

IPv6 実装状況 アップデート

IPv6 Summit Tokyo 2015 , 16/11/2015

古今東西IPv6物語 - 今後のアクションに向けて

Miwa Fujii <miwa@apnic.net>

APNIC



Agenda

- IPv6 end user readiness 統計データ
 - トレンド
 - Source: IPv6 ready end users measurement:
<http://labs.apnic.net/ipv6-measurement/>
 - 観測: iOS と Android デバイス
- 締め: 今後に向けて

IPv6 measurement

End user readiness: World



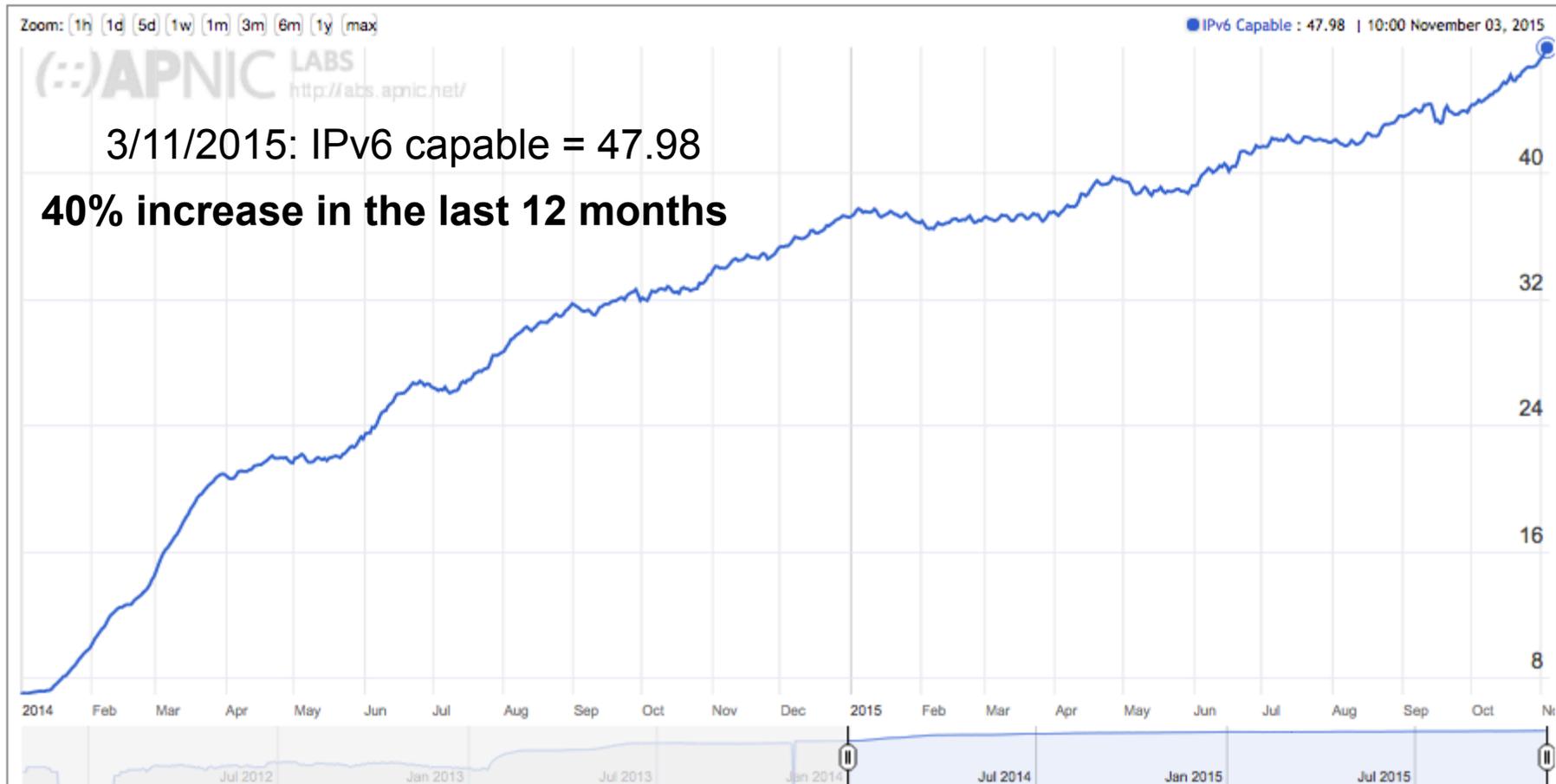
<http://stats.labs.apnic.net/ipv6/XA>

The IPv6 economy league table

CC	Country	IPv6 capable (%)
BE	Belgium	46.00
CH	Switzerland	28.19
US	United States of America	26.81
DE	Germany	25.73
PT	Portugal	18.72
LU	Luxembourg	17.38
GR	Greece	17.14
EE	Estonia	17.05
PE	Peru	15.78
JP	Japan	15.72
CZ	Czech Republic	10.86
NO	Norway	10.49
MY	Malaysia	10.20
RO	Romania	9.79
SG	Singapore	9.78

<http://stats.labs.apnic.net/ipv6/> as of 03/11/2015

Belgium



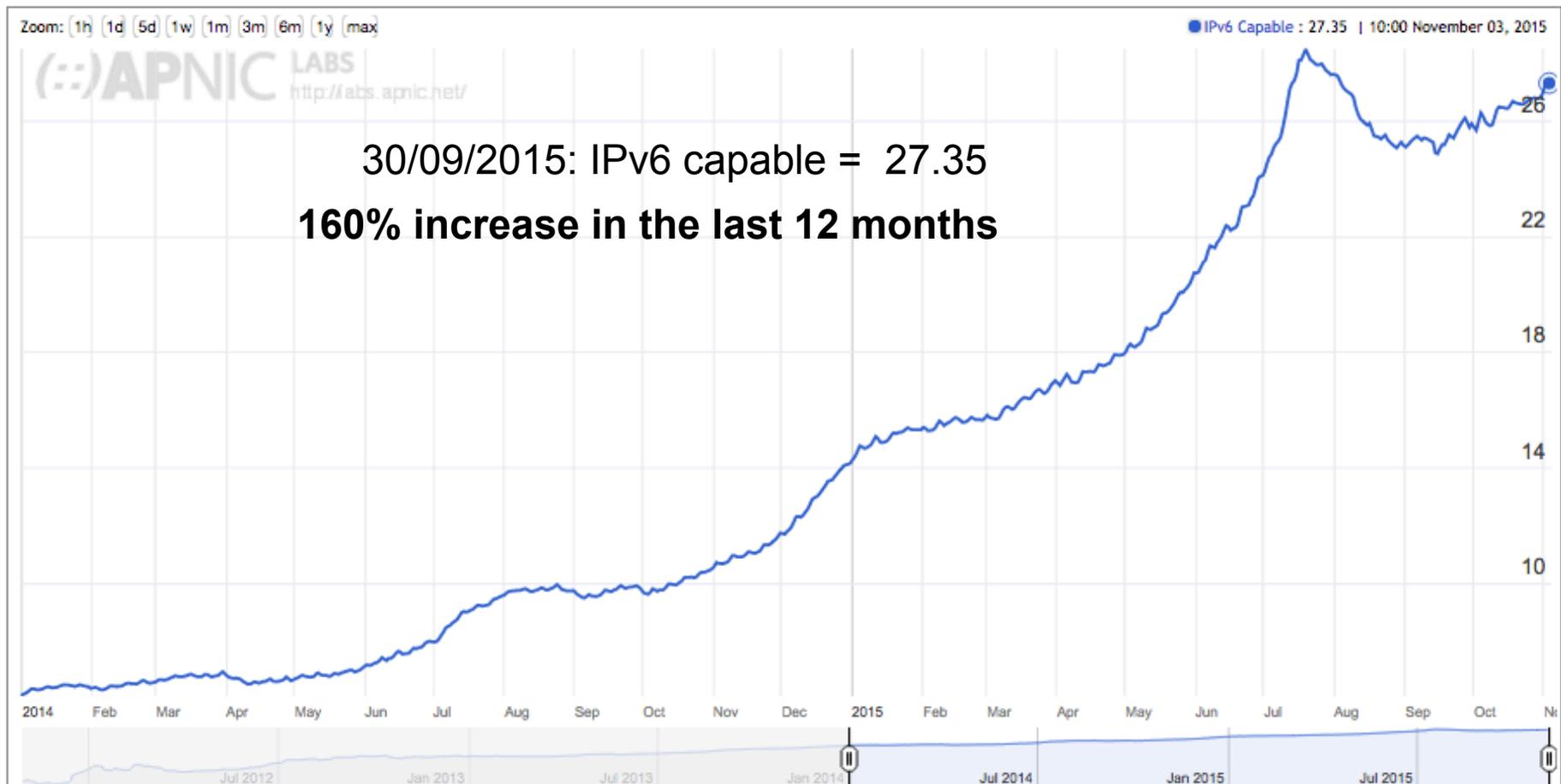
<http://stats.labs.apnic.net/ipv6/BE>

Belgium IPv6 leaderboard

ASN	Organization	IPv6 capable (%)
12392	Brutel	75.05
6848	Telenet	63.98
5432	Belgacom-skynet	34.64
2611	Belnet	18.34

<http://stats.labs.apnic.net/ipv6/BE> 3/11/2015

USA



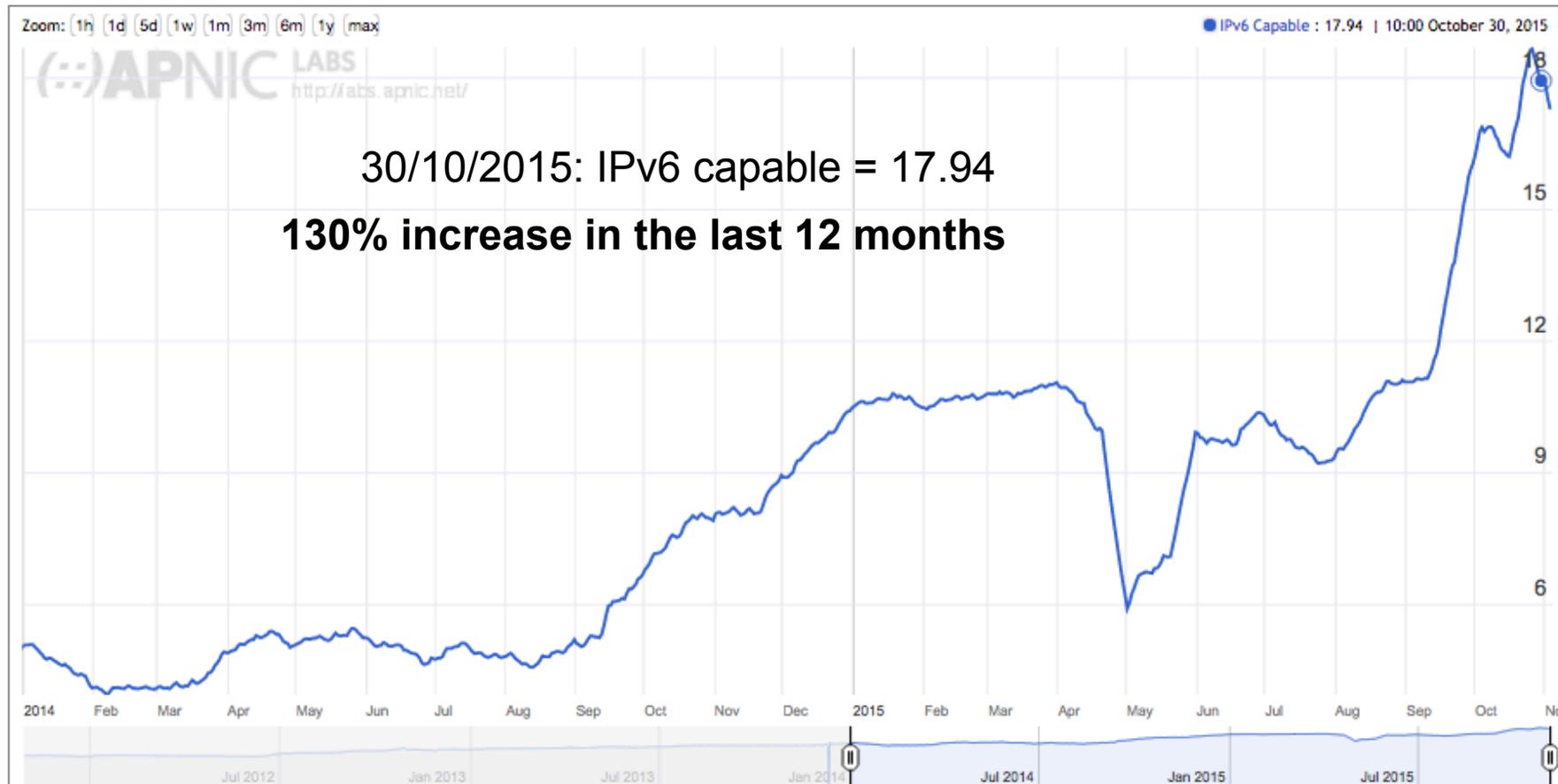
<http://stats.labs.apnic.net/ipv6/US>

USA IPv6 leaderboard

ASN	Organization	IPv6 capable (%)
22394	Verizon Wireless	89.30
16591	Google Fiber Inc.	84.99
7018	ATT	72.28
22140	T-Mobile USA Inc.	71.96
7922	Comcast Cable Communications Inc.	55.15
46690	SNET	45.85
12271	Time Warner Cable Internet LLC	44.52
20001	Roadrunner-west –TWC Internet LLC	42.48
6621	Hughes Network Systems	41.32

<http://stats.labs.apnic.net/ipv6/US> 03/11/2015

Japan



http://stats.labs.apnic.net/ipv6/JP_30/10/2015

Japan IPv6 leaderboard

ASN	Organization	IPv6 capable (%)
18126	CTC Chubu Telecommunications	72.77
7506	INTERQ GMO Internet	57.47
7522	STCN STNet	56.90
2516	KDDI	52.25
2527	So-net Entertainment Corporation	38.74
10010	Tokai Communications Corporation	26.47
18144	Energia Communications Inc	21.00
17676	Softbank BB	19.59
9365	ITSCOM	19.47

