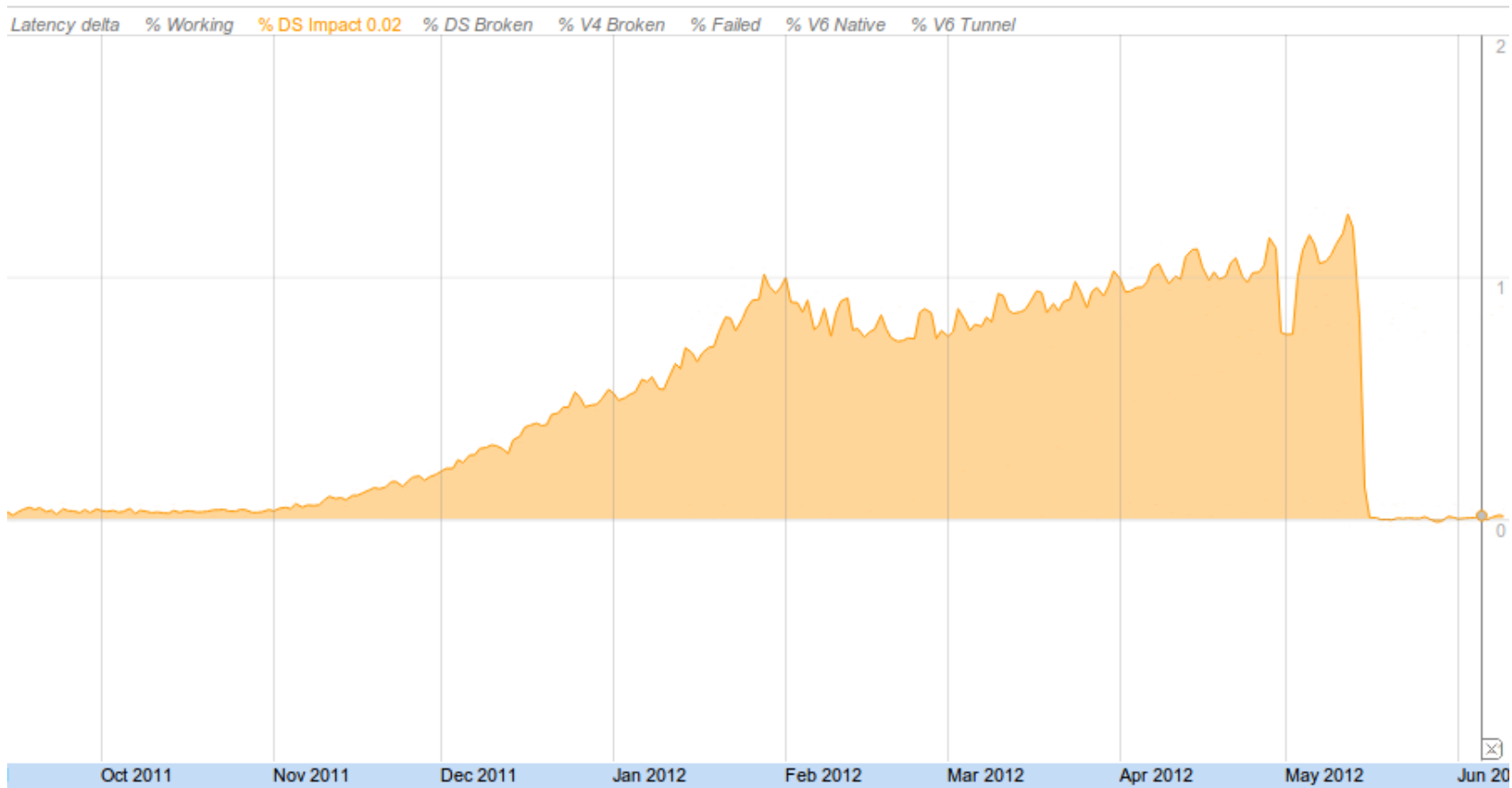
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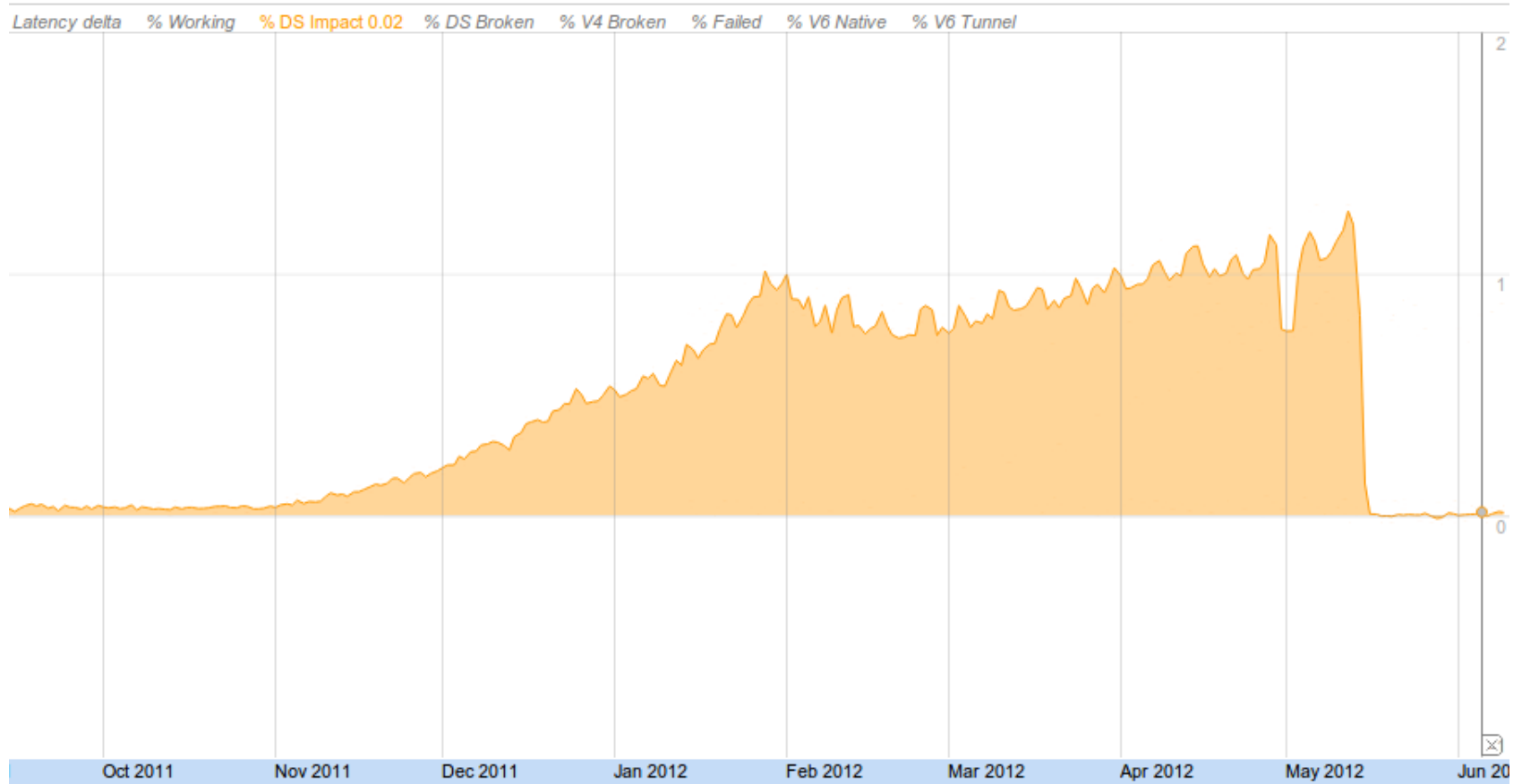
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Japan is not alone



