Where are we now?
IPv6 deployment update

14-18 May 2018 | Bangkok, TH

Klée Aiken

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Agenda

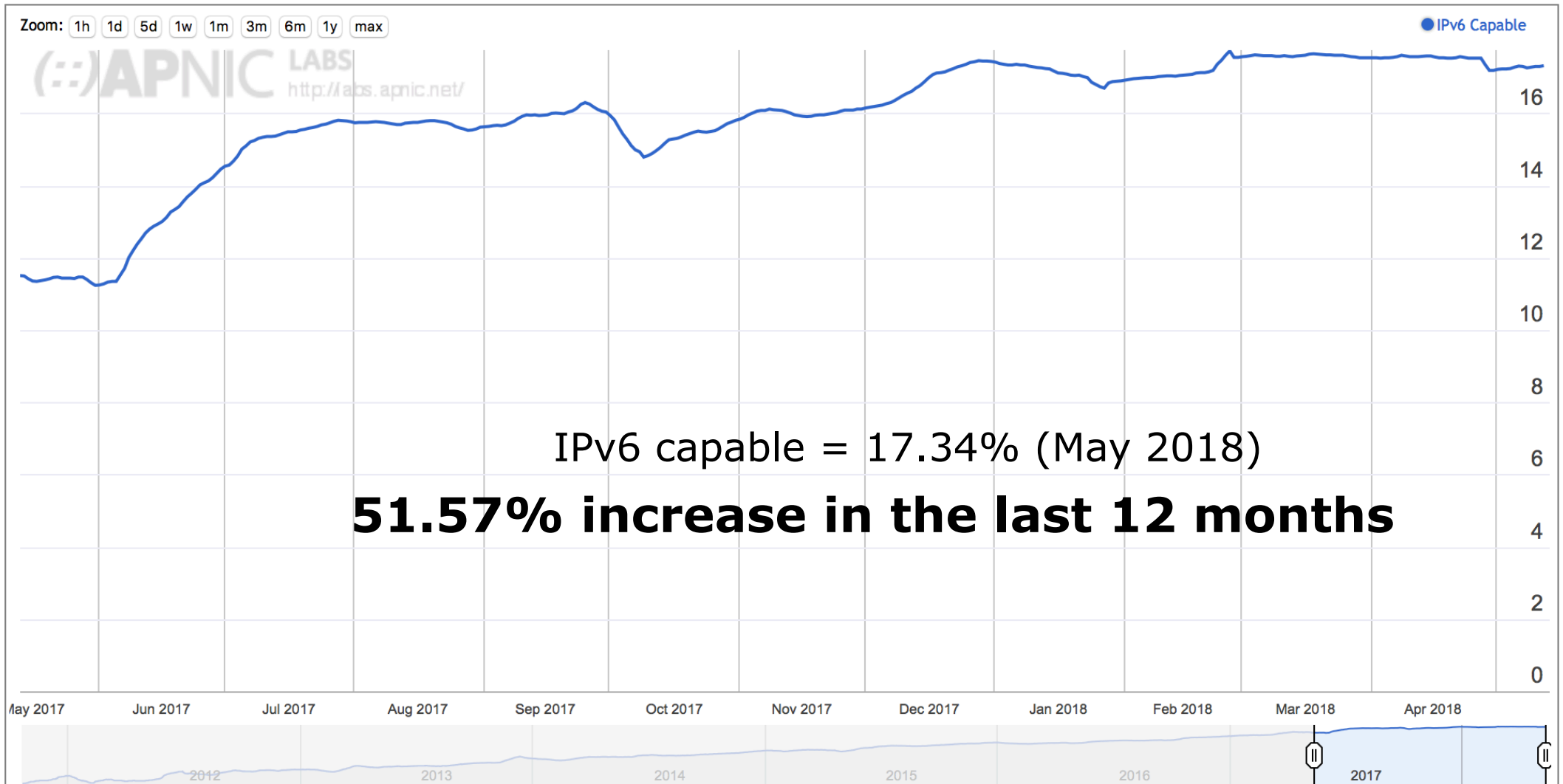- IPv6 End-User Readiness
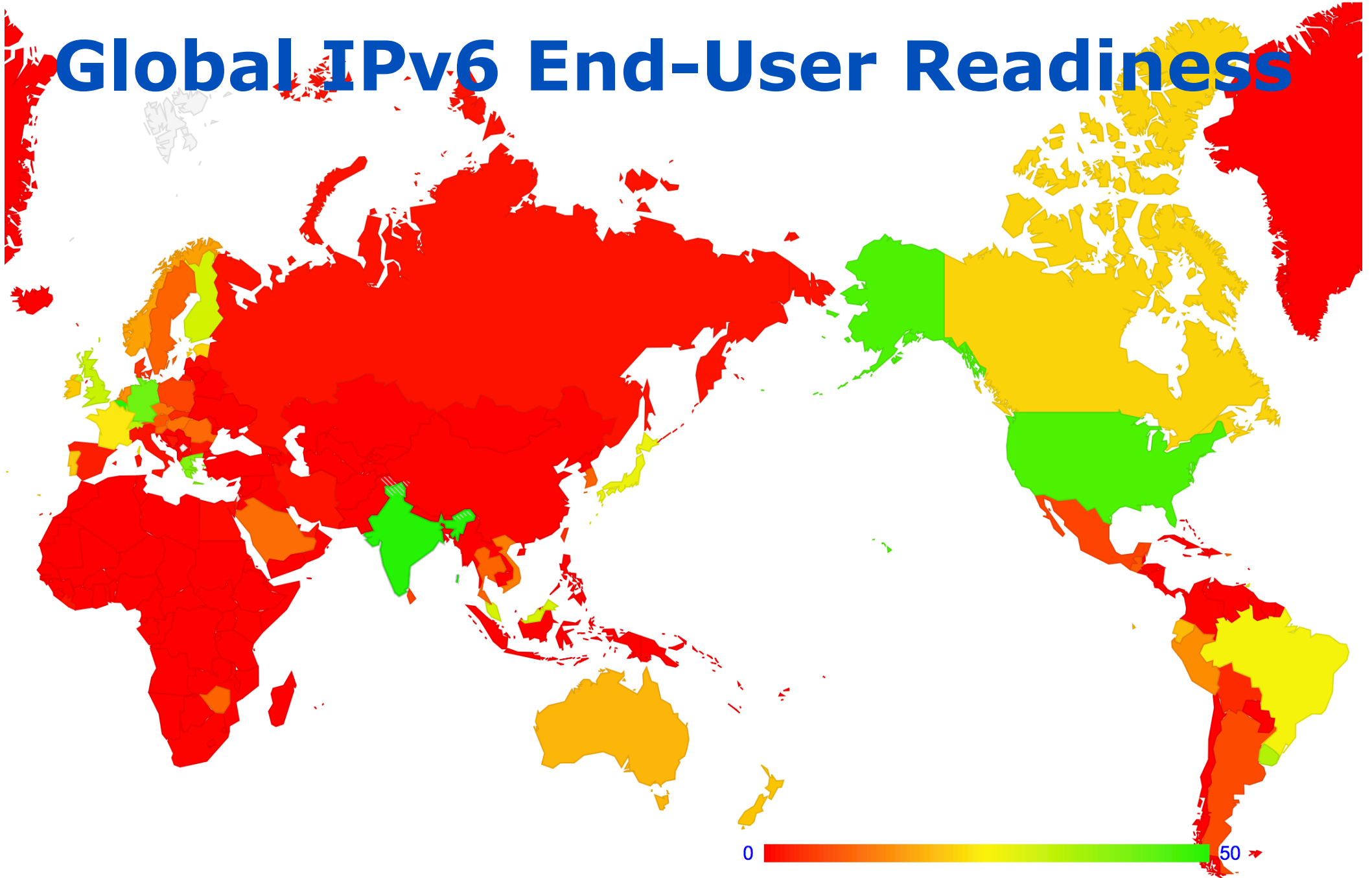
- IPv6 Performance