<http://stats.labs.apnic.net/ipv6/US> 05/11/2015

Norway

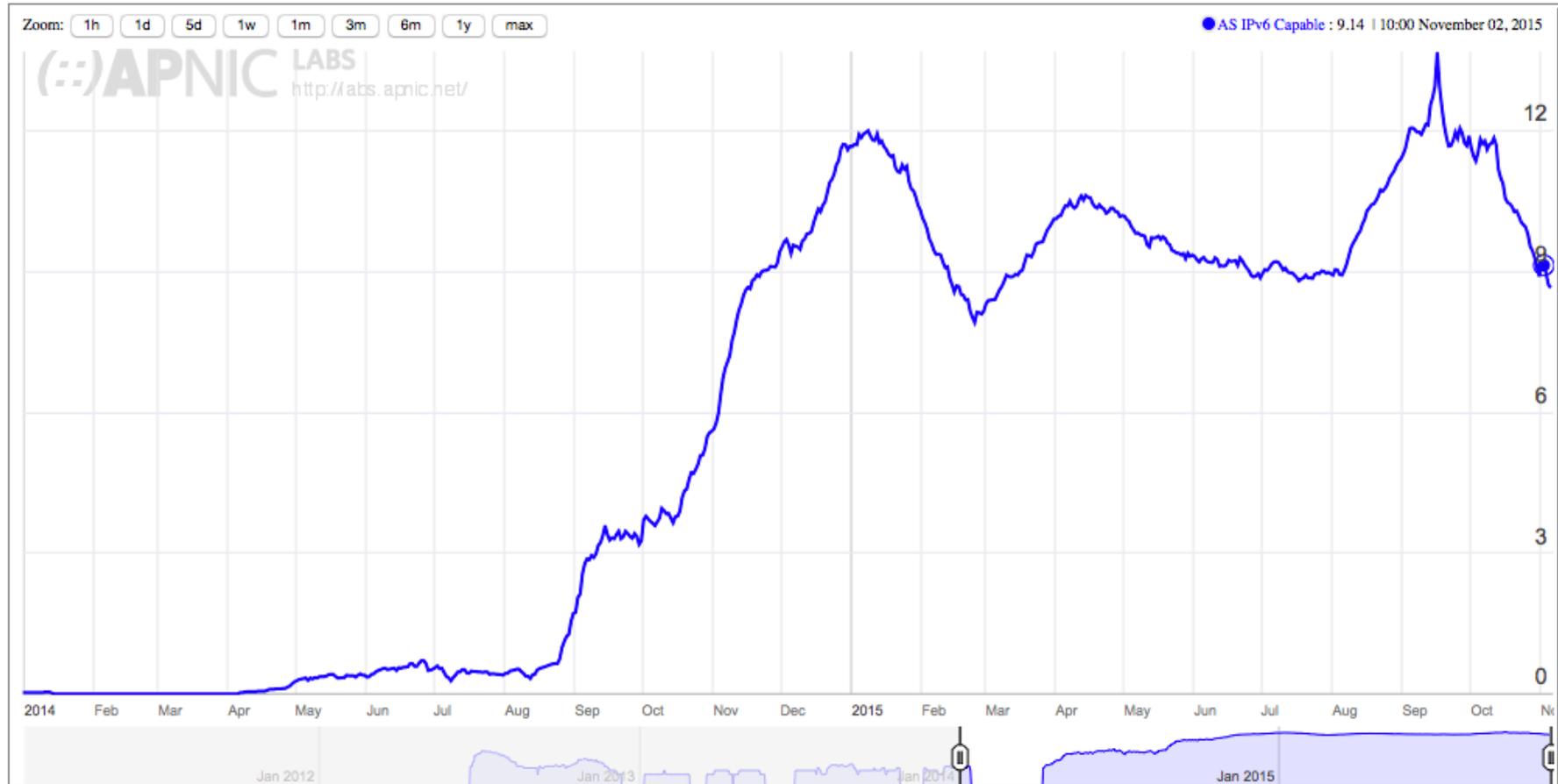


<http://stats.labs.apnic.net/ipv6/NQ> 06/11/2015

Norway IPv6 leaderboard

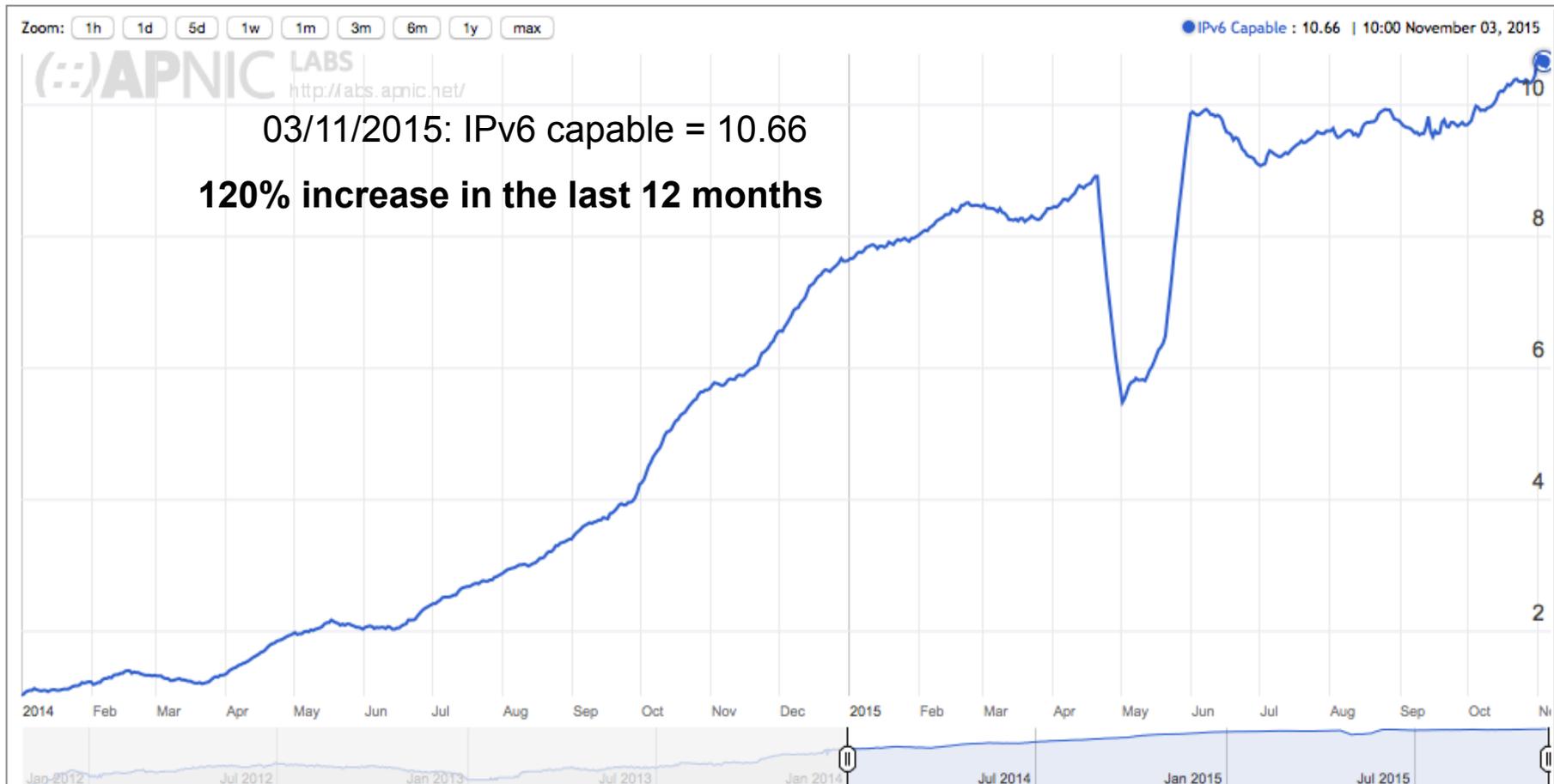
ASN	Organization	IPv6 capable (%)
41164	GET Norway	27.45
2119	Telenor	9.93

AS2119 Telenor



<http://stats.labs.apnic.net/ipv6/AS2119> 02/11/2015

Malaysia

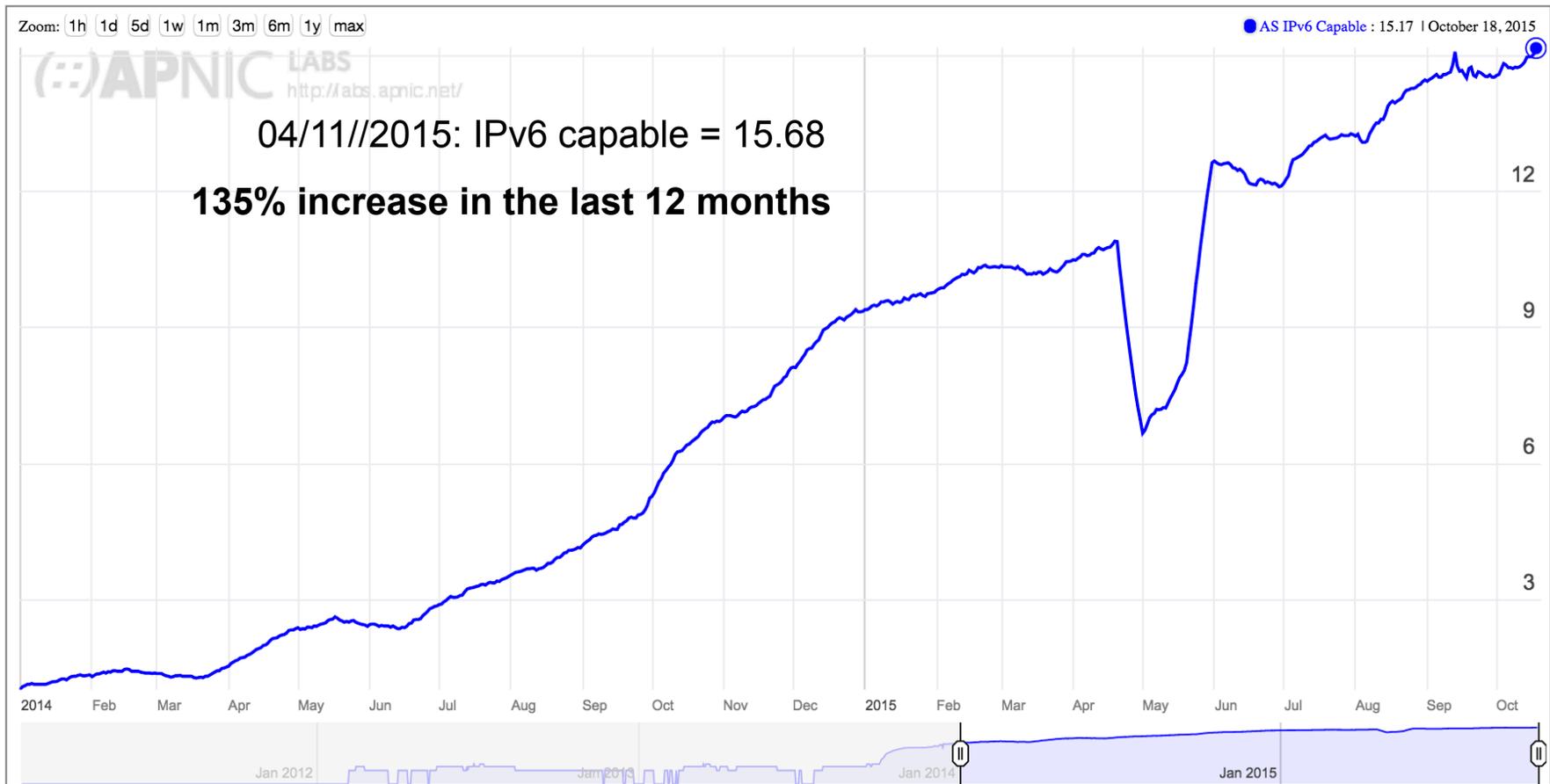


<http://stats.labs.apnic.net/ipv6/MY>

Malaysia IPv6 leaderboard

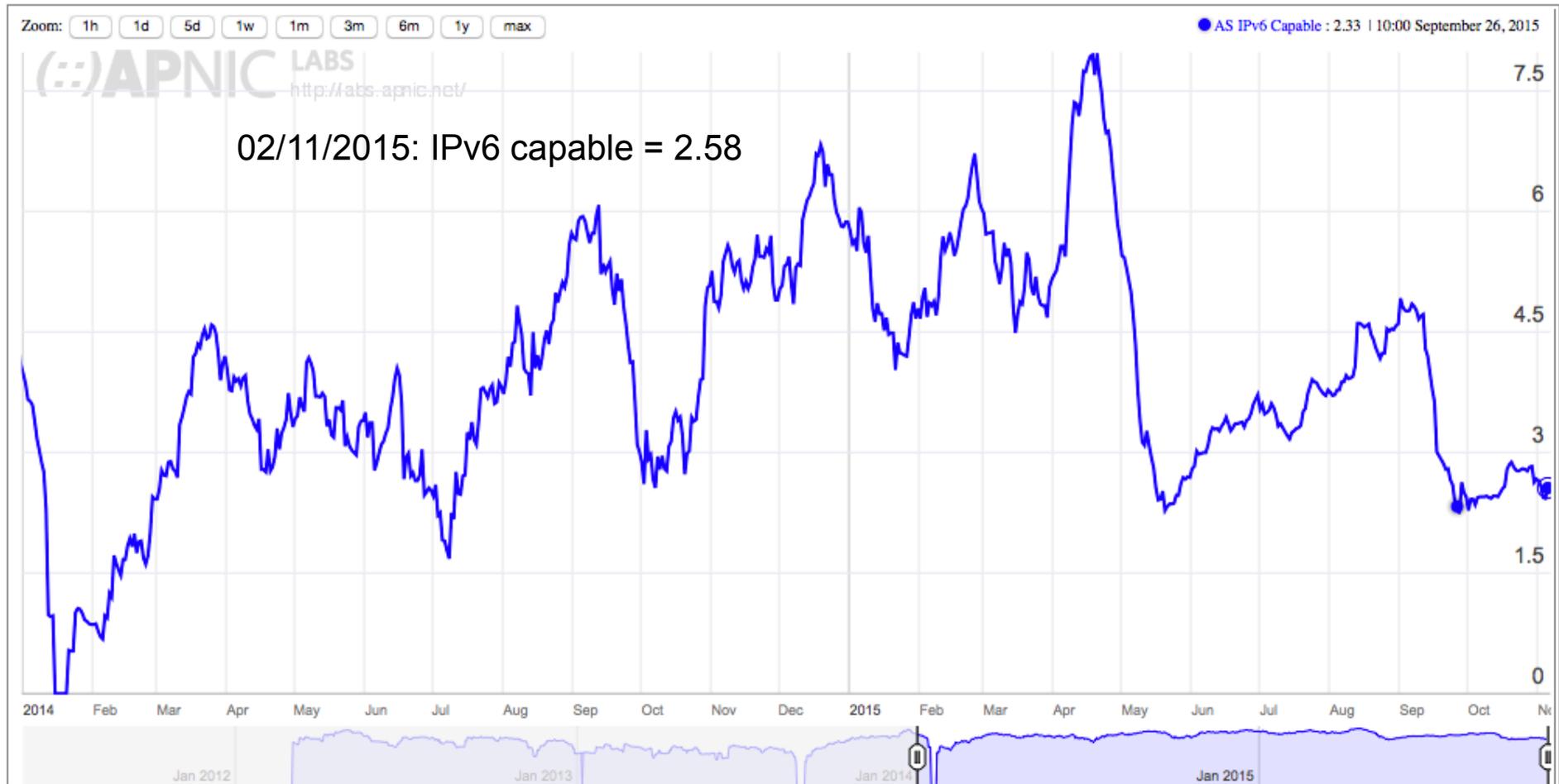
ASN	Organization	IPv6 capable (%)
4788	TMTNET	15.18
38044	GITN Network	4.54