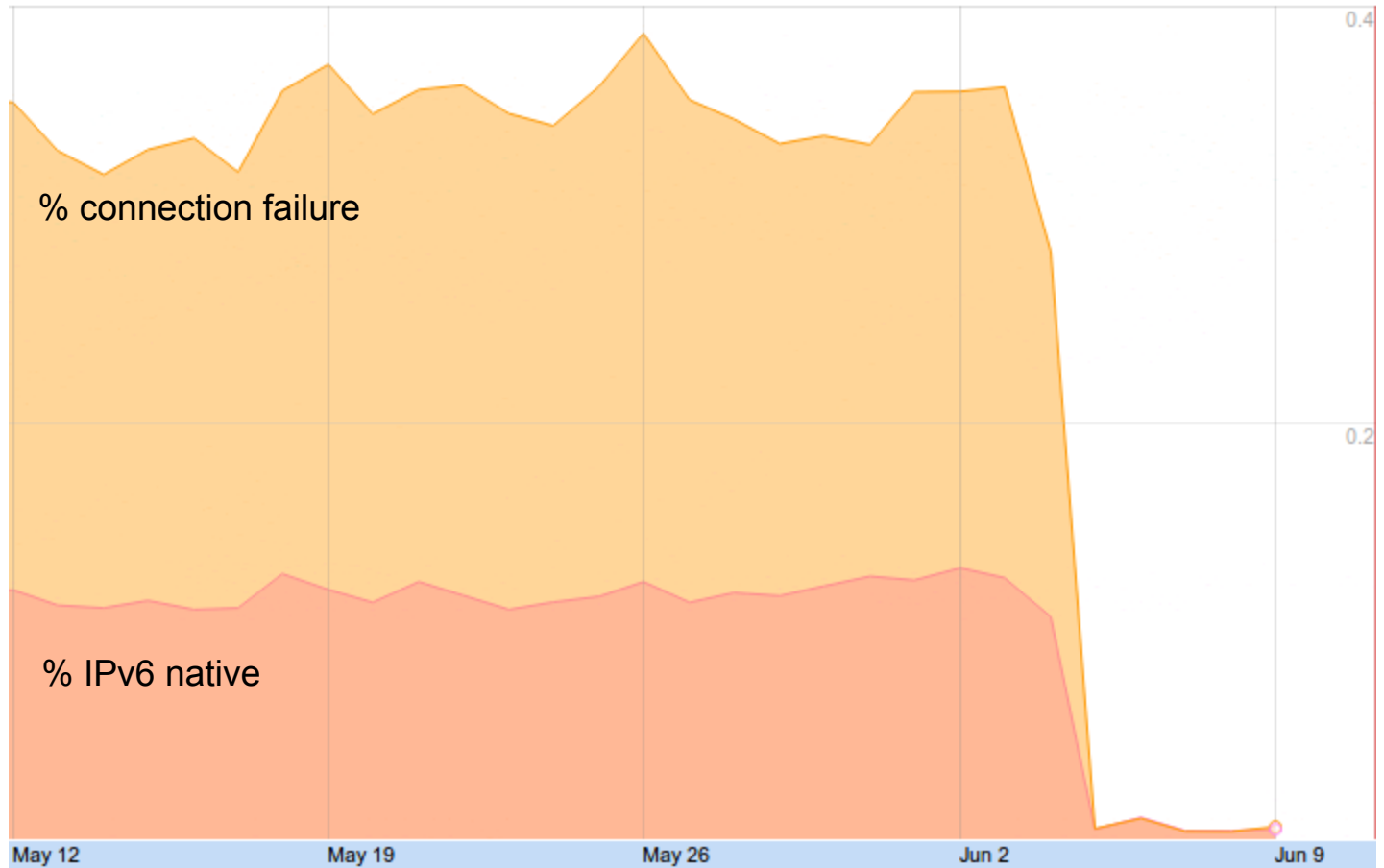
A major ISP in Greece

日本だけではない

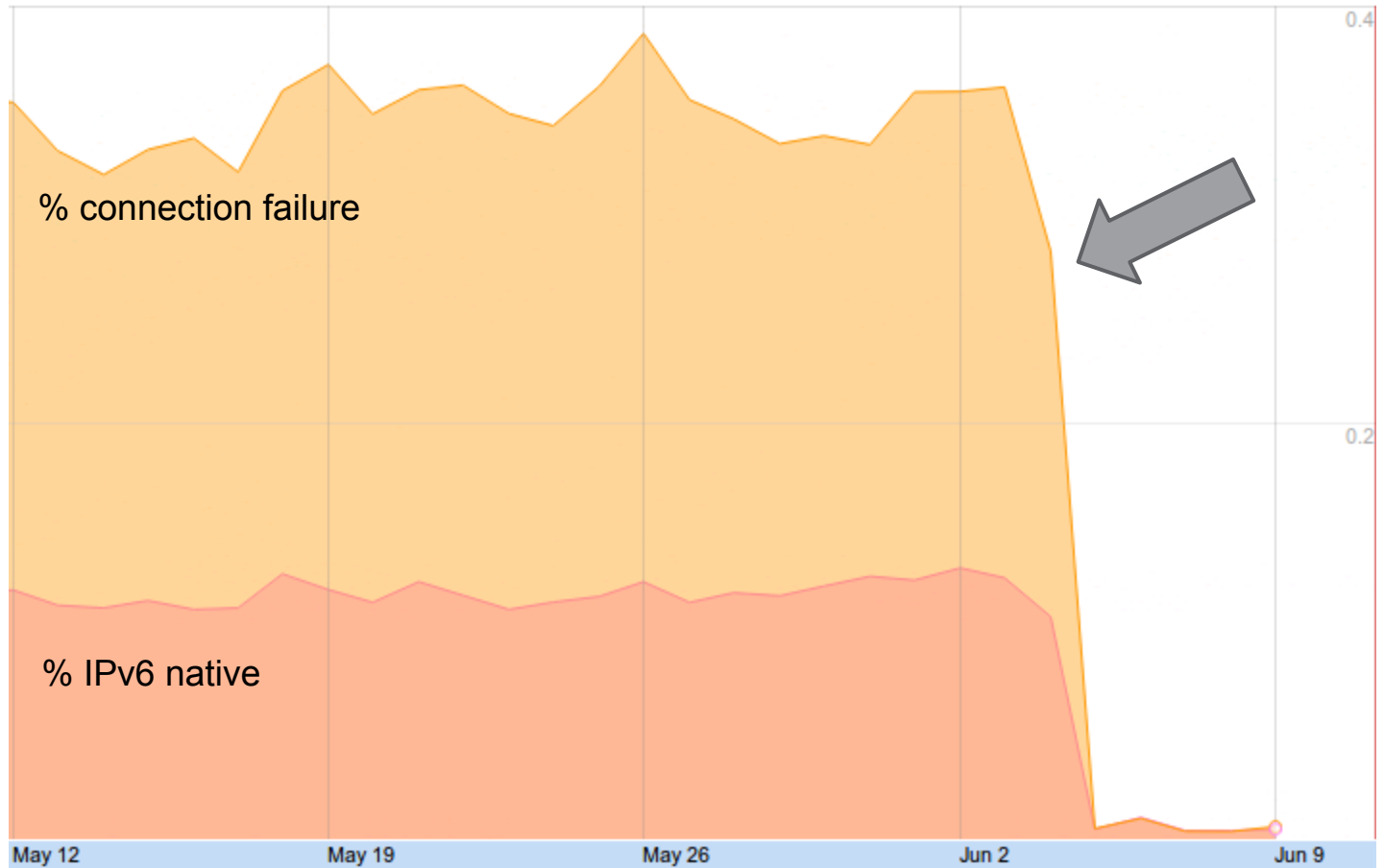


ギリシャの主要なISP