- Industry Trends

- Observations

IPv6 stats from: https://stats.labs.apnic.net/ipv6
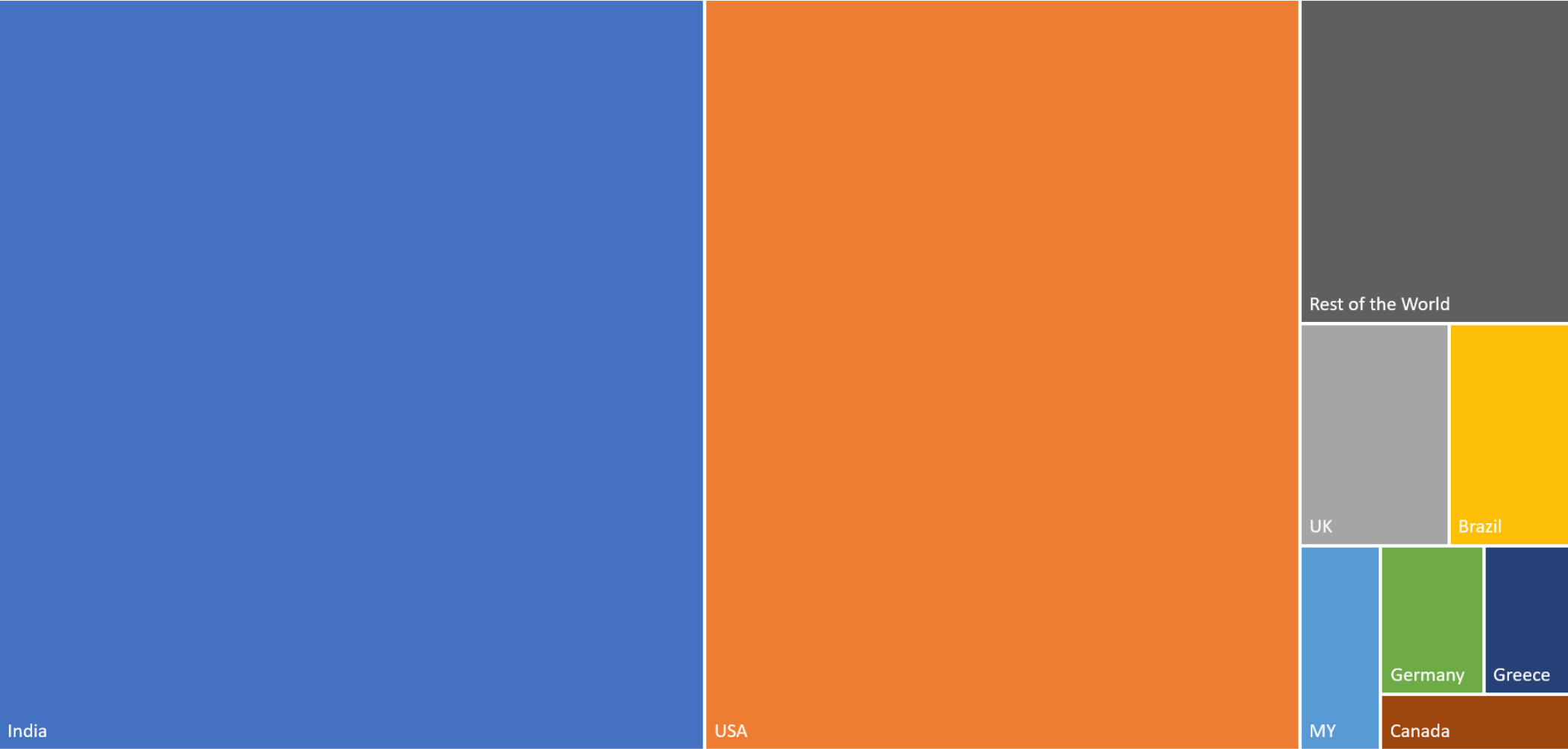Retrieved: 11 May 2018

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Global IPv6 End-User Readiness

IPv6 capable = 17.34% (May 2018)

51.57% increase in the last 12 months

Global IPv6 End-User Readiness

The IPv6 economy league table

CC	Economy	IPv6 capable (%)
BE	Belgium	58.03
IN	India	55.90
US	United States	44.92
DE	Germany	39.71
GR	Greece	38.43
LU	Luxembourg	33.25
UY	Uruguay	32.61
CH	Switzerland	30.81
GB	United Kingdom	29.92
MY	Malaysia	29.61
FI	Finland	27.86
JP	Japan	27.01
BR	Brazil	26.21
TT	Trinidad and Tobago	25.87

What about the Asia-Pacific?