AS4788 TMnet



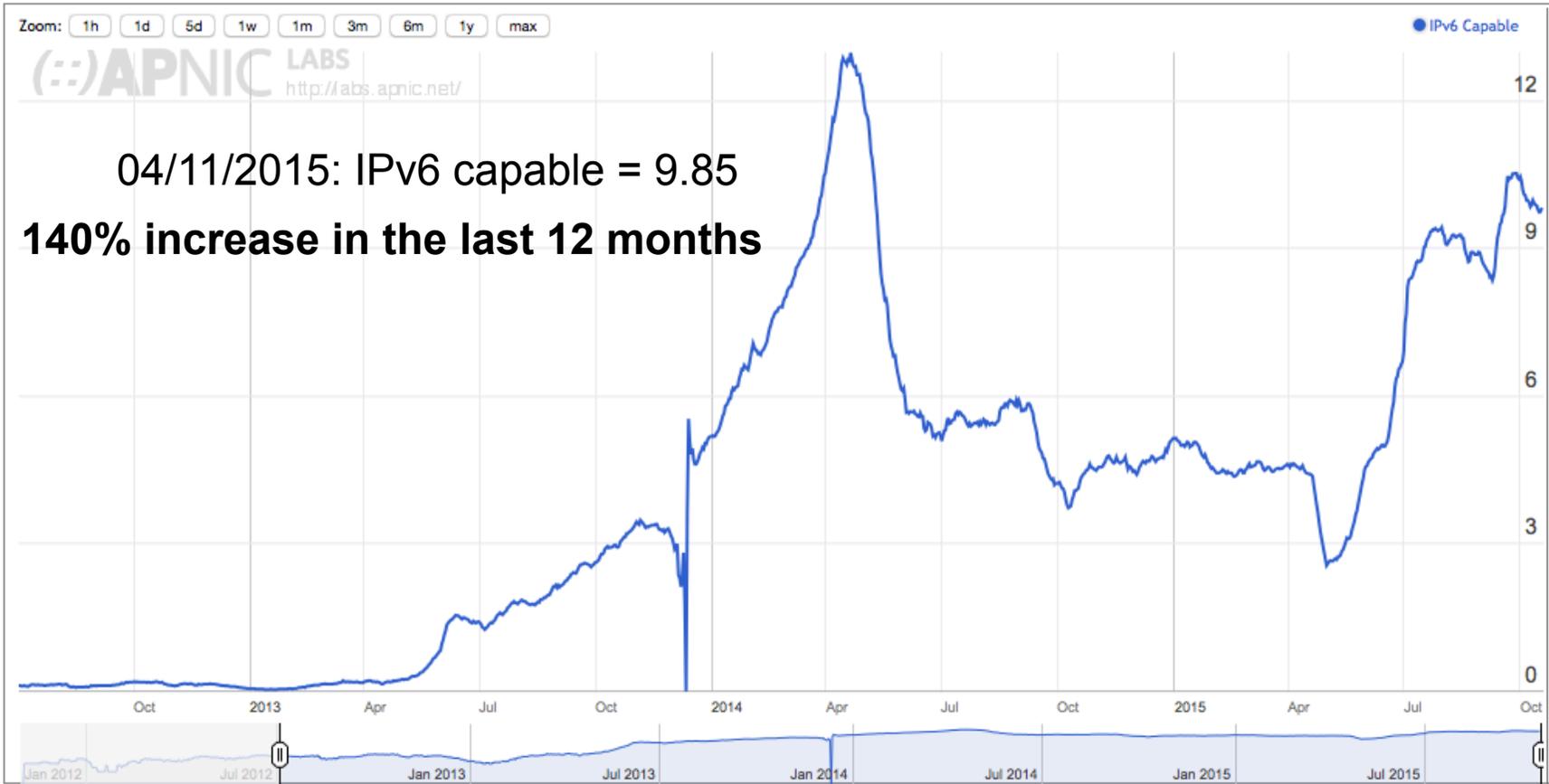
<http://stats.labs.apnic.net/ipv6/AS4788>

AS38044 GITN



<http://stats.labs.apnic.net/ipv6/AS38044>

Singapore



Singapore IPv6 leaderboard

ASN	Organization	IPv6 capable (%)
10091	StarHub Cable Vision	56.93
133165	Digital Ocean Inc (cloud services)	35.97
63949	Linode LLC (cloud services)	16.57
55430	StarHub Internet (NGNBN)	7.66
4773	MobileOne Ltd.	5.27

Observations

- 堅調に伸びているIPv6実装
- しかし、地域、国、各AS番号によって実装に格差
- 傾向
 - 最近の動向として、携帯網、クラウドサービス、ケーブルTVオペレーターにIPv6実装が見られ始めた
 - 地域にある比較的小中のオペレーターが実装先行
 - IPv6実装が進むと、確実にIPv6 readyなエンドユーザー急増
 - 数社がIPv6実装することで、その国のIPv6 readyなエンドユーザーの比率急増

Korea



<http://stats.labs.apnic.net/ipv6/KR> 06/10/2015

Korea IPv6 leaderboard

ASN	Organization	IPv6 capable (%)
9644	SKTelecom	17.89

<http://stats.labs.apnic.net/ipv6/MY> 07/05/2015)

Korea is moving!

- 早期に、高レベルのブロードバンド普及率達成
- 大半の投資がIPv4: technology locked to IPv4
 - 普及している国産CPEをアップデートするオプション無し
 - 国内データネットワーク: IPv6実装の余地がほぼ無い
- が、携帯電話網で464XLAT実装

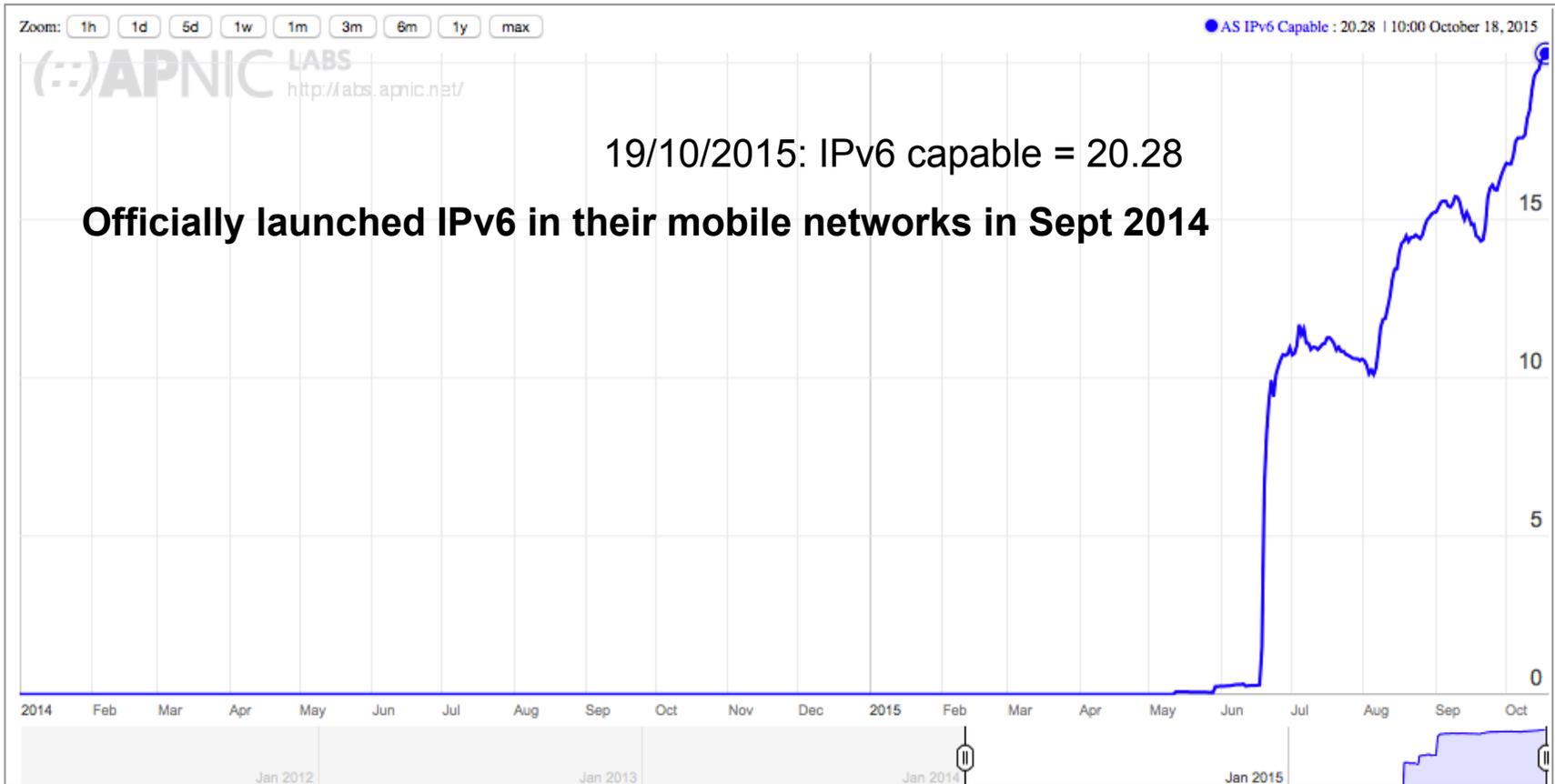
SK Telecom

- 2000万カスタマー
 - Koreaの携帯市場ほぼ4900万の機器
 - 一人一つ以上の携帯普及率
- ほぼ400万人のカスタマーがすでに464XLATに移行
 - 複数のAPN使用
 - レガシー機器はIPv4オンリー

Case study: Korea SK Telecom

- 2014年7月にIPv6実装(464XLAT)
 - IPv4サービスをIPv6シングルスタックのネットワーク経由で提供
- 安定したサービス提供中
- なぜSKTは携帯電話網にIPv6を実装したのか？
 - NAT設備投資費を軽減
 - CGN/NAT機器への負担を軽減
 - 二つのネットワークを管理する上での複雑性の軽減
 - 韓国政府からの奨励
- APNIC40(2015年9月)SKTのIPv6実装に関する発表
 - <https://conference.apnic.net/40/program#sessions/ipv6session>

SK Telecom



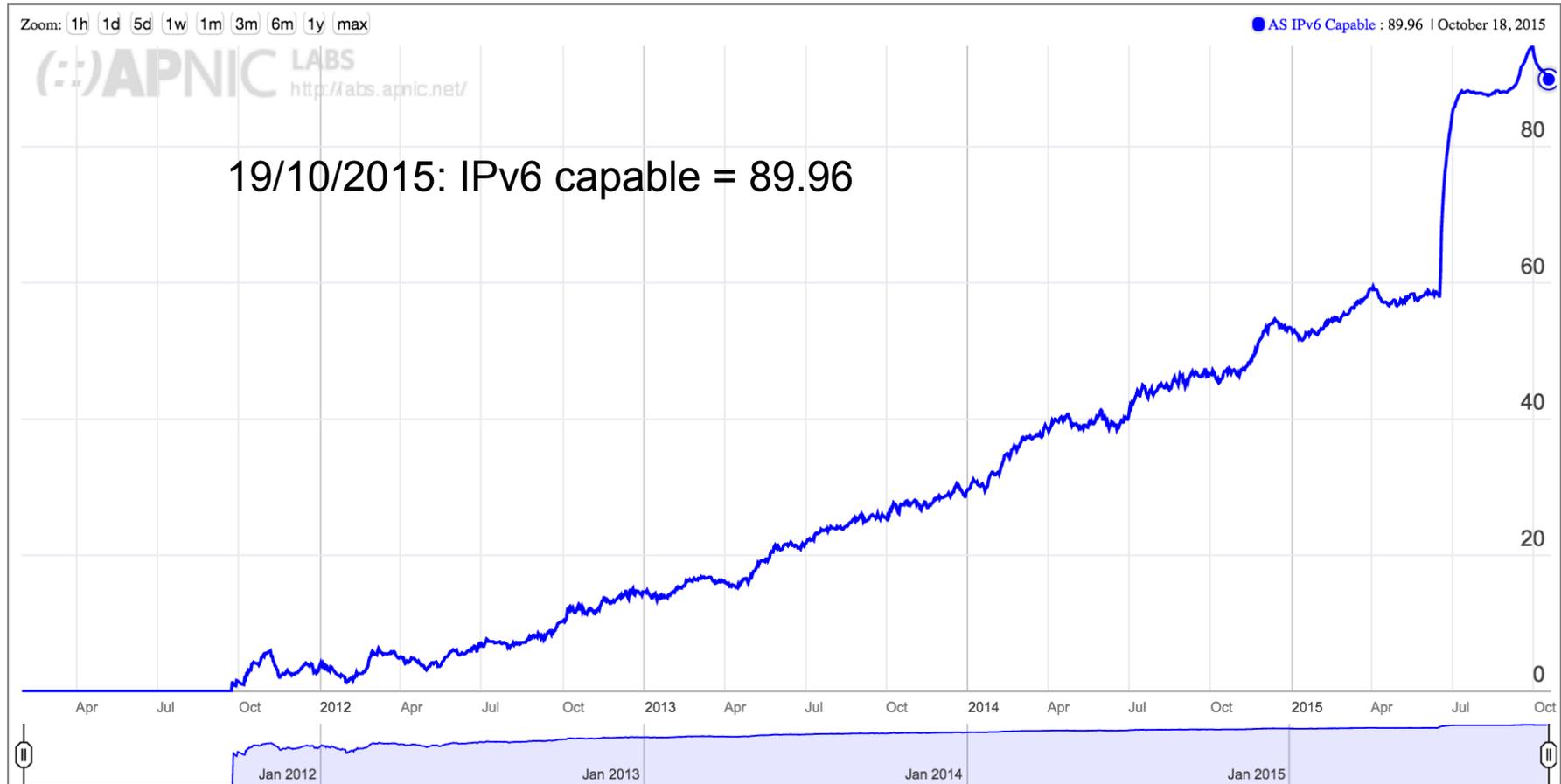
<http://stats.labs.apnic.net/ipv6/AS9644> 19/10/2015