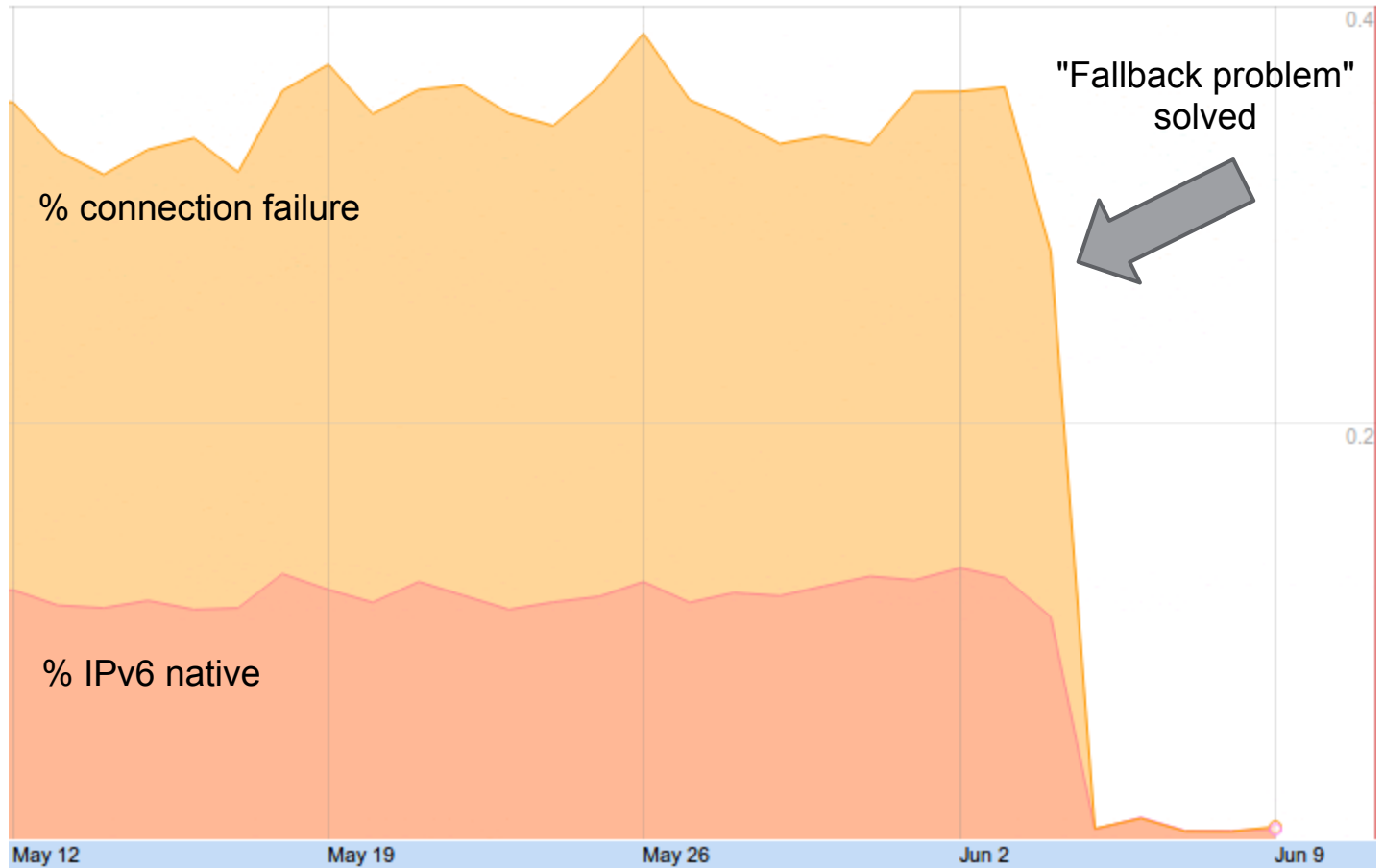
AAAA filtering: collateral damage



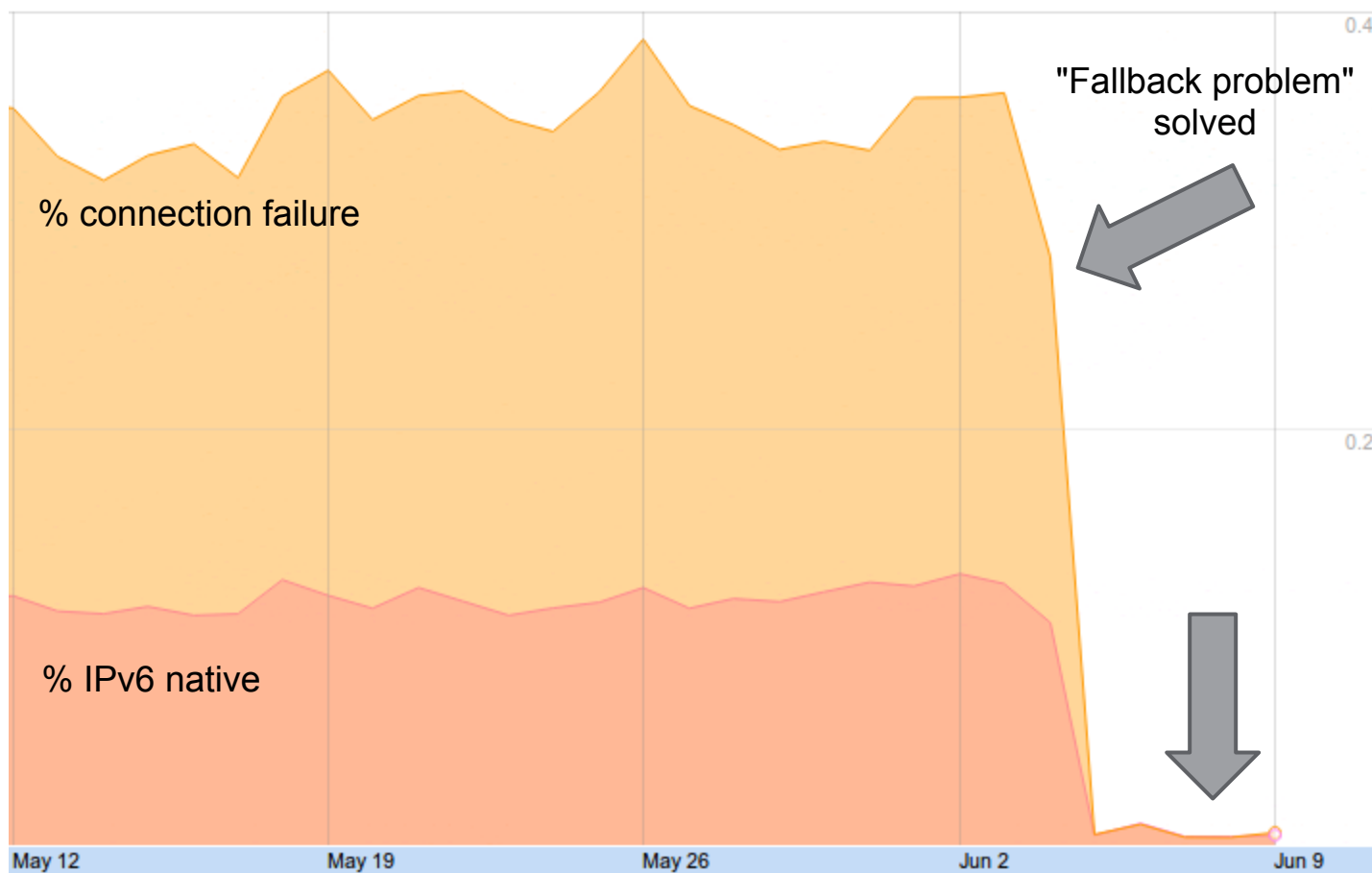