CC	Economy	IPv6 capable (%)
IN	India	55.90
MY	Malaysia	29.61
JP	Japan	27.01
NZ	New Zealand	20.02
AU	Australia	17.57
MO	Macao	11.87
VN	Vietnam	11.20
KR	Korea	10.44
TH	Thailand	10.42
SG	Singapore	8.69
LK	Sri Lanka	6.31
TW	Taiwan	3.87
IR	Iran	2.41
BT	Bhutan	0.48

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Thailand: IPv6 End-User Readiness

IPv6 capable = 10.42% (May 2018)

170.65% increase in the last 12 months
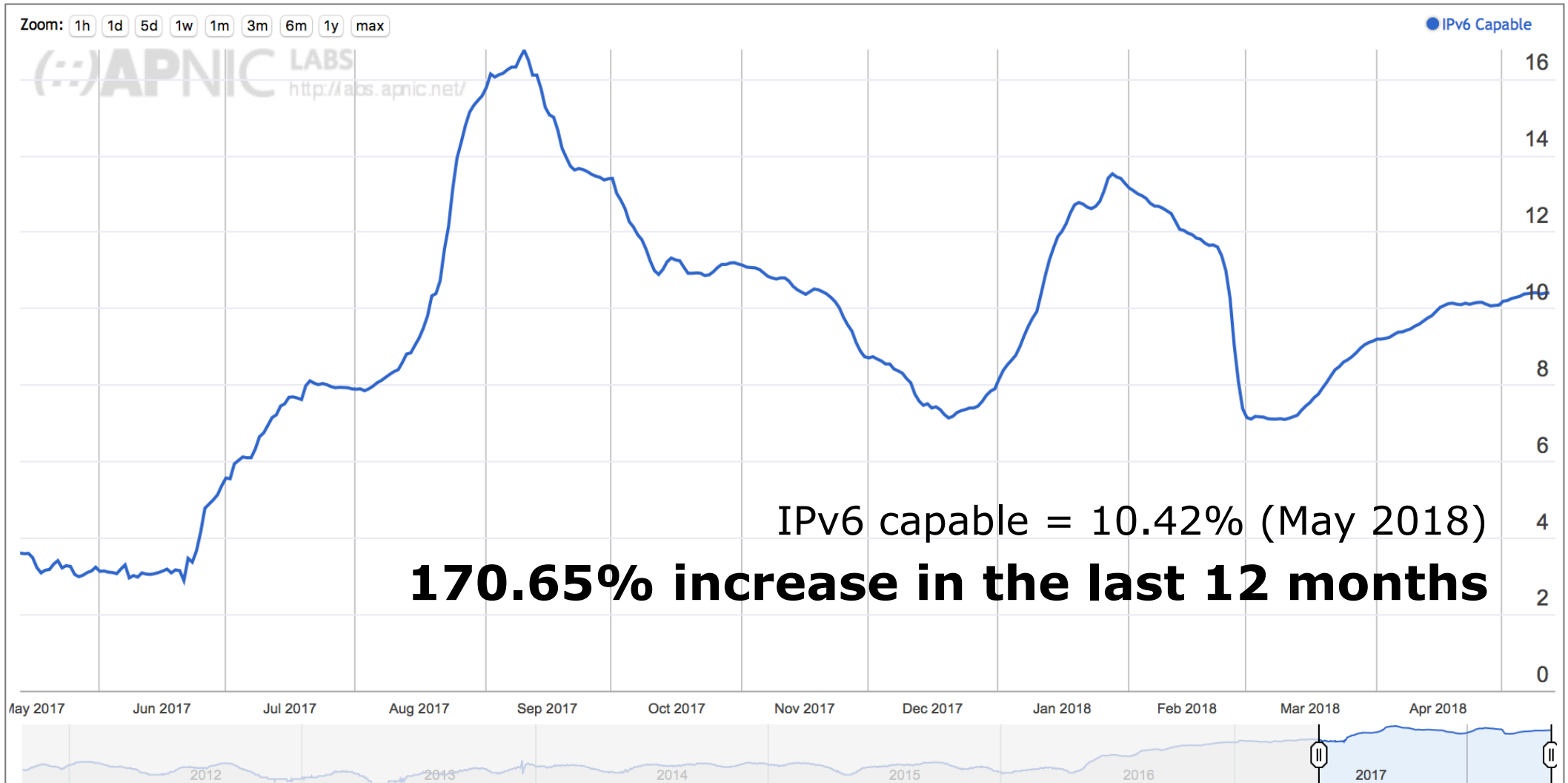
Thailand IPv6 leaderboard

ASN	Organization	IPv6 capable (%)
133481	AIS Fibre	49.33
131445	AIS 3G	38.56
7470	True Internet	0.77
45629	JasTel	0.04
17552	True Internet	0.03
23969	TOT	0.02
132061	Realmove	0.01
24378	Total Access Communication	0.01