Case study: Verizon Wireless

- DSネットワークを2012年に実装
- なぜVZWはIPv6移行に踏み切ったのか？
 - IPv6を実装することにより、VZWは再度グローバルな接続性を提供が可能になる
 - NAT不要
 - 高品質な接続性確保
 - IPv6実装により、加速度的に増加する携帯電話加入者への対応が可能になる
- VZWはLTEを導入するタイミングでIPv6を意識的に実装
 - LTEコアネットワークにIPv6
 - LTE携帯端末にDSをサポート

http://conference.apnic.net/_data/assets/pdf_file/0017/50813/vzw_apnic_13462152832-2.pdf

Verizon Wireless



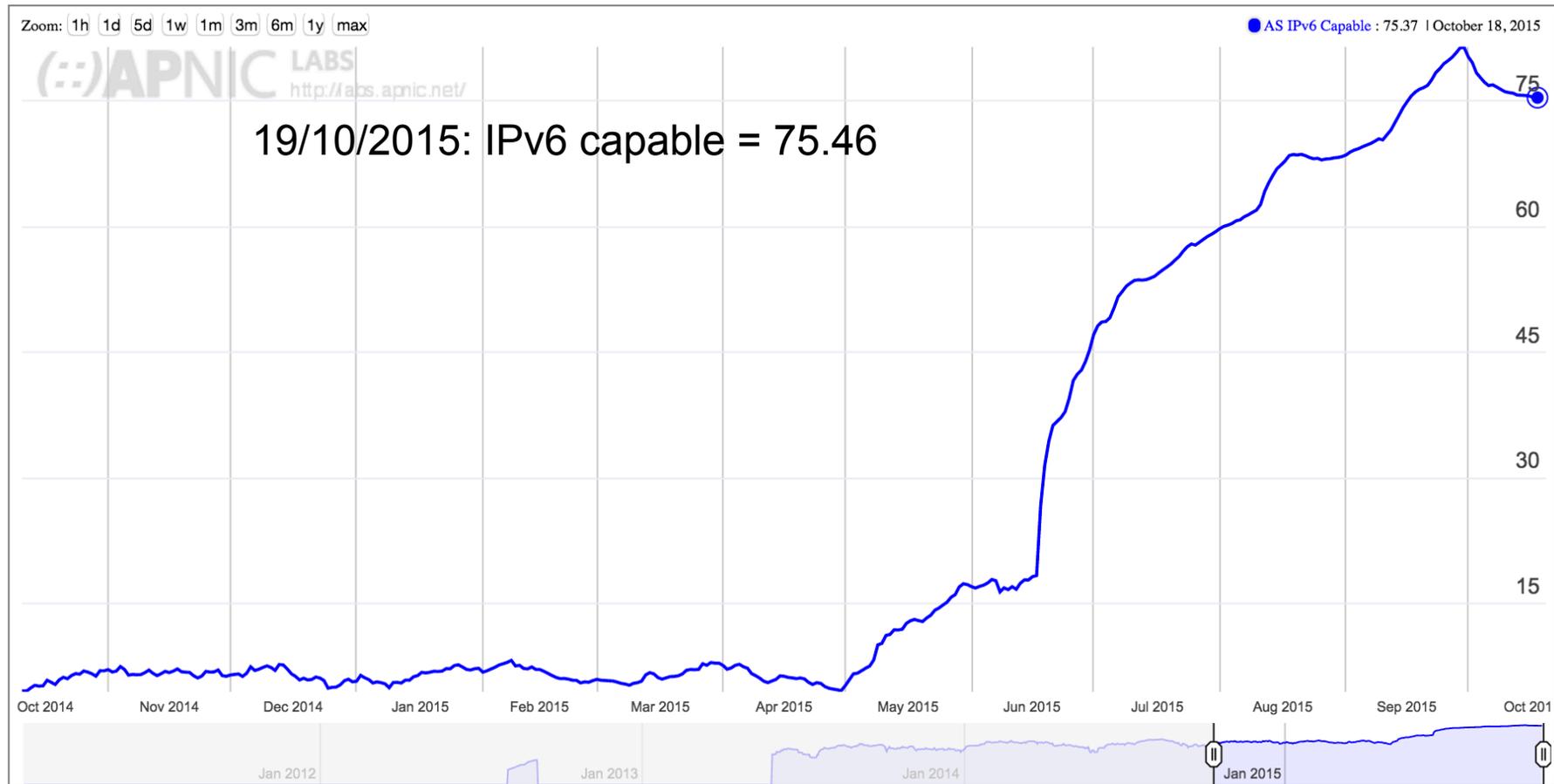
<http://stats.labs.apnic.net/ipv6/AS22394>, 18/10/2015

Case Study: T-Mobile USA

- IPv4アドレスの枯渇と、常時接続携帯端末の急激な増加を受け、2009年後半にIPアドレス戦略を再考
 - IPv4 はビジネスのニーズに対応しない
 - 3GPP IPv6は比較的簡易
- IPv6実装の実現可能性とインパクトについて検証(9ヶ月)
 - 携帯端末へのIPv6導入は緩慢で注意を要するプロセス
- T-Mobile USAは2010年に2G/3G/HSPAネットワークにてIPv6に関心のあるユーザーを対象にトライアルを開始
 - 結果、IPv6シングルスタック+464XLATによる移行テクノロジーを選択
- T-Mobile USA はIPv6実装に際し、設備投資はしていない
- **エンドユーザーはデフォルトでIPv6アドレスの割り当てを受ける**
 - IPv4アドレスの割り当てはなし

http://conference.apnic.net/_data/assets/pdf_file/0010/58870/tmo-ipv6-feb-2013_1361827441.pdf

T-Mobile USA



<http://stats.labs.apnic.net/ipv6/AS21928> 20/10/2015

Case study: Telenor

- 2010年: 携帯電話網にてIPv6プロジェクト開始
- 2011年: 最初のパイロットカスタマーにIPv6サービス提供
- 2014年: IPv6 only ASP 及び、DS APNによるサービス開始
- Telenor: 十分なIPv4アドレスの在庫保持

IPv6 for mobile network operators

- Verizon: 2012年DS実装
- T-Mobile USA: 2013年464XLAT実装
- SK Telecom: 2014年464XLAT実装
- Telstra Australia: 464XLAT試験中
- Telenor Norway: 2014年DS実装
- Orange Poland

464XLAT観測

- 明らかに稼働確認
 - Androidデバイス高いIPv6 Ready End User率
- Google, Facebook, Cloudflare, Akamai: DSサポート
 - IPv6レディーなコンテンツ
 - IPv6実装後、IPv6トラフィック堅調伸び、CGN/NATへの負担軽減
- IPv4アドレスの不足が確実な携帯電話網オペレータが、IPv4オンリーのブロードバンドサービスの落とし穴を避けることが可能
- iOS携帯端末ユーザーが大半のオペレーターには向かない

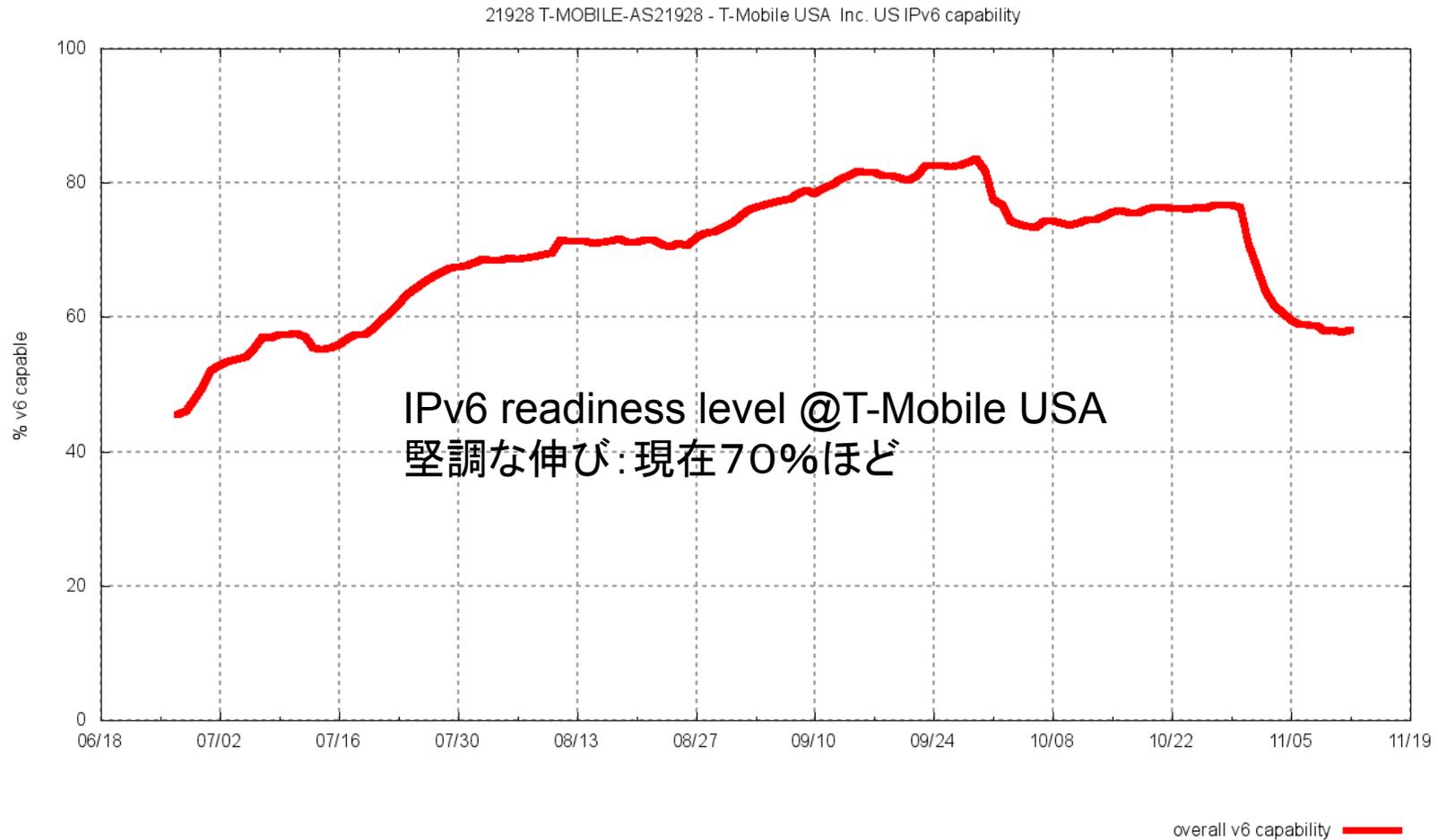
iOS and 464xlat

- Appleのスタンプ(2015年6月)
 - 464xlatメカニズムは実装しない
- IPv6はApple Appsのレベルで吸収

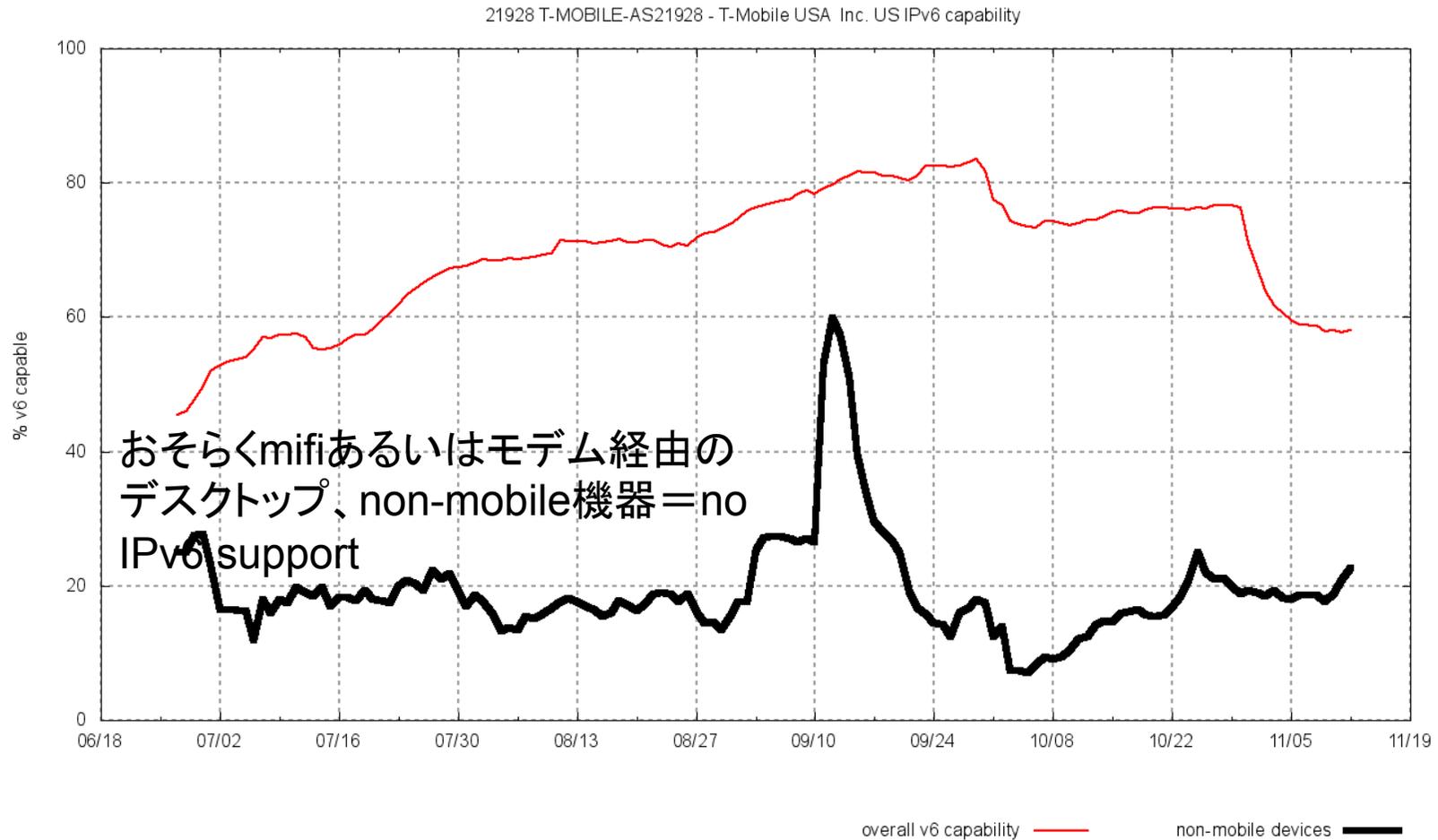
T-Mobile

- T-Mobile USA 464xlat実装
- T-Mobile:
 - 主に、携帯電話サービス＋多少のWiFi
- IPv6 end user readiness chart
 - 統計