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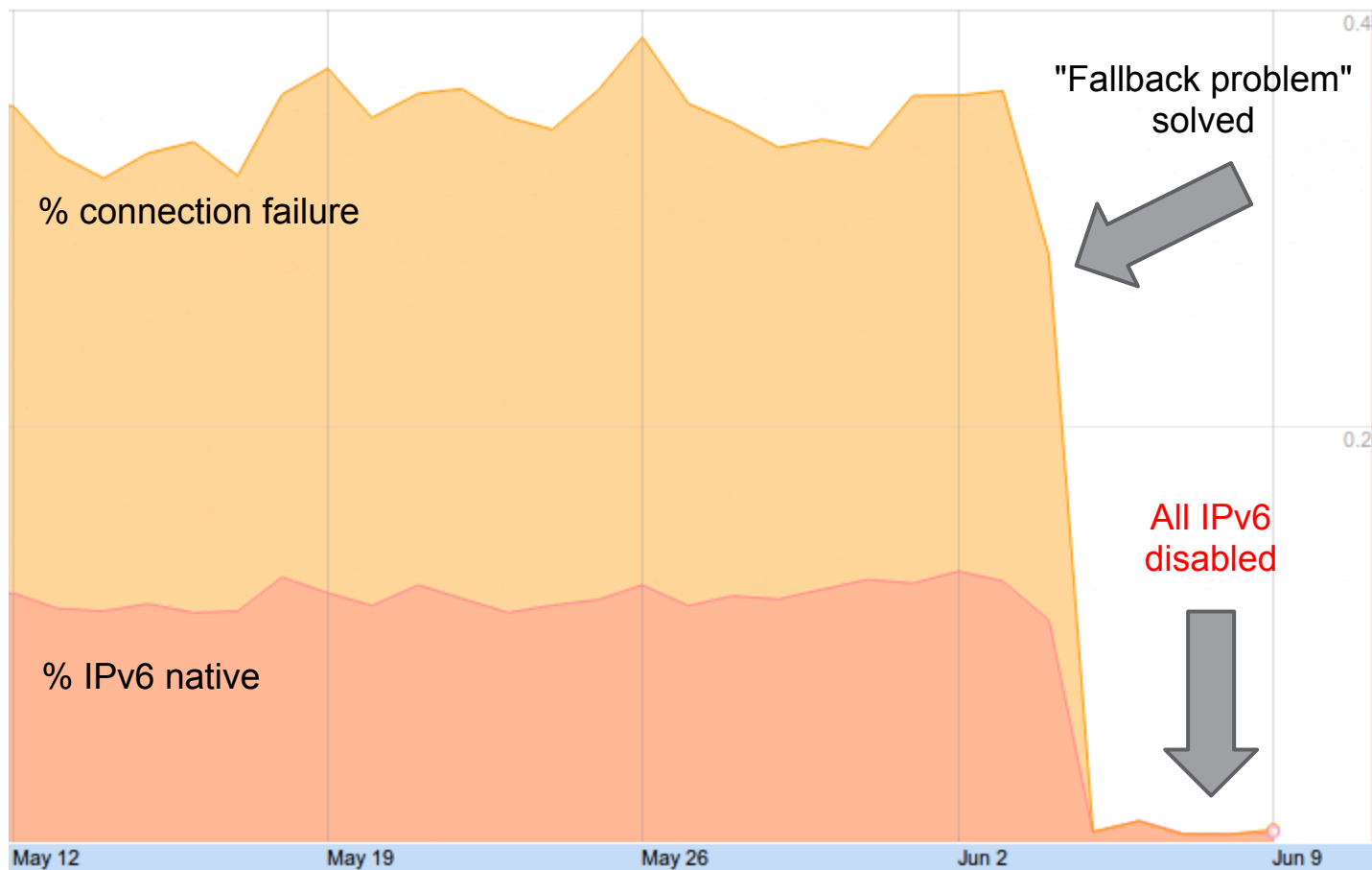
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