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AS133481: AIS Fibre

IPv6 capable = 49.33% (May 2018)
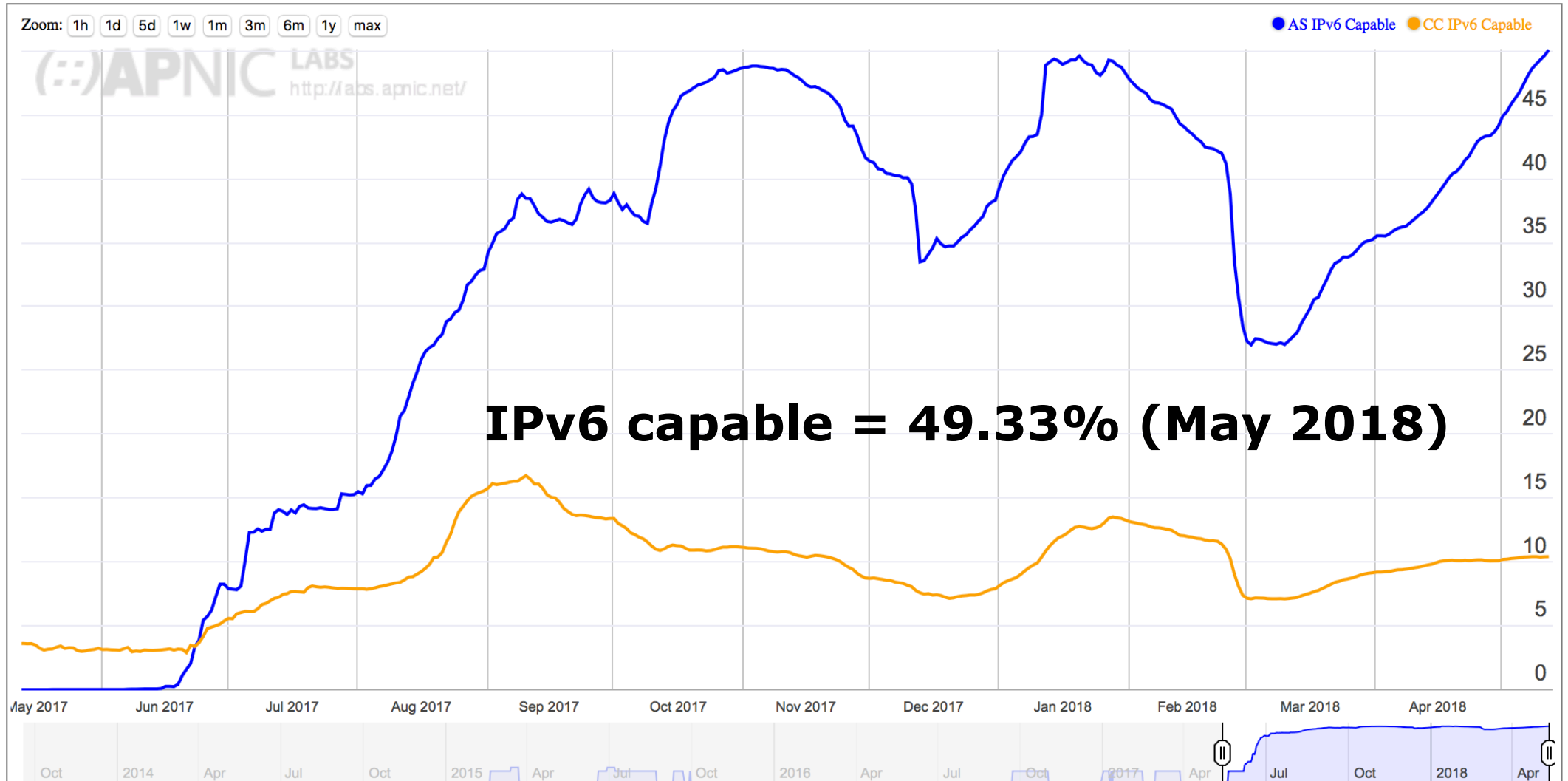
Thailand IPv6 Deployment

% Eyeball Share

AS133481 - AIS-FIBRE-AS-AP AIS Fibre

AS131445 - AIS3G-2100-AS-AP Advance Wireless Network

AS45629 - JASTEL-NETWORK-TH-AP JasTel Network International Gateway

AS17552 - TRUE-AS-AP True Internet Co.,Ltd.

AS23969 - TOT-NET TOT Public Company Limited

AS132061 - REALMOVE-AS-AP Realmove Company Limited

ASAS24378 - ENGTAC-AS-TH-AP Total Access Communication PLC.

58 other ASN

%IPv6   %IPv4

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Malaysia: IPv6 End-User Readiness

IPv6 capable = 29.61% (May 2018)

67.76% increase in the last 12 months
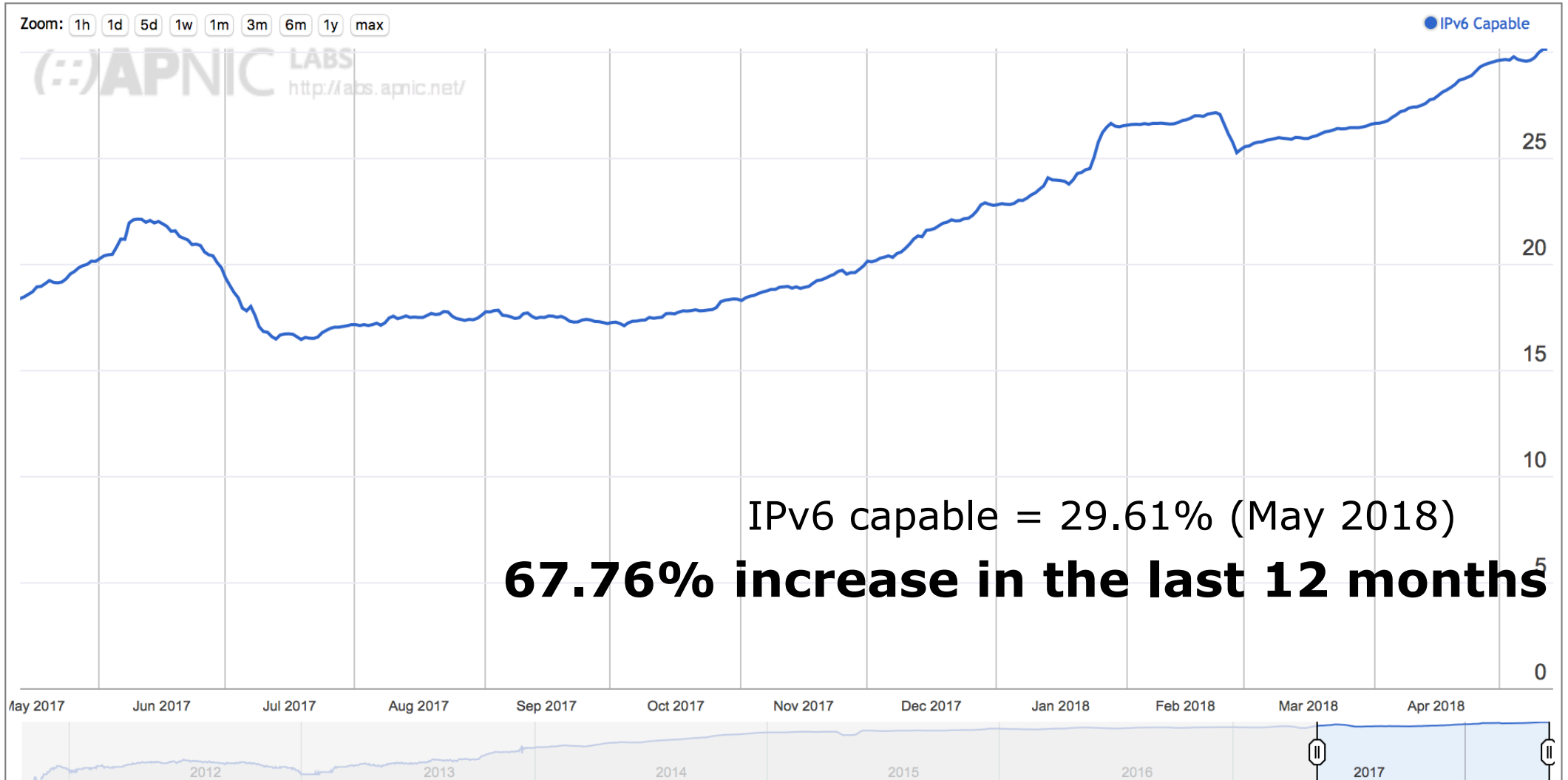
Malaysia IPv6 leaderboard