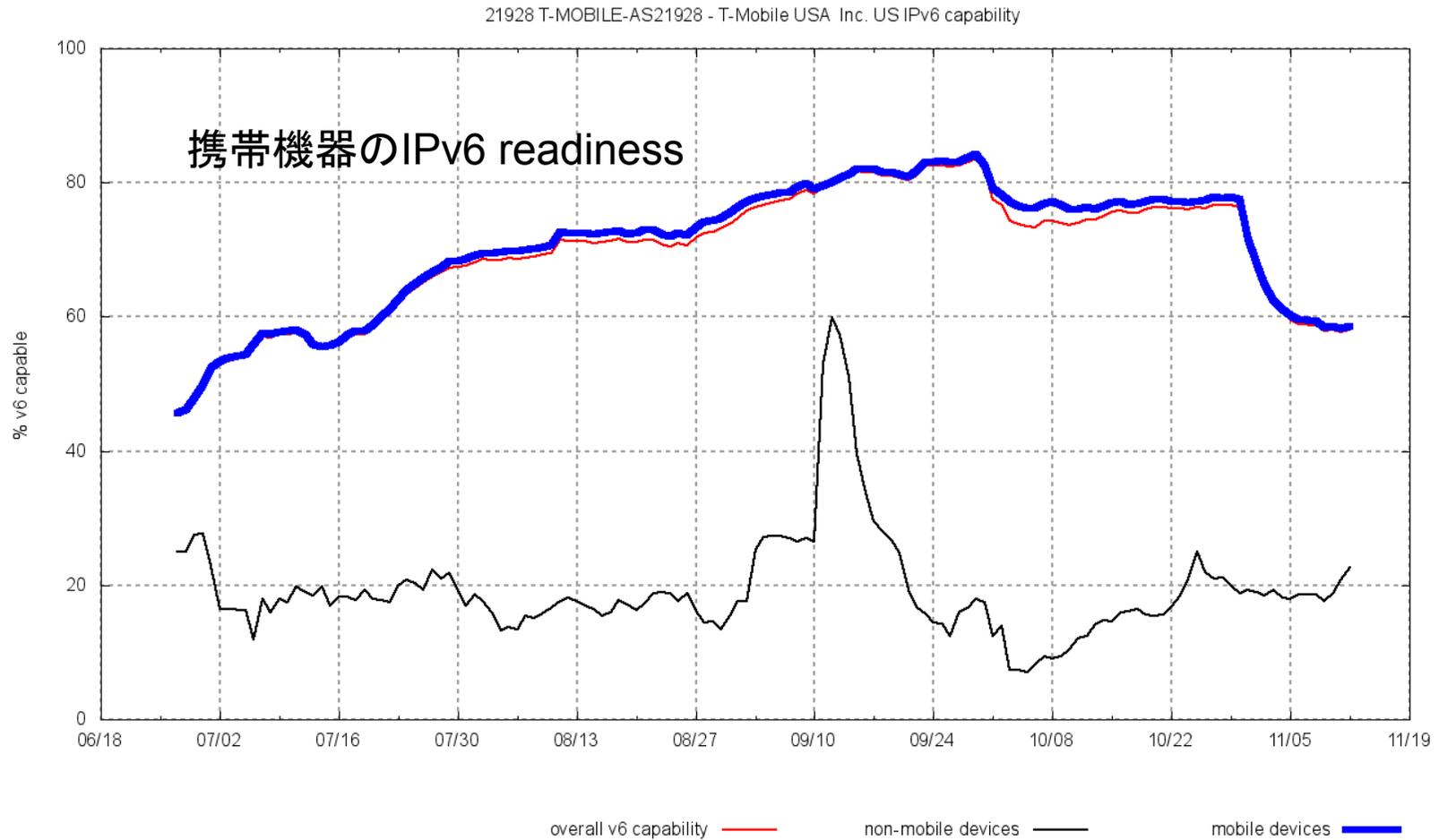
T-Mobile USA



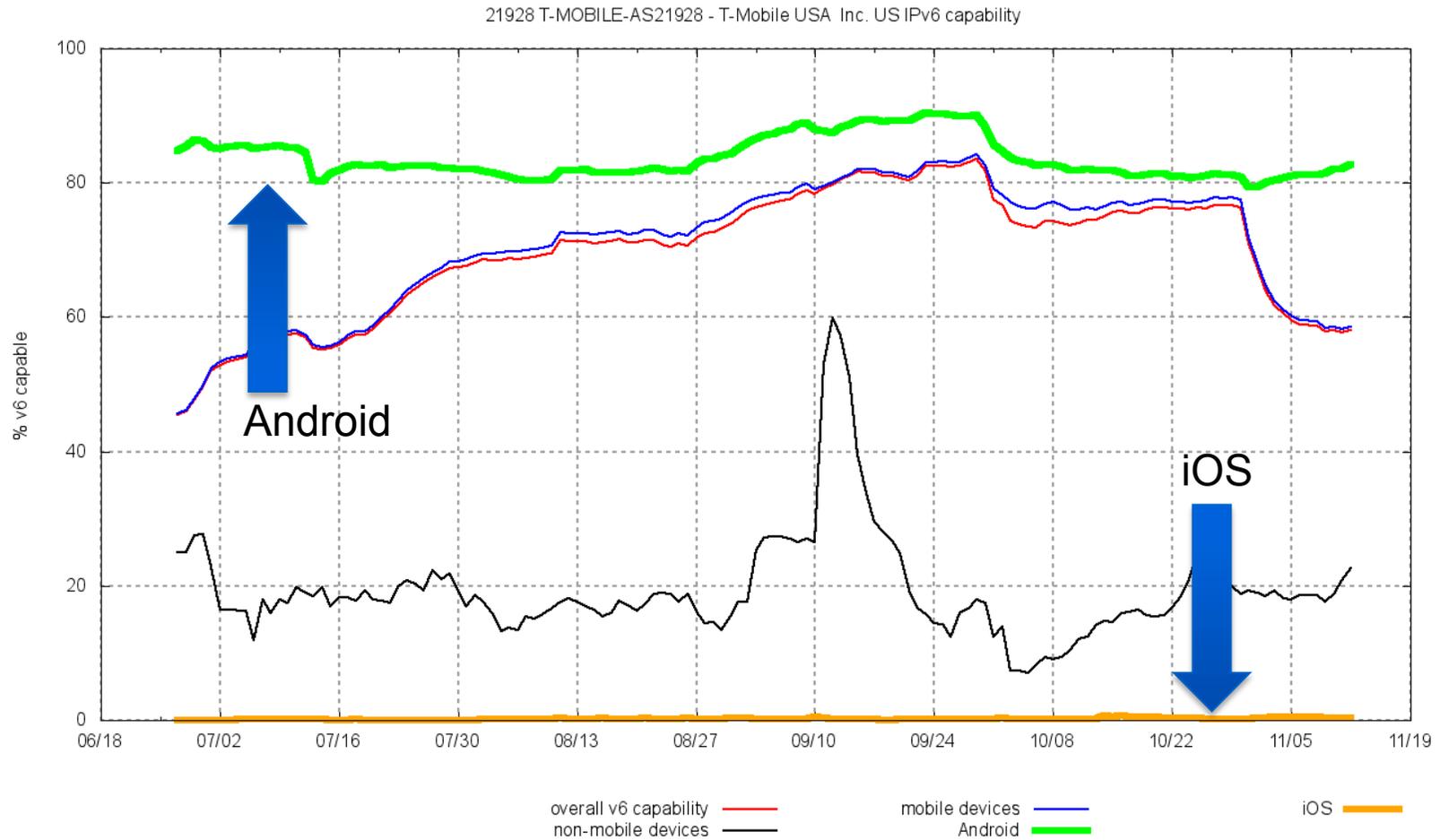
T-Mobile USA



T-Mobile USA

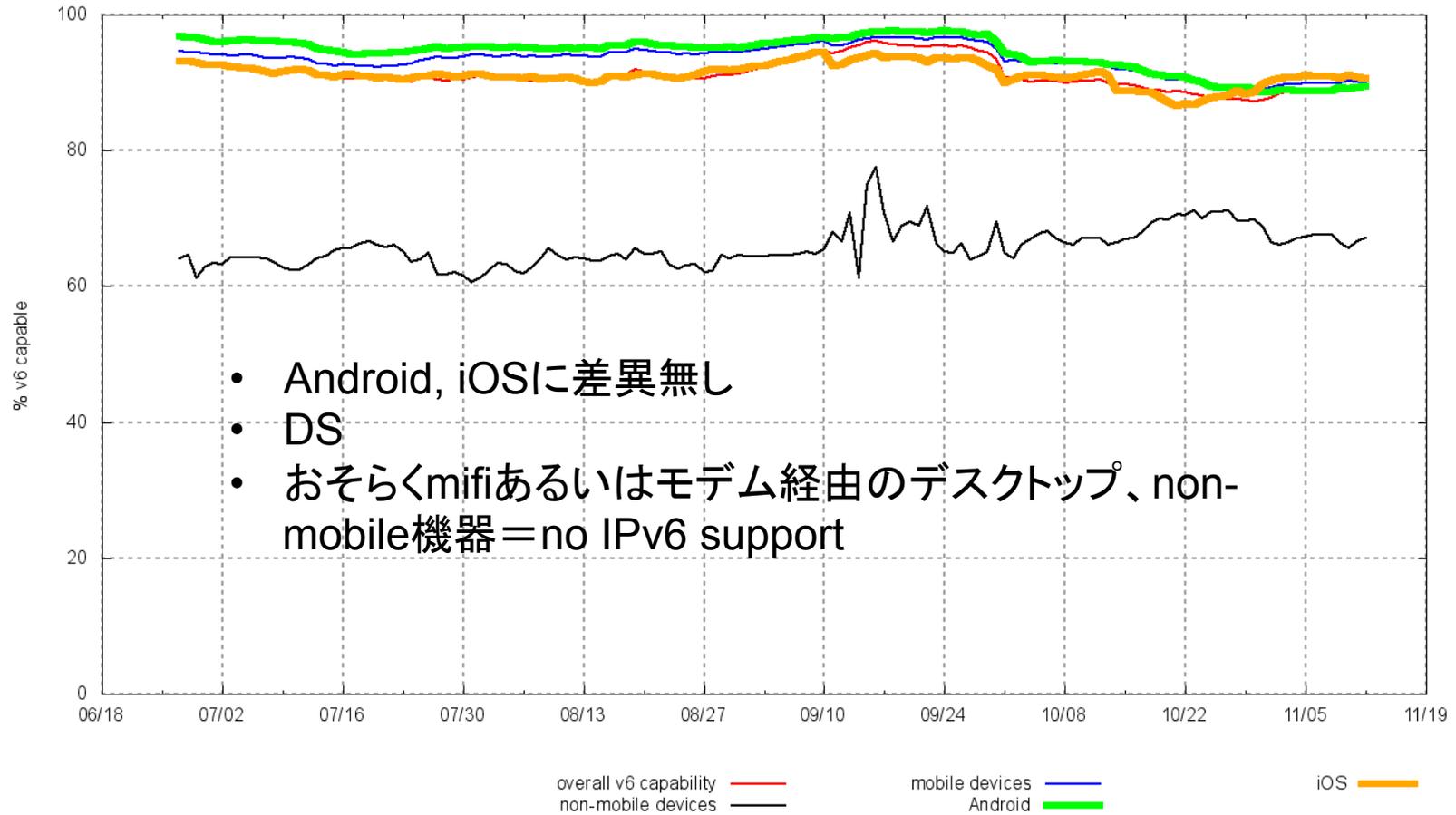


T-Mobile USA



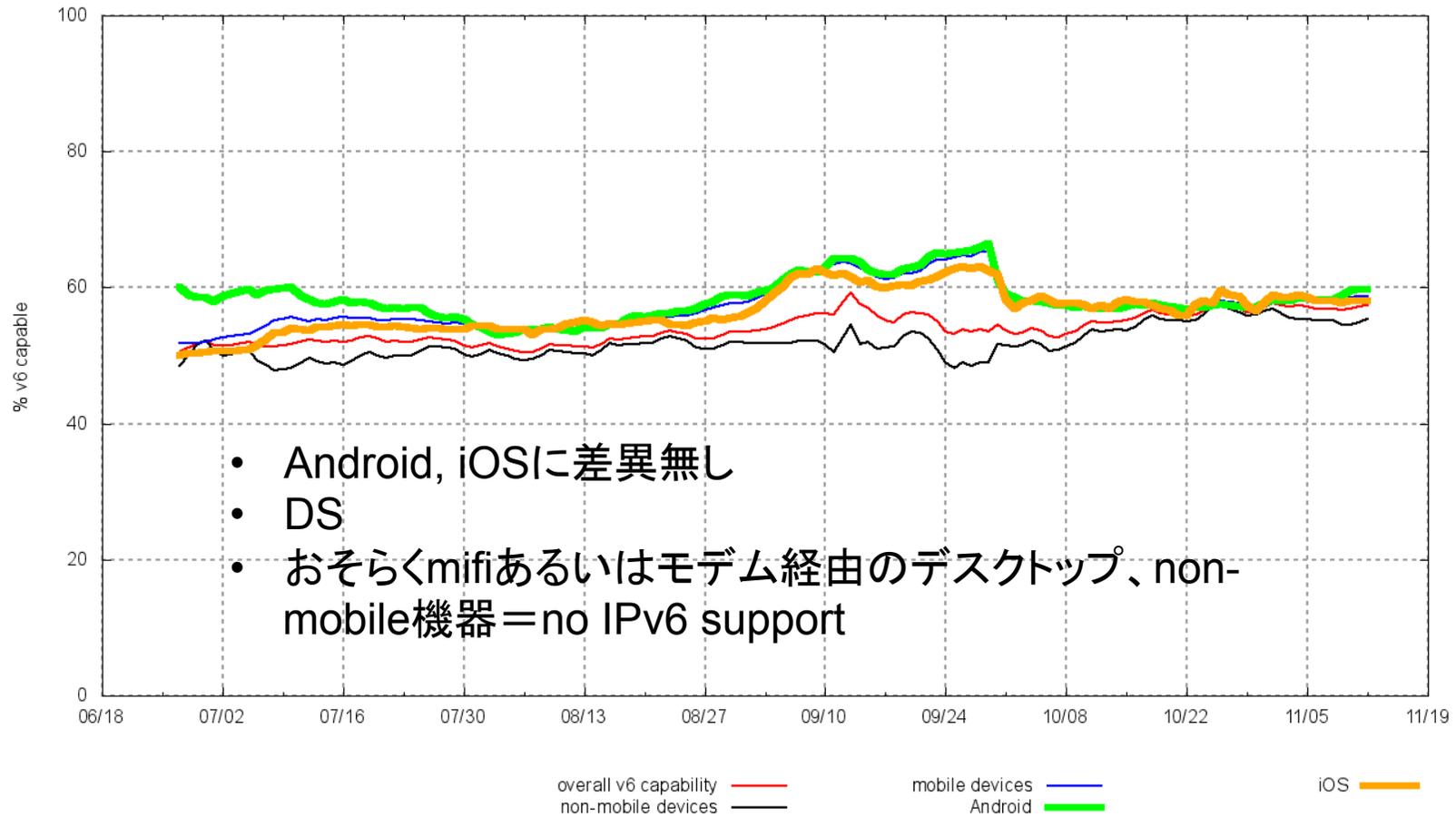
Verizon

22394 CELLCO - Cellco Partnership DBA Verizon Wireless US IPv6 capability