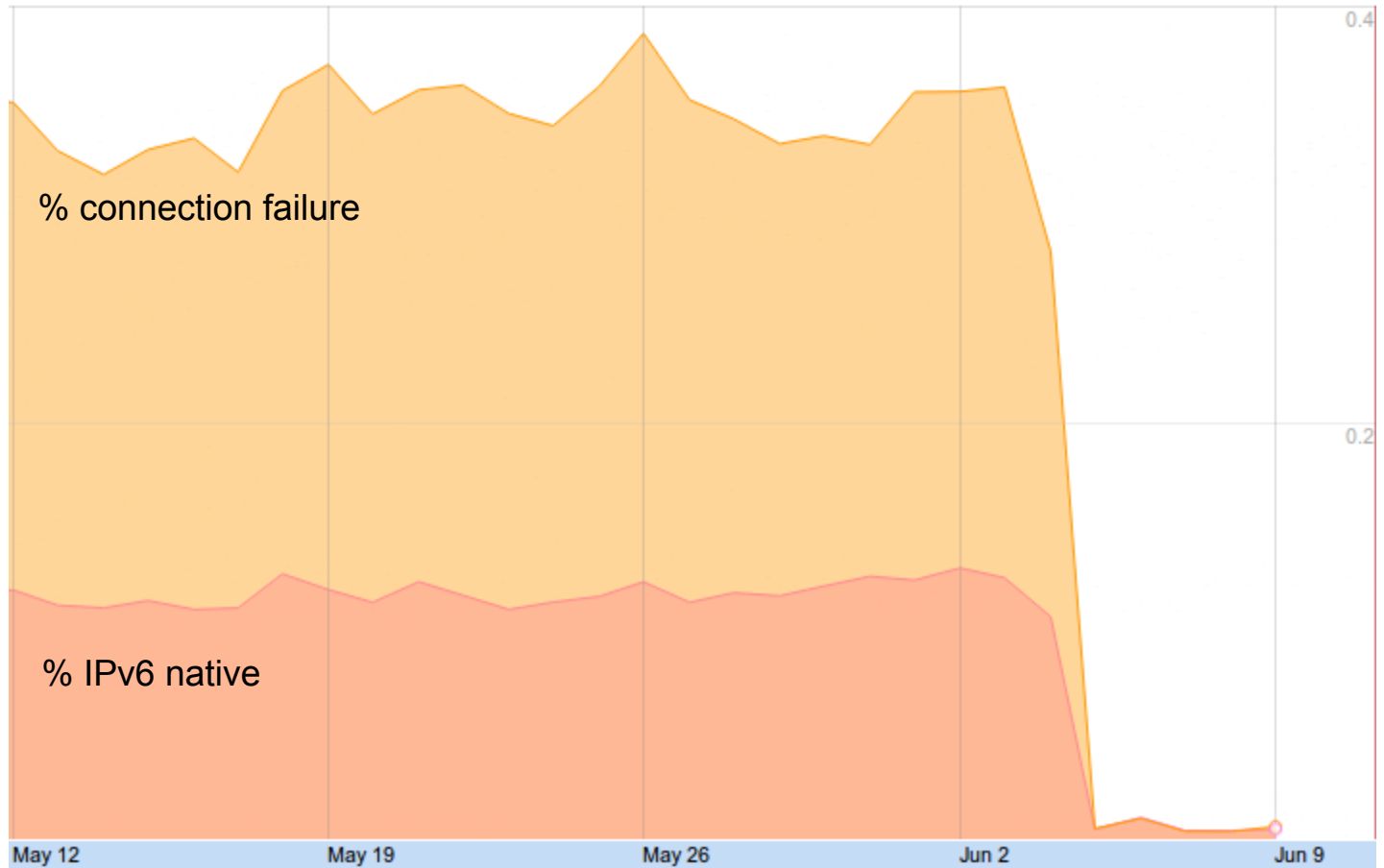
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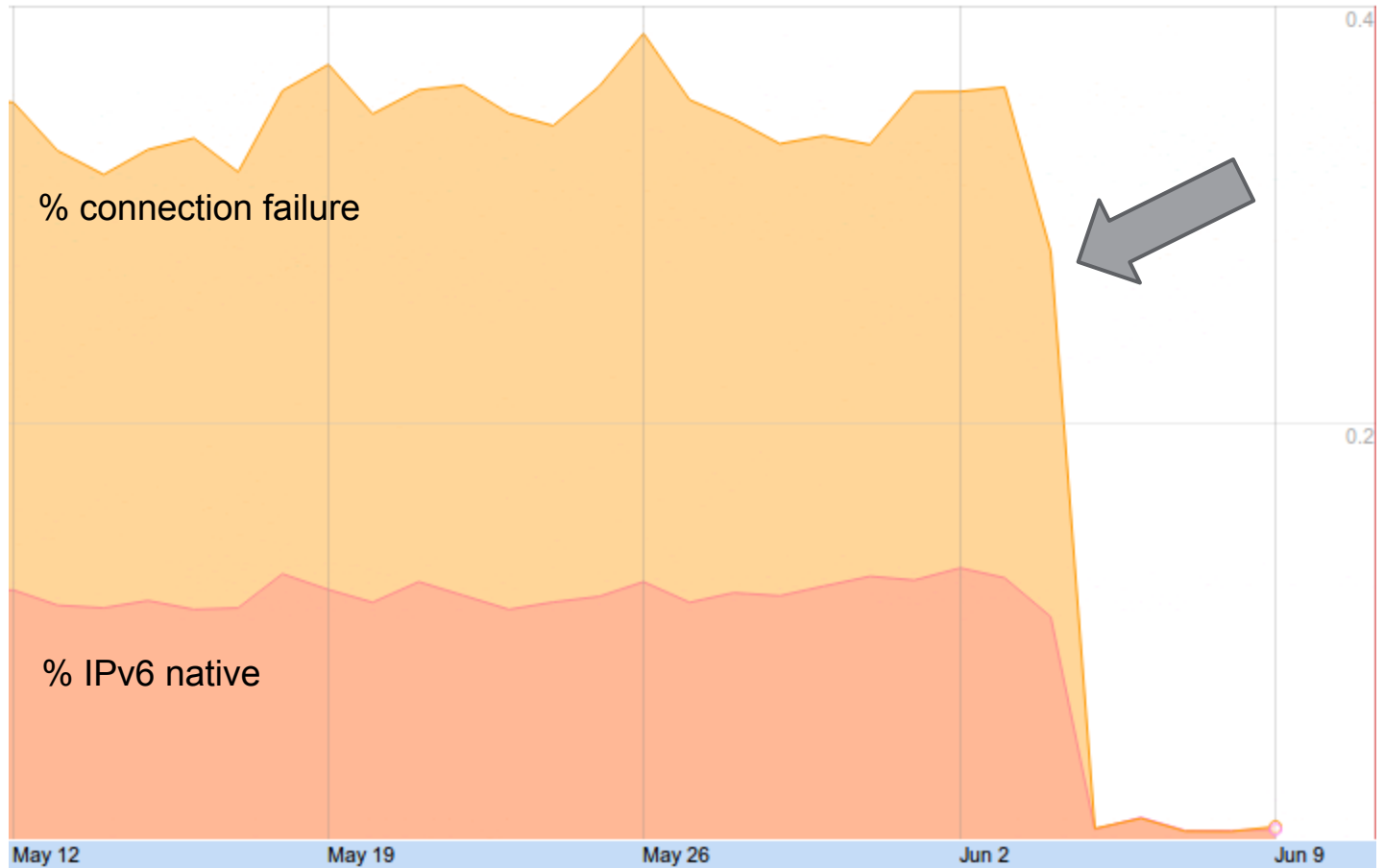