ASN	Organization	IPv6 capable (%)
4818	DiGi Telecommunications	40.02
4788	TMNet	34.84
9534	Maxis	24.08
45960	YTL Communications	19.55
38322	WEBE Digital	18.98
10030	Celcom	13.26
38466	U Mobile	12.77
9930	Time	11.98
38044	GITN	4.88

AS4788: TMNet

9.51% increase in the last 12 months

IPv6 capable = 34.84% (May 2018)

India: IPv6 End-User Readiness

IPv6 capable = 55.9% (May 2018)
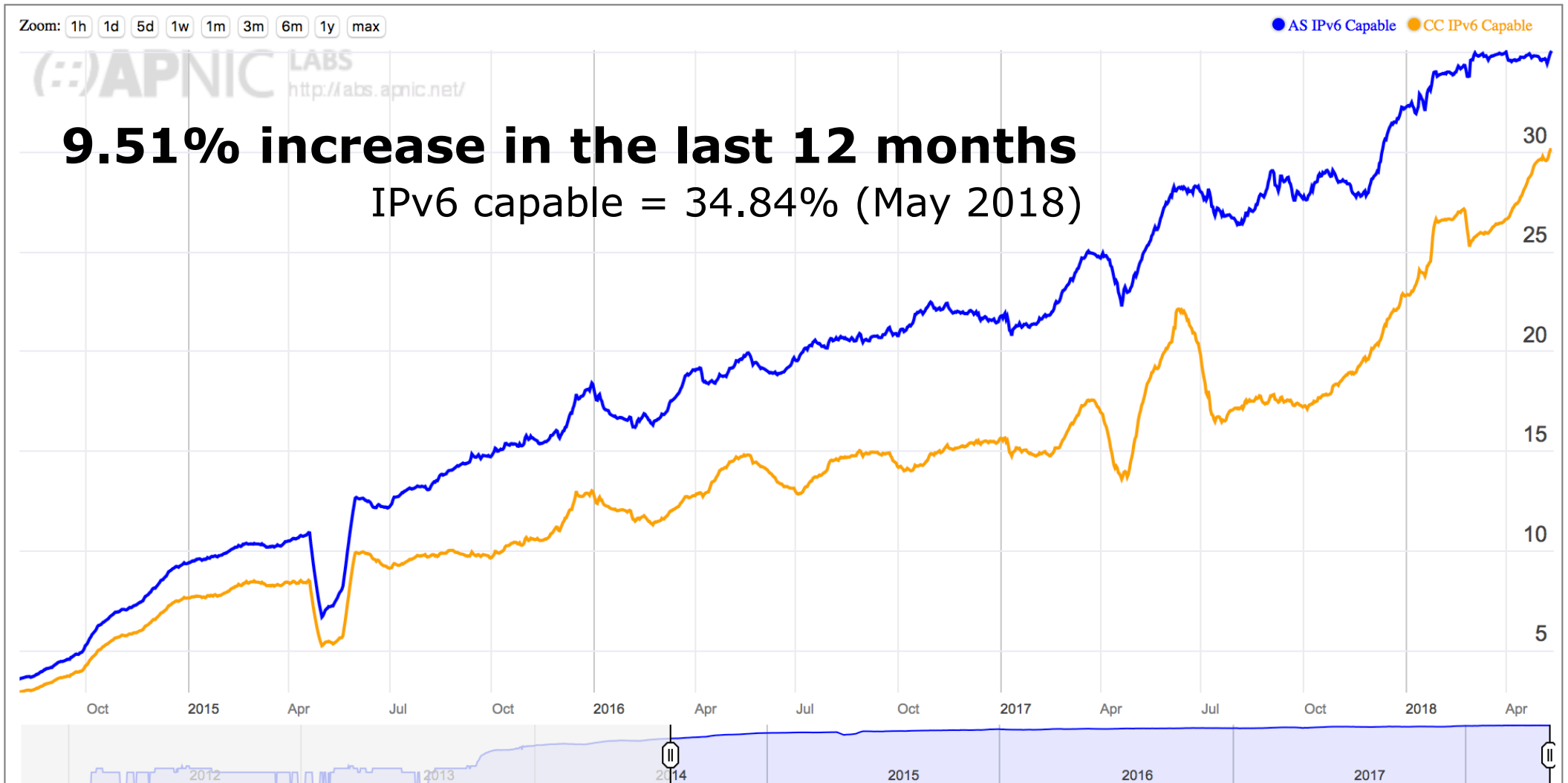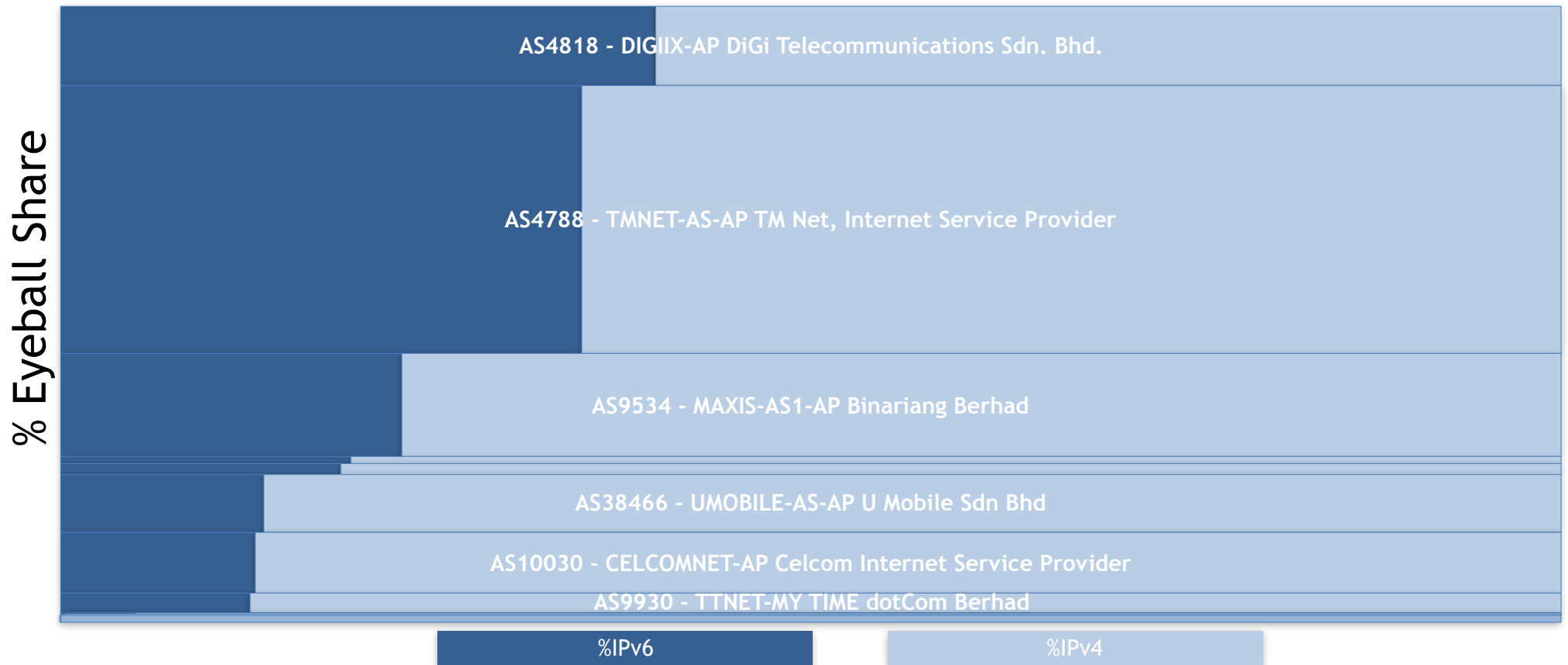
103% increase in the last 12 months
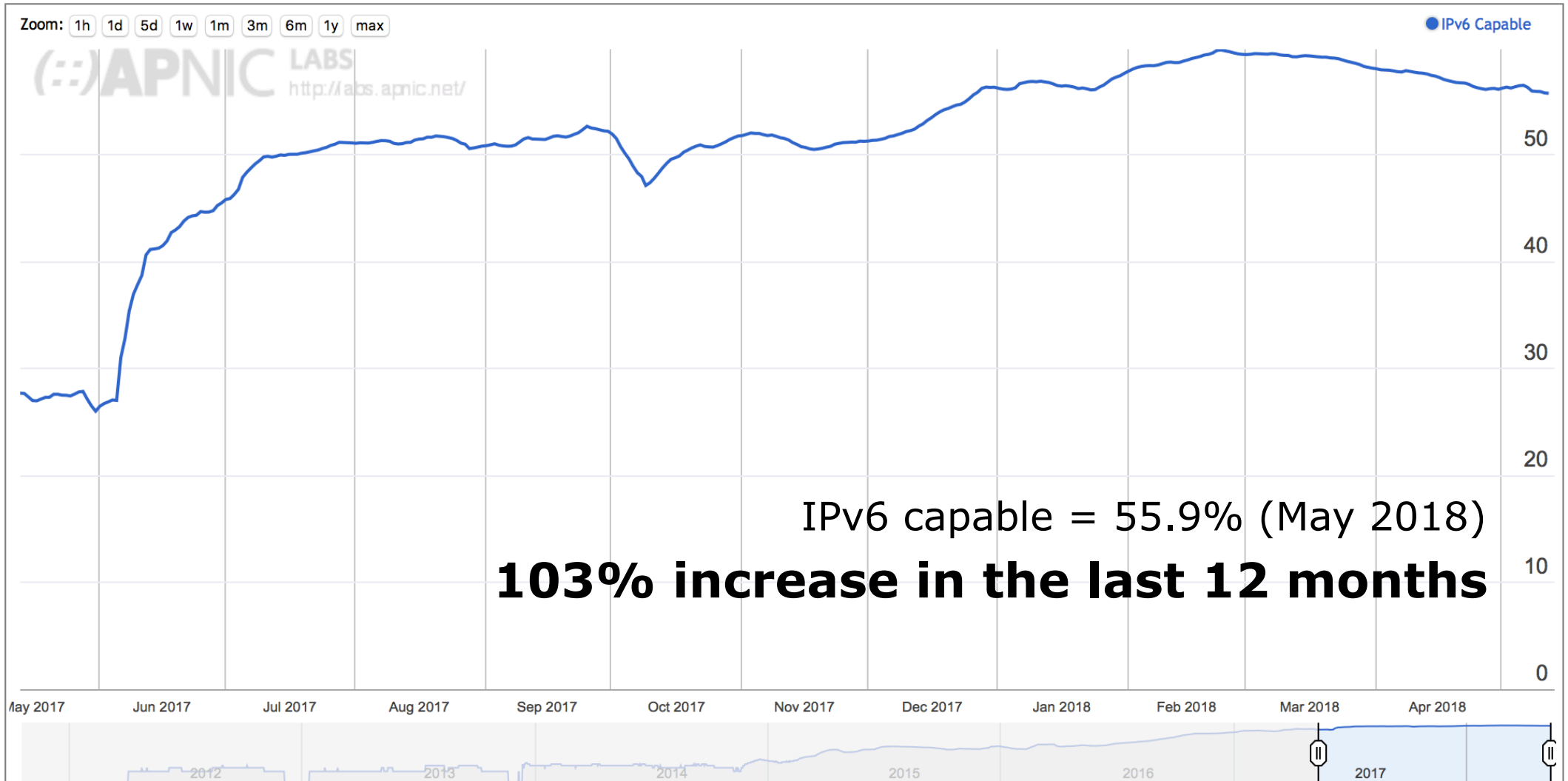
India IPv6 leaderboard

ASN	Organization	IPv6 capable (%)
55836	Reliance Jio	91.22
45271	Idea Cellular	39.02
38226	Vodafone	38.10
55441	TTSL	35.27
45609	Bharti Airtel	4.68
14061	Digital Ocean	2.15
18209	Atria Convergence Technologies	0.47
55947	Bangalore Broadband Network	0.25