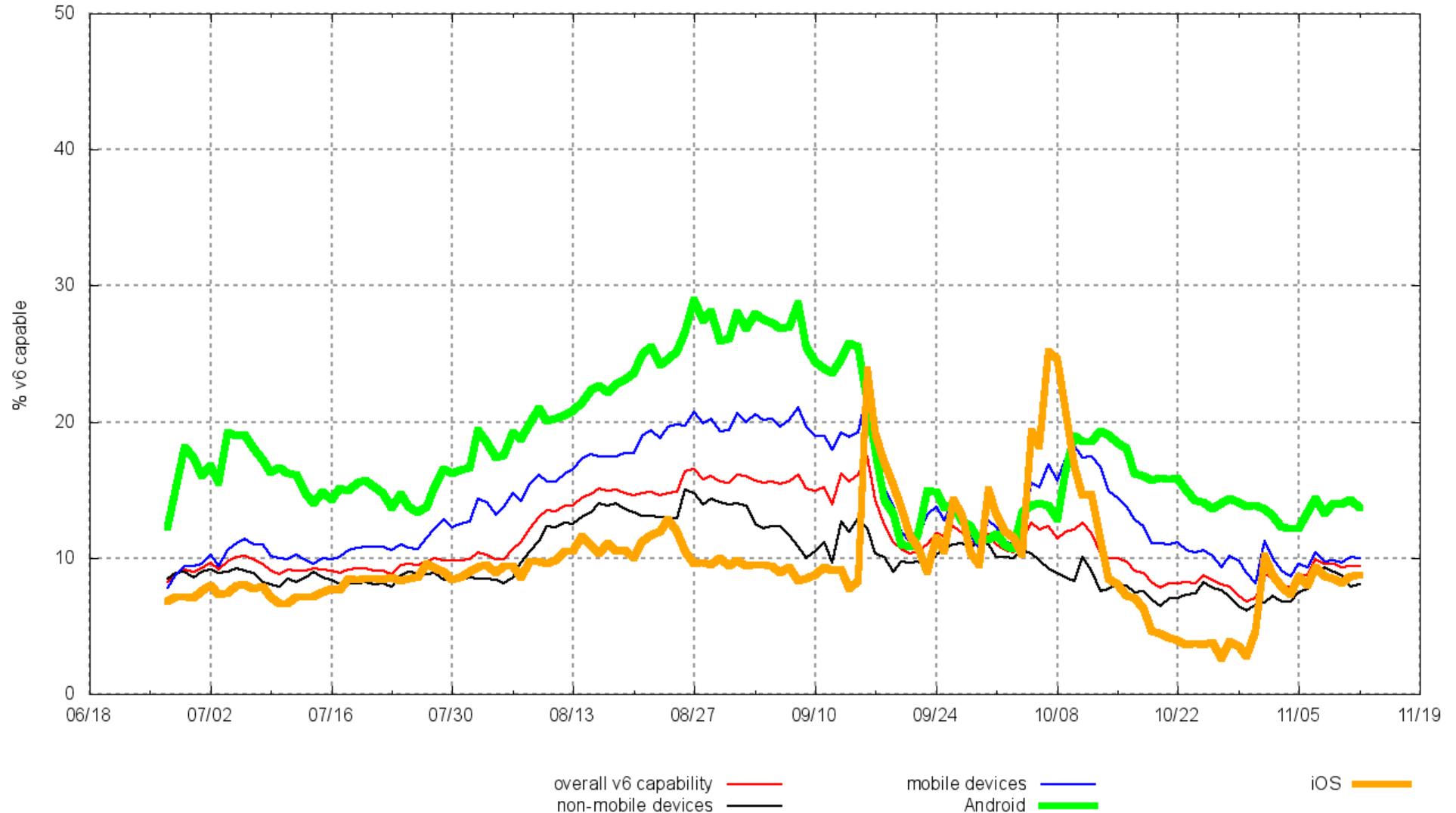
Comcast

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

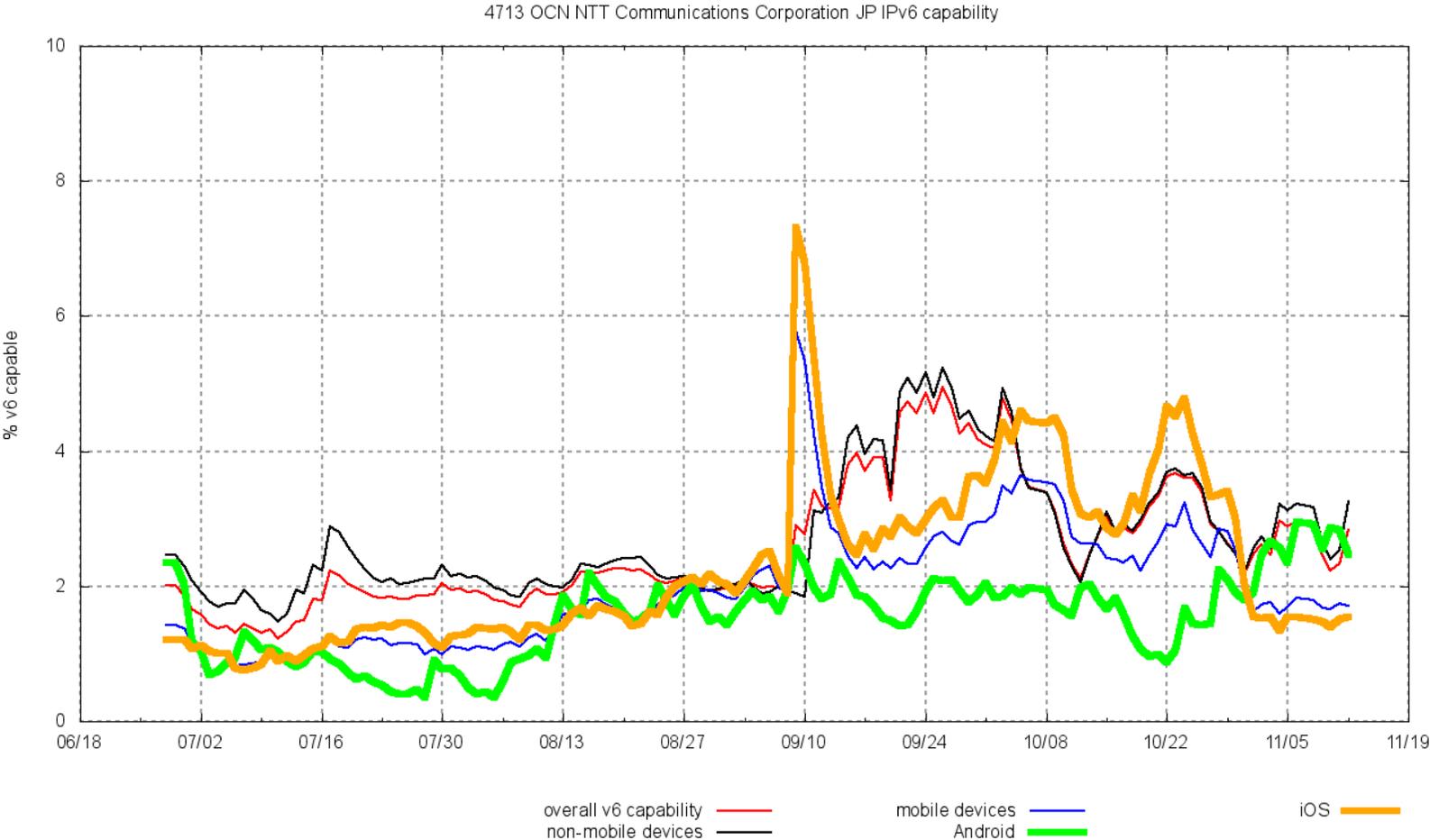


AS2119 Telenor Norge AS

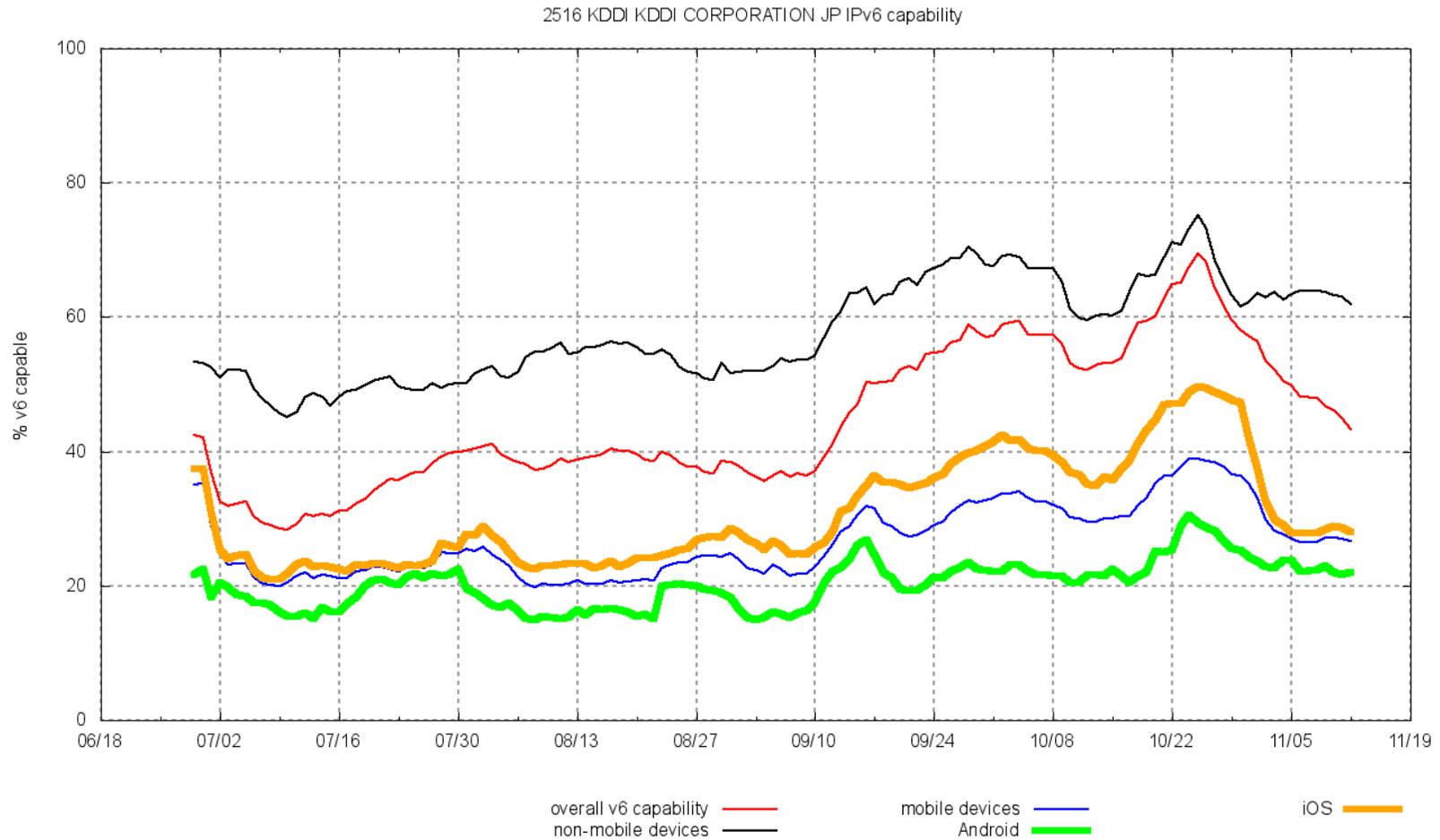
2119 TELENOR-NEXTEL Telenor Norge AS NO IPv6 capability