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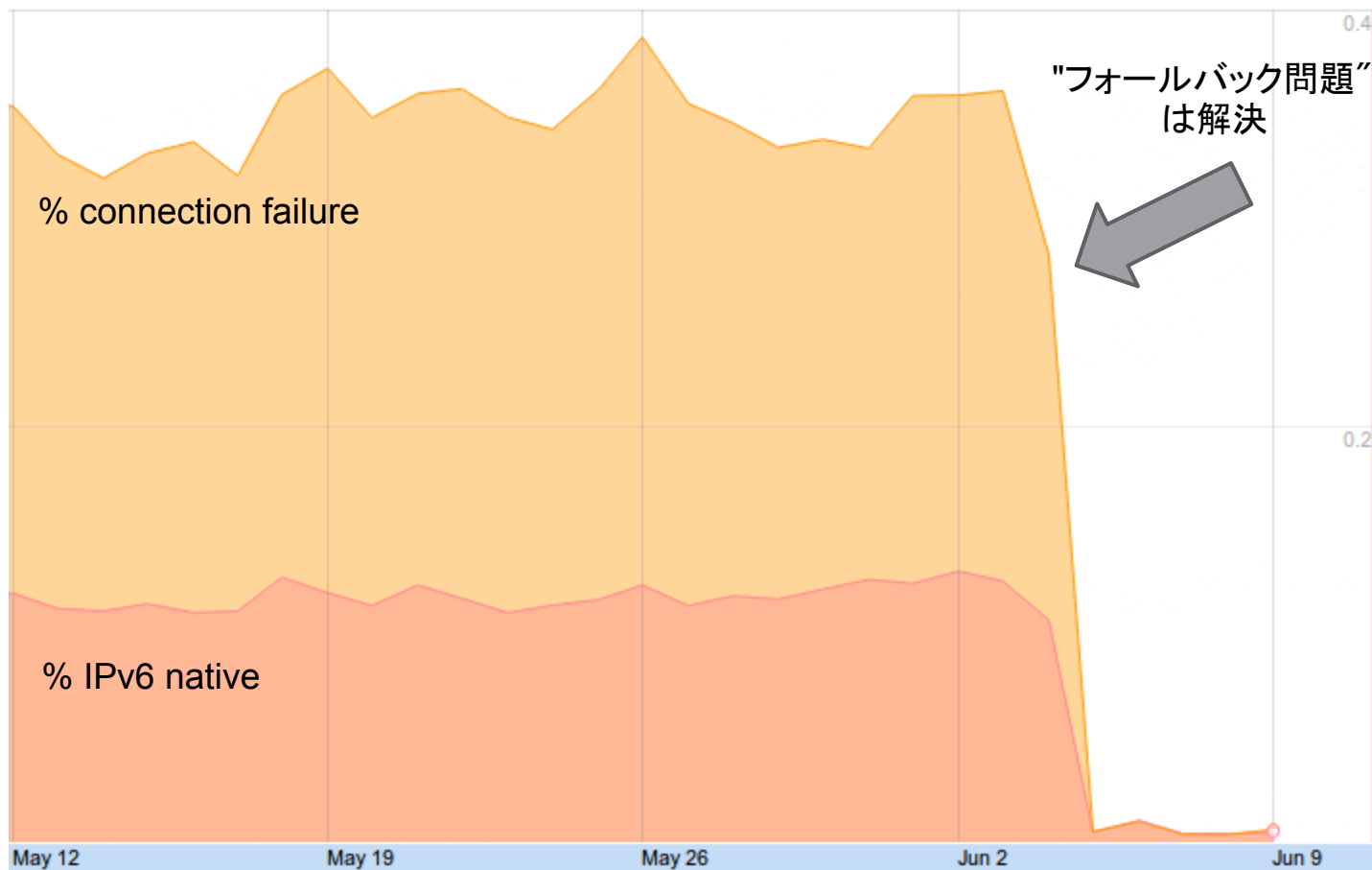
AAAA filtering: 巻き添えの被害