AS55836: Reliance Jio

9.51% increase in the last 12 months
IPv6 capable = 91.22% (May 2018)

India IPv6 Deployment

% Eyeball Share

AS55836 - RELIANCEJIO-IN Reliance Jio Infocomm Limited

AS45271 - ICLNET-AS-AP Idea Cellular Limited

AS38266 - HUTCHVAS-AS Vodafone Essar Ltd., Telecommunication - Value Added Services

AS45609 - BHARTI-MOBILITY-AS-AP Bharti Airtel Ltd. AS for GPRS Service

AS9829 - BSNL-NIB National Internet Backbone

757 other ASN

%IPv6   %IPv4

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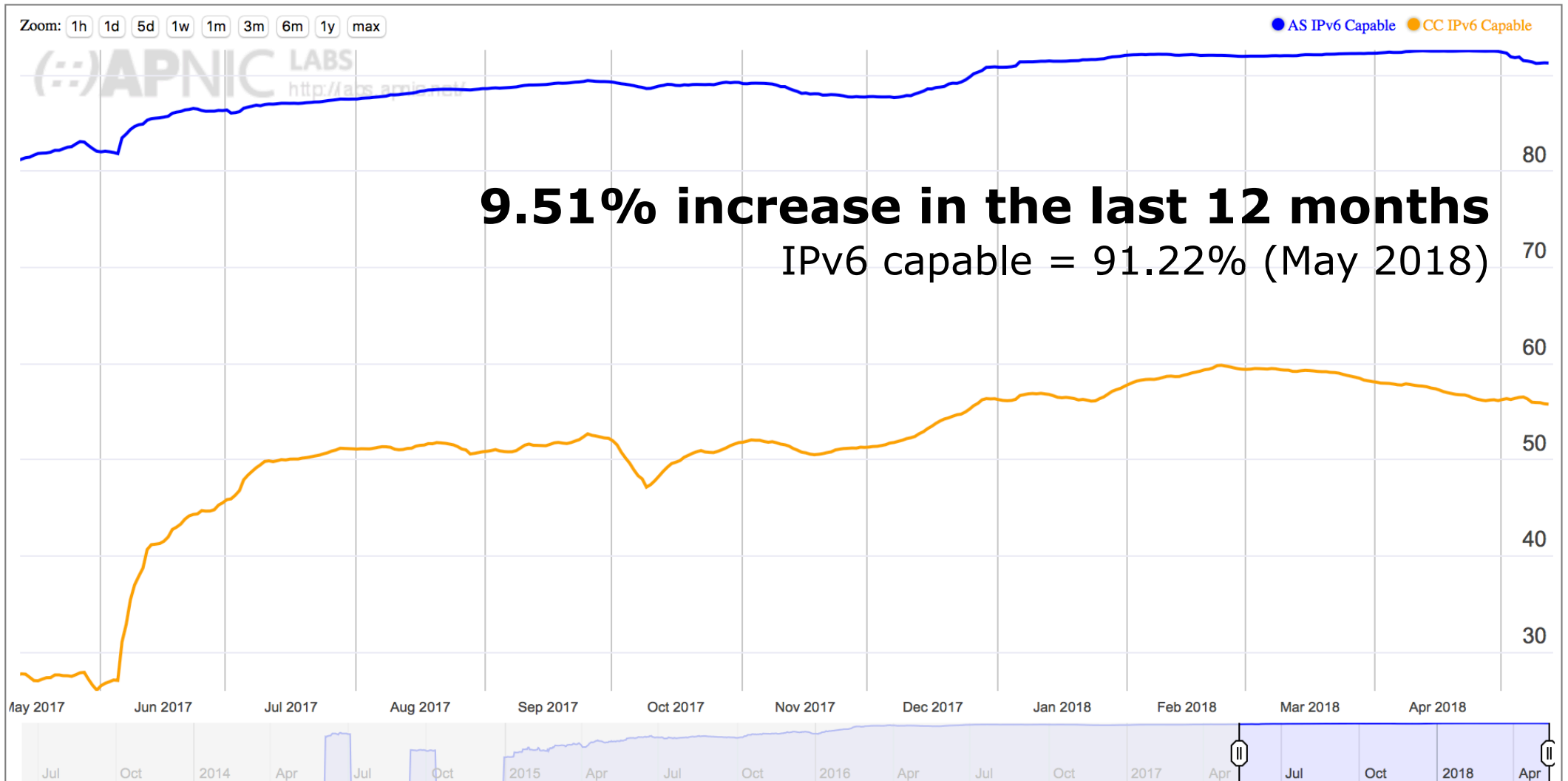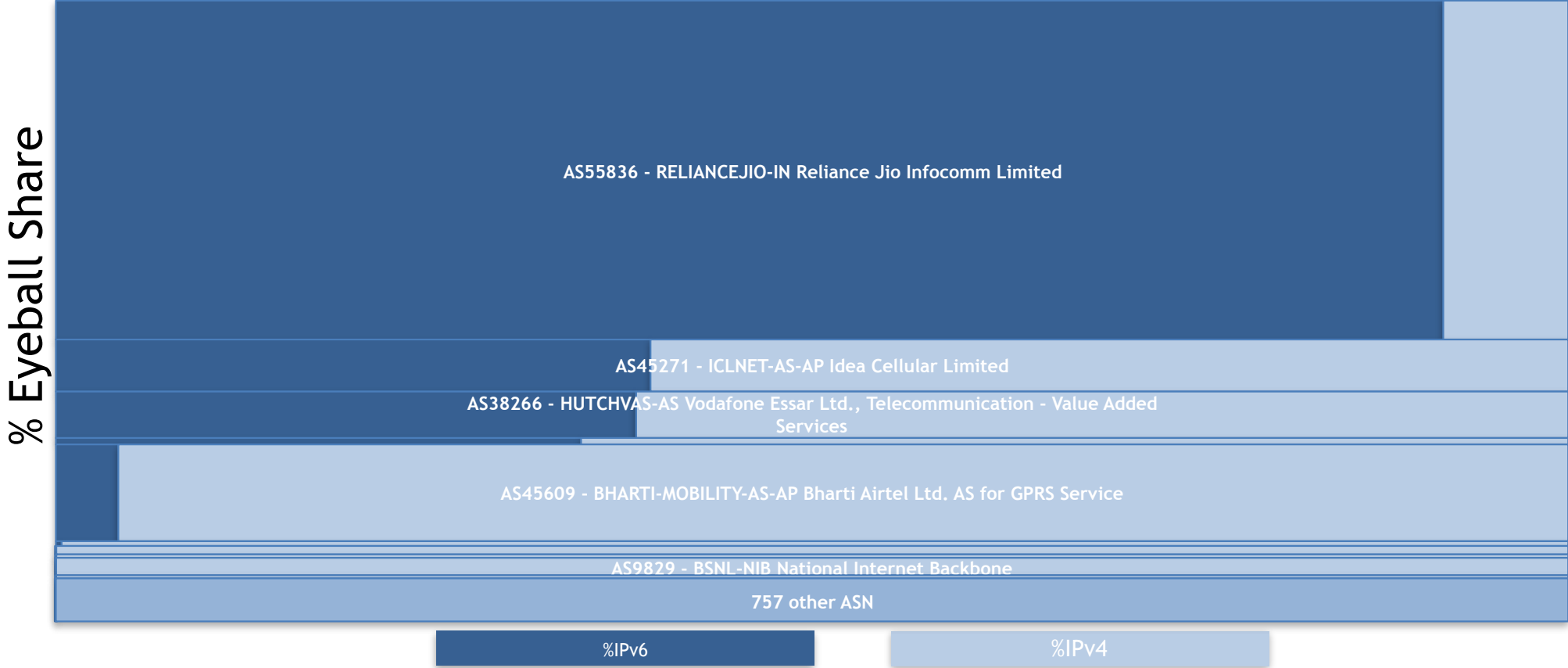
IPv6 in Action: Performance