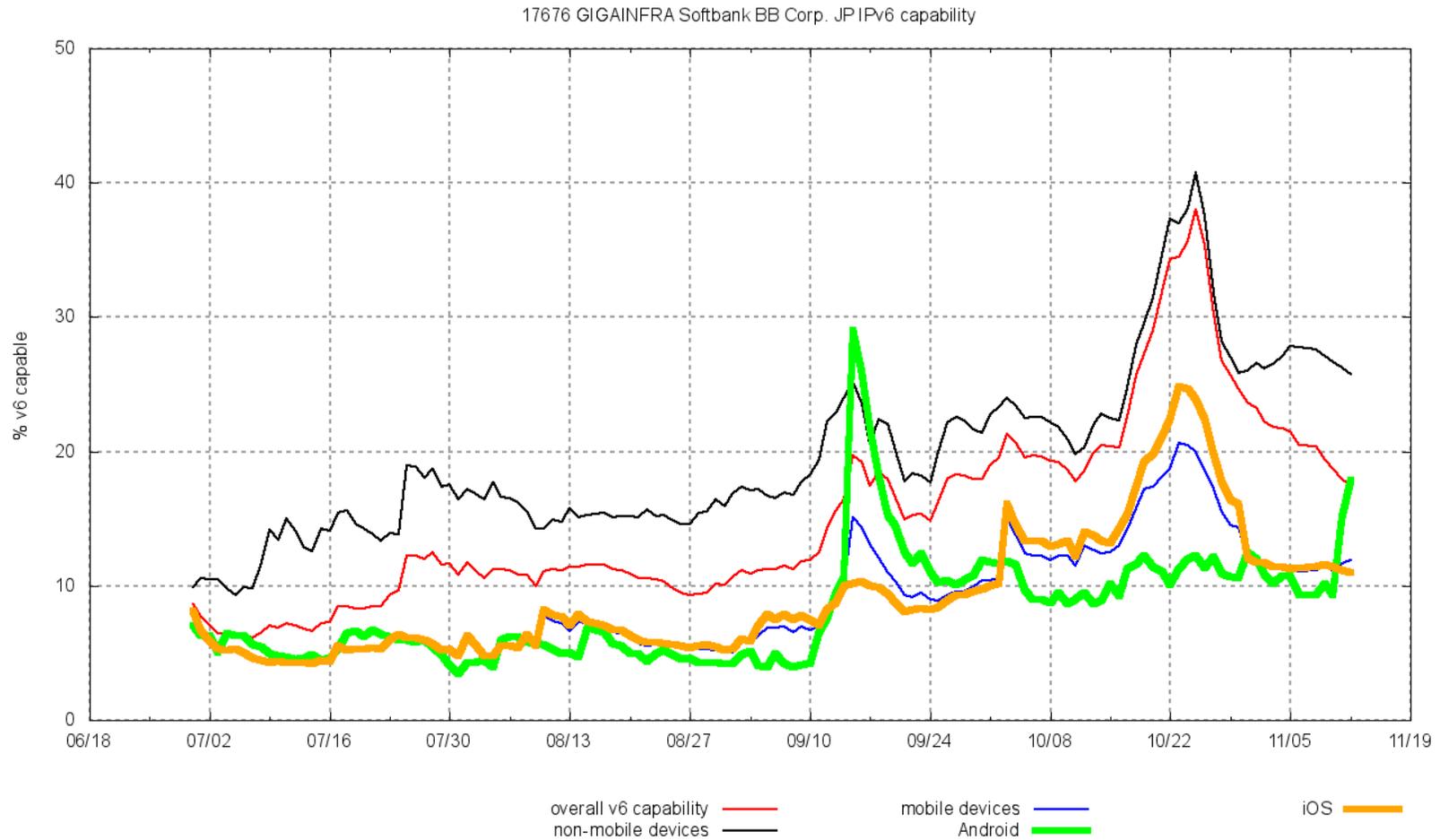
AS4713 NTT



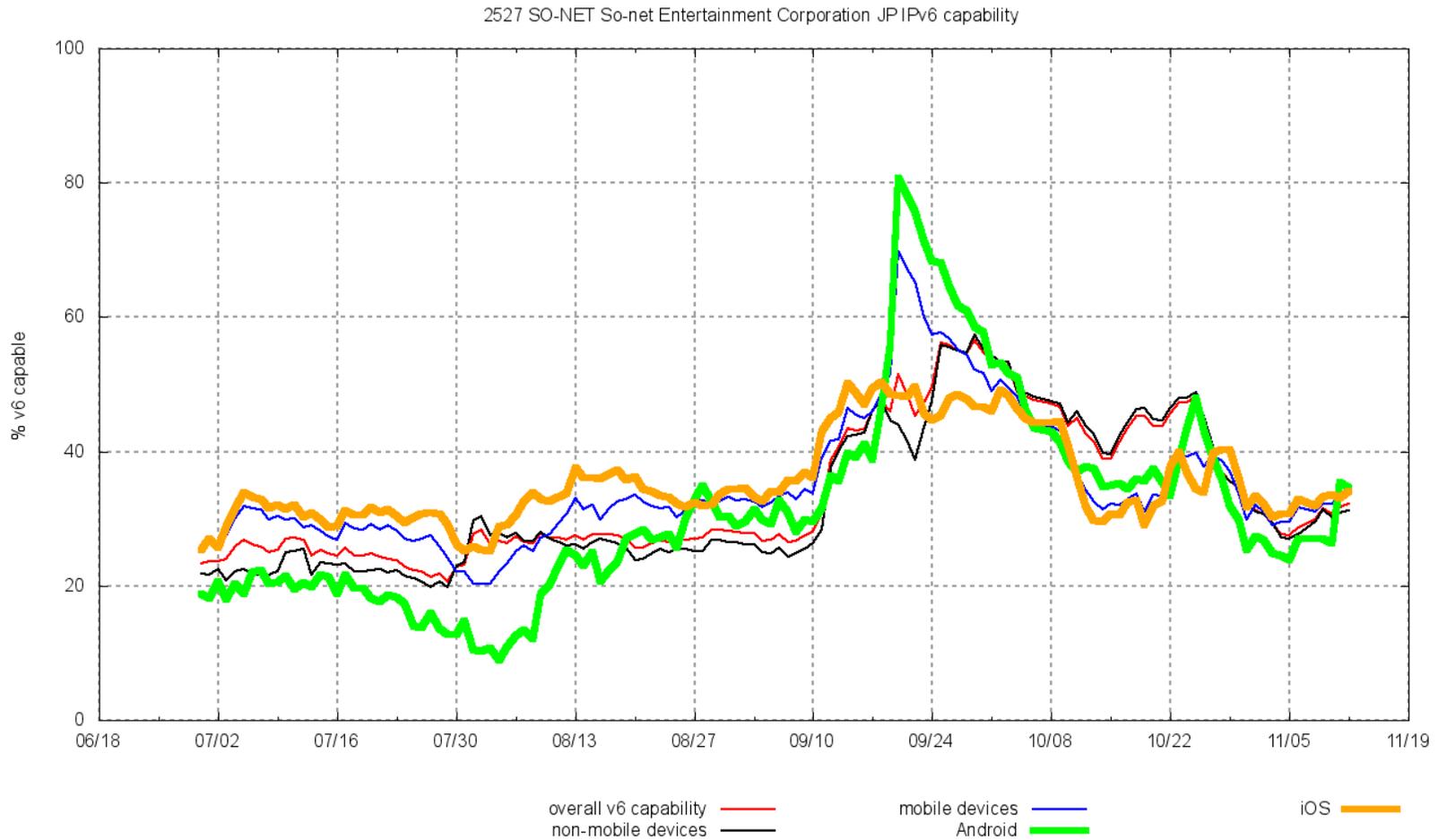
AS2516 KDDI



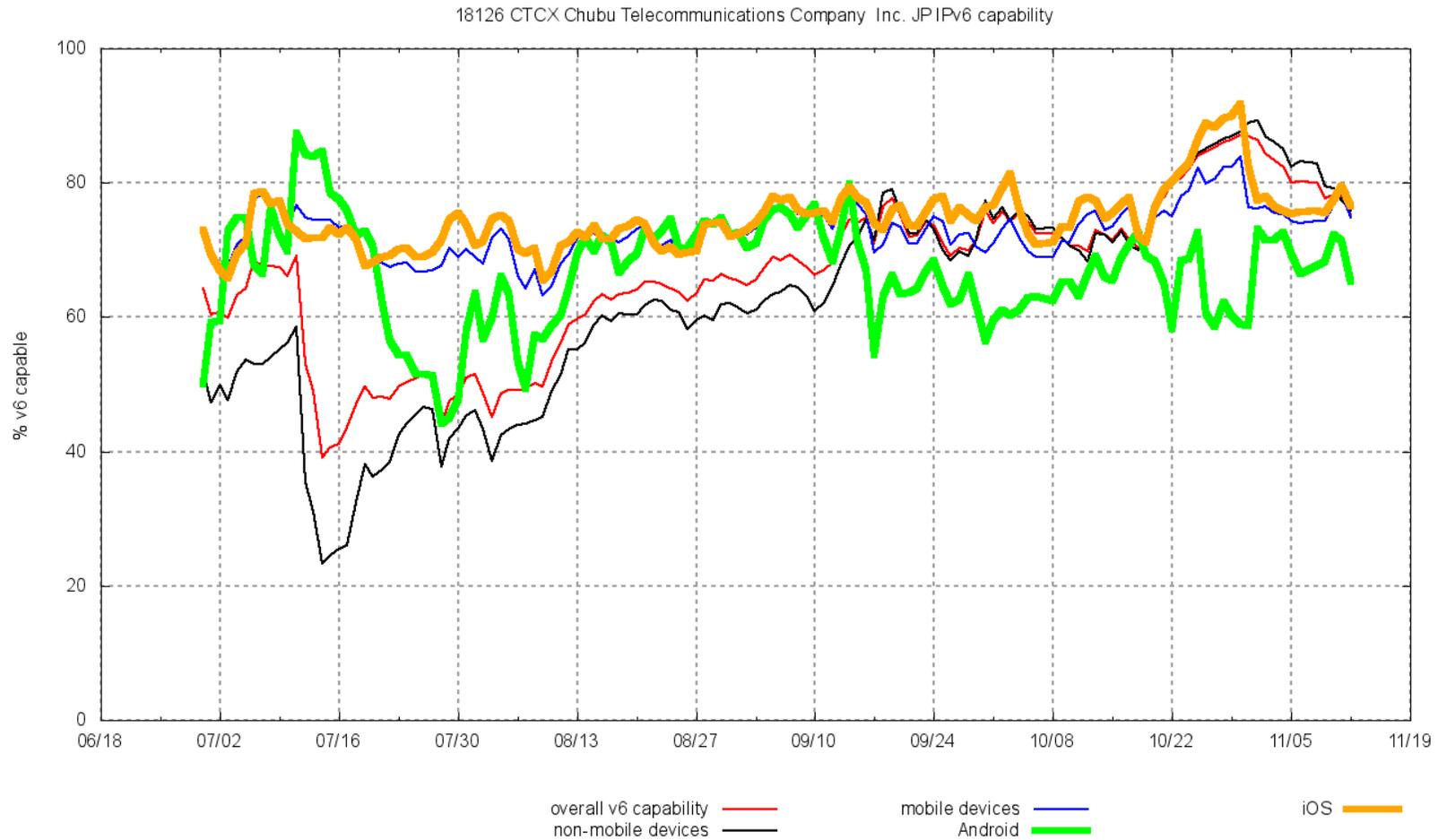
AS17676 Softbank



AS2527 So-net Entertainment Corp.



AS18126, Chubu Telecommunications



Korea is moving!

- 早期に、高レベルのブロードバンド普及率達成
- 大半の投資がIPv4: technology locked to IPv4
 - 普及している国産CPEをアップデートするオプション無し
 - 国内データネットワーク: IPv6実装の余地がほぼ無い
- が、携帯電話網で464XLAT実装

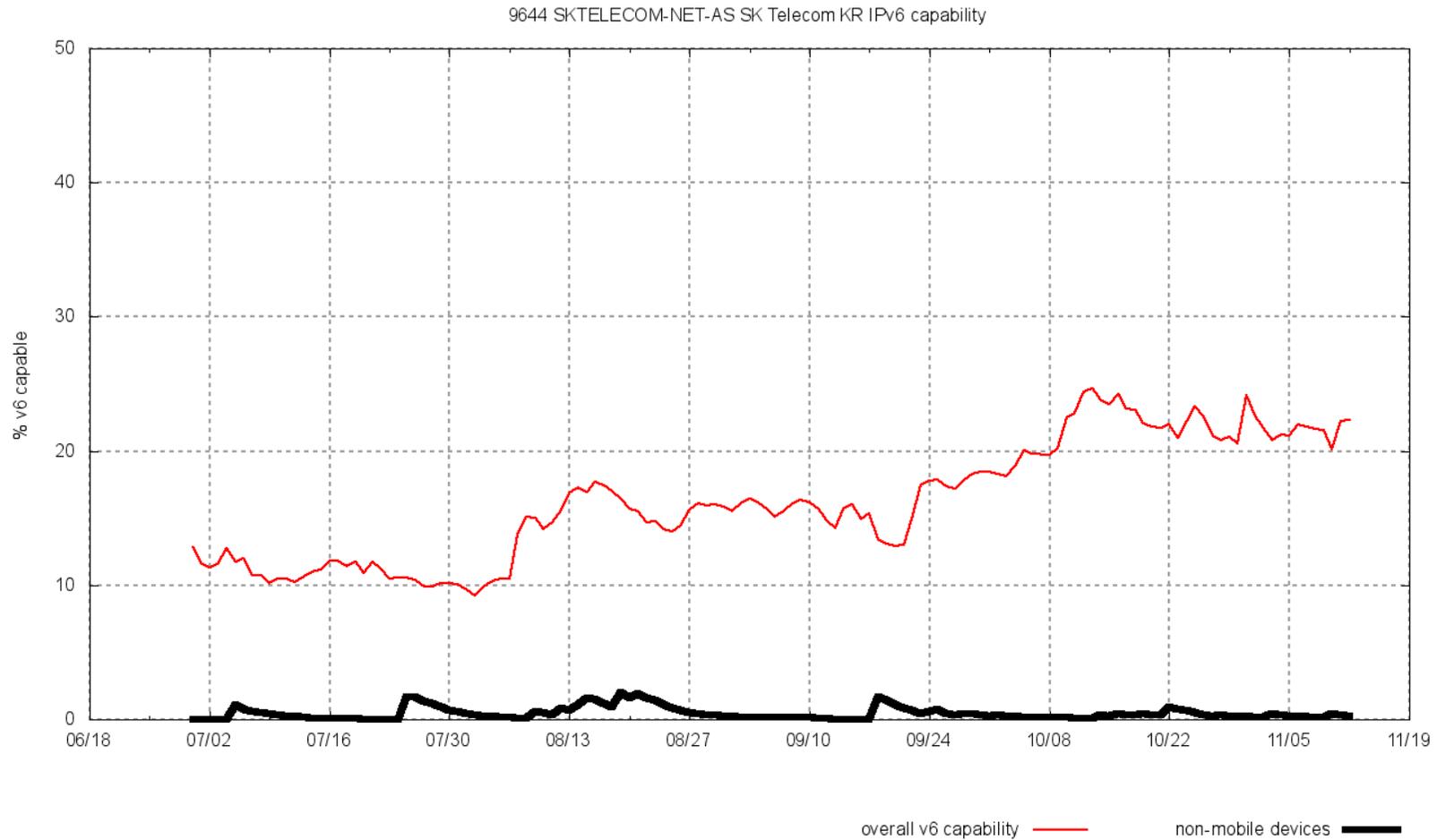
SK Telecom

- 2000万人の顧客
 - Koreaの携帯市場ほぼ4900万の機器
 - 一人一つ以上の携帯普及率
- ほぼ400万人の顧客がすでに464XLATに移行
 - 複数のAPN使用
 - レガシー機器はIPv4オンリー