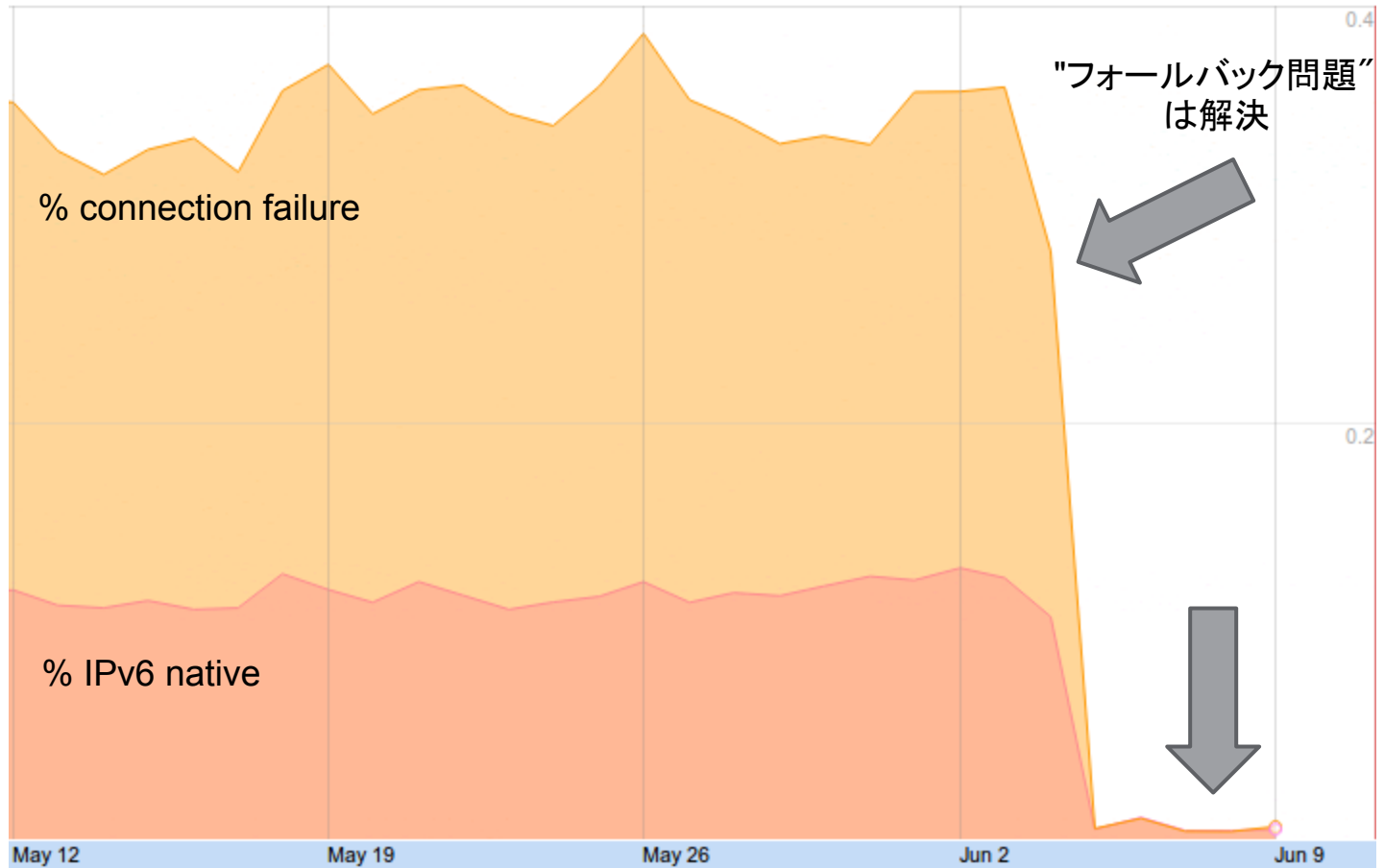
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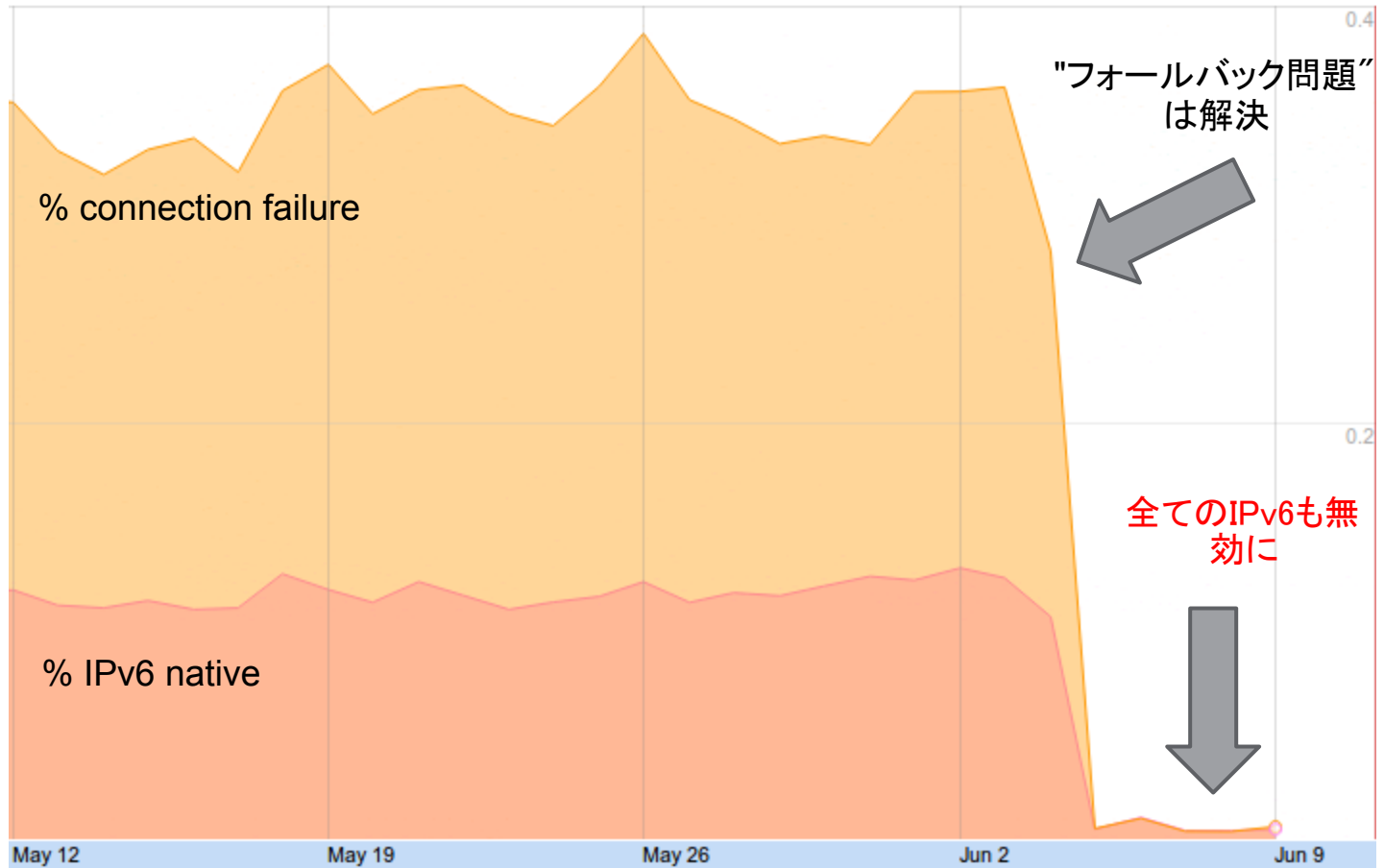
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Summary

2006

2012 ?

Summary

2006



2012 ?

Summary

2006



2012 ?



Summary

2006



2012 ?



Questions?