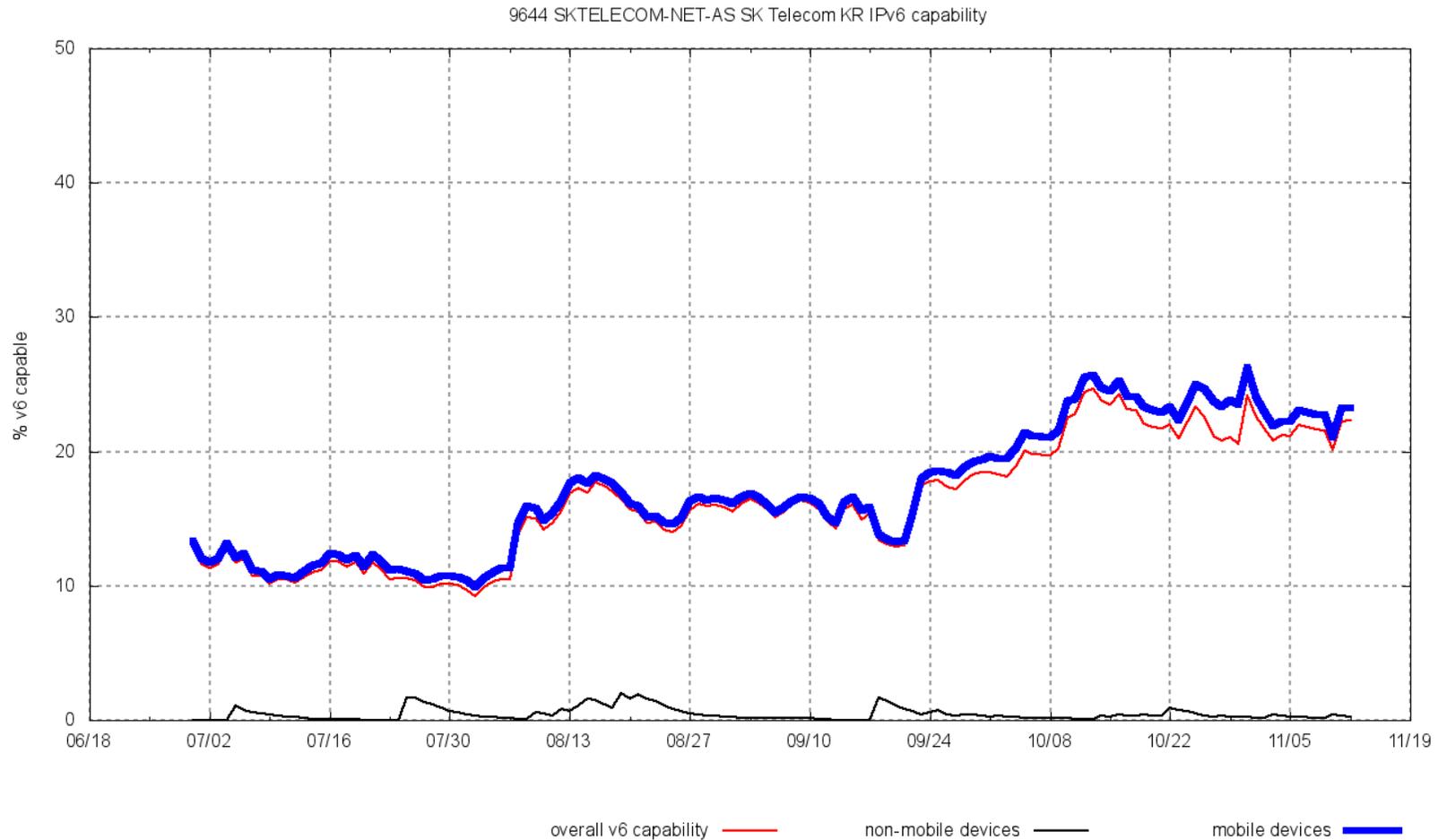
S-K Telecom overall IPv6



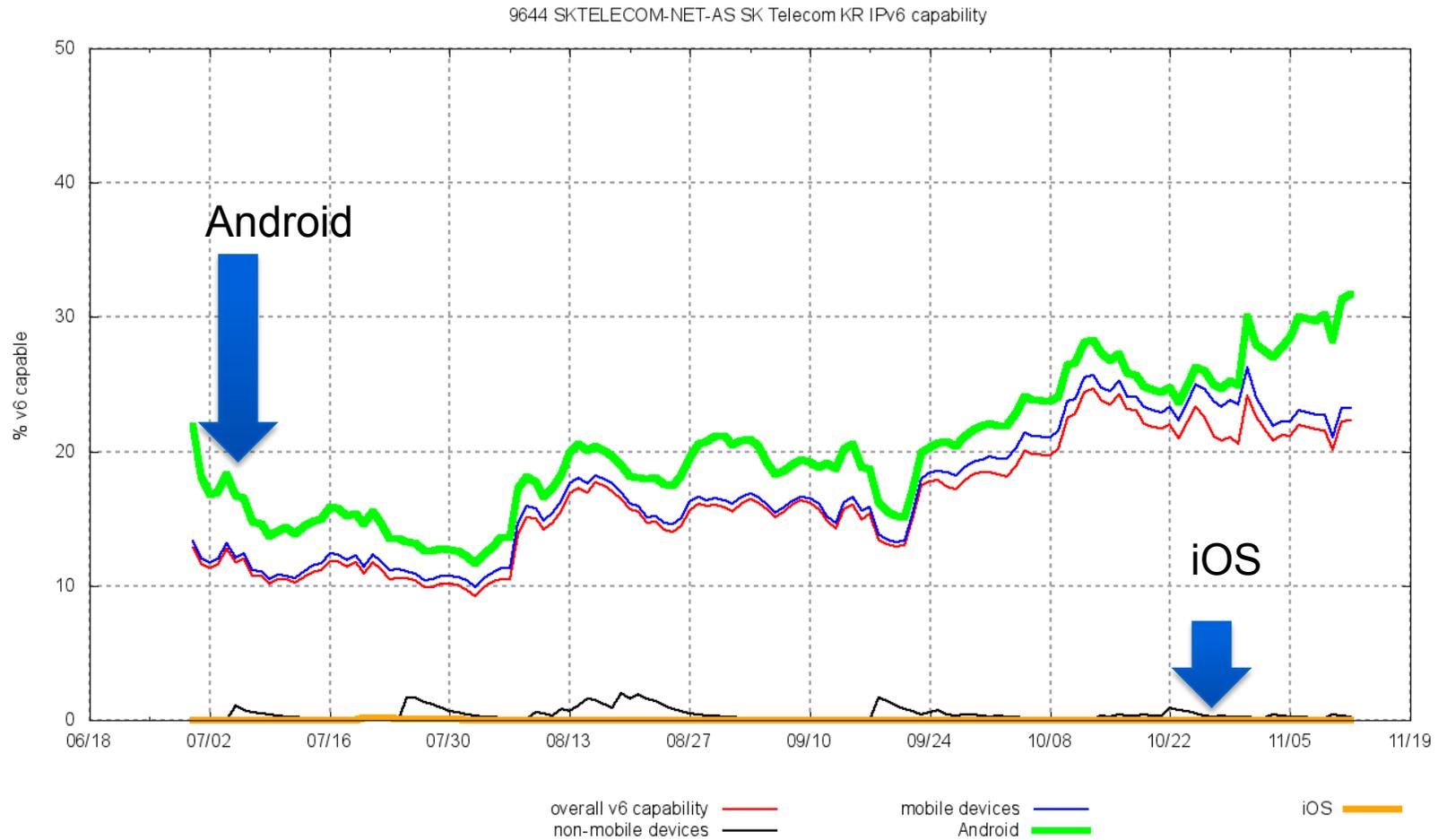
S-K Telecom non-mobile IPv6



S-K Telecom mobile IPv6



S-K Telecom iOS/Android IPv6



Conclusion

APNIC



Mobile networks

- 急増する携帯電話網経由でのインターネット利用
 - ネットワークオペレーターのビジネスの有り様に大きく影響
 - ボイス、メッセージング、データ:IPベースのサービスに集約
 - LTEへの移行、好機
 - IoTビジネス戦略
- ビジネス意思決定者とネットワークエンジニアの対話
 - 高品質なAll-IPサービスの実現へのストラテジー？

www.apnic.net/ipv6

APNIC

Contact us | Jobs | Site map

Search...

Connected
Via IPv6



Get IP

Manage IP

Training

Events

Research

Community

Blog

About

MyAPNIC

Community

▶ Resource Policies

▶ Participation

▶ Community activities

▶ IANA transition

▶ Internet ecosystem

▶ Security@APNIC

▼ IPv6@APNIC

▶ Key IPv6 messages

▶ IPv6 data and statistics

▶ IPv6 transition stories

▶ IPv6 for governments

▶ IPv6 for mobile networks

▶ IPv6 Best Current Practices

▶ IPv6 for Decision Makers

▶ IPv6 for CTOs

▶ About CGN

▶ Technical Assistance Service

▶ IPv4 post-exhaustion

▶ IPv4 exhaustion

IPv6@APNIC

[Like](#) [Share](#) [6](#) [Tweet](#) [1](#)



IPv6 is a top issue for the Asia Pacific Internet community. APNIC engages in activities throughout the region to help facilitate a smooth transition. The greater goal is to support the Asia Pacific in deploying IPv6 to maintain a scalable Internet for everyone.

APNIC reached the last /8 of IPv4 addresses in April 2011, and now delegates IPv4 resources according to the "last /8 policy". The scarcity of IPv4 makes IPv6 deployment critical for all networks and organizations in the Asia Pacific. Here's what APNIC is doing to support the community in achieving real and tangible IPv6 deployment:

Distributing IPv6 addresses

Getting an IPv6 block is the first step in your transition, and the process is very simple.

[Kickstart IPv6 - one click to IPv6](#)

IPv6 training and education

Is your technical staff ready to deploy IPv6? Gaining technical knowledge does not happen overnight. Plan and implement training for your personnel. APNIC Training is constantly updating our IPv6 content, to reflect the industry's best current practices.

[Upcoming training events](#)

Monitoring IPv6 deployment

Do you offer your services over IPv6? Understand your clients' capabilities, facing your website and network assets. APNIC Labs has designed a javascript test system that reports on end-user capability in Google Analytics. Anyone can use the IPv6 Tracker, even without native IPv6 capability.

[Learn more about APNIC Labs IPv6 measurements.](#)

APNIC



www.apnic.net/ipv6

APNIC Contact us | Jobs | Site map Search... Go

Connected Via IPv6

Get IP Manage IP Training Events Research Community Blog About MyAPNIC

Community

- ▶ Resource Policies
- ▶ Participation
- ▶ Community activities
- ▶ IANA transition
- ▶ Internet ecosystem
- ▶ Security@APNIC
- ▼ **IPv6@APNIC**
 - ▶ Key IPv6 messages
 - ▶ IPv6 data and statistics
 - ▶ IPv6 transition stories
 - ▶ IPv6 for governments
 - ▶ IPv6 for mobile networks
 - ▶ IPv6 Best Current Practices
 - ▶ IPv6 for Decision Makers
 - ▶ IPv6 for CTOs
 - ▶ About CGN
- ▶ Technical Assistance Service
- ▶ IPv4 post-exhaustion
- ▶ IPv4 exhaustion

IPv6@APNIC

IPv6 is a top issue for the... facilitate a smooth transit... for everyone.

APNIC reached the last /8... policy". The scarcity of IPv... what APNIC is doing to su...

Distributing IPv6 ad...
Getting an IPv6 block is th...
Kickstart IPv6 - one click

IPv6 training and e...
Is your technical staff rea... training for your personne... practices.
Upcoming training event

Monitoring IPv6 de...
Do you offer your services... Labs has designed a javas... Tracker, even without native IPv6 capability.
Learn more about APNIC Labs IPv6 measurements.

IPv6@APNIC

- ▶ Key IPv6 messages
- ▶ IPv6 data and statistics
- ▶ IPv6 transition stories
- ▶ IPv6 for governments
- ▶ IPv6 for mobile networks
- ▶ IPv6 Best Current Practices
- ▶ IPv6 for Decision Makers
- ▶ IPv6 for CTOs
- ▶ About CGN

THANK YOU



www.facebook.com/APNIC



www.twitter.com/apnic



www.youtube.com/apnicmultimedia



www.flickr.com/apnic



www.weibo.com/APNICrir

APNIC