- **Is IPv6 as robust as IPv4?**
  - Do all TCP connection attempt succeed?
    - Connection failure = No ACK for acknowledged SYN

  - IPv4 connection failure sits at 0.2%
  - IPv6 connection failure sits at 1.8%

[source : http://www.potaroo.net/presentations/2016-02-10-ad-measurement.pdf]

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IPv6 in Action: Performance

- **Is IPv6 as fast as IPv4**? (IPv6 unicast)
  - Comparison of RTT (e2e)
    - Time since SYN till ACK (factors out any congestion issues)

  - IPv6 is faster about half of the time
    - 36-90ms faster
  - **IPv6 as fast as IPv4**

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- **Testing HTTP Traffic**
  – TechArk Network Operator Measurement Activity (NOMA) conducted preliminary tests of IPv6 performance for HTTP traffic using RIPE Atlases.

  – Found performance of IPv6 is better when measuring to a "near" target

[source: https://blog.apnic.net/2017/09/29/network-operator-perspective-ipv6-performance/]

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IPv6 in Action: Performance

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- **IPv6 at LinkedIn**
  - For some select networks in Europe, LinkedIn is seeing up to **40% performance improvements over IPv6**, and in the **US, up to 10%.**

  - **TCP timeout on IPv4 over mobile** carrier networks is as high as **4.6%** and **IPv6 timeouts** are on a much lower side at **1.6%.**

[source : https://blog.apnic.net/2016/05/13/linkedin-ipv6-measurements/]

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IPv6 in Action: Content

Percentage of Alexa Top 1000 websites currently reachable over IPv6
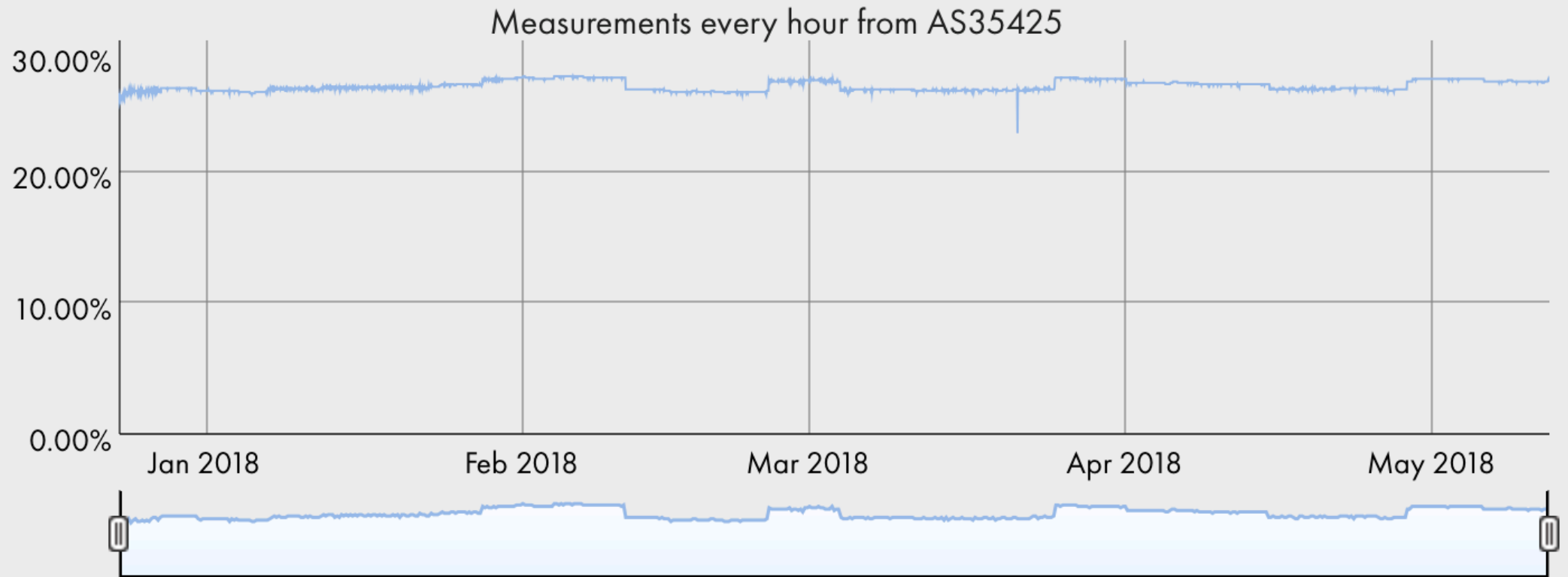
Measurements every hour from AS35425

[source : http://www.worldipv6launch.org/measurements/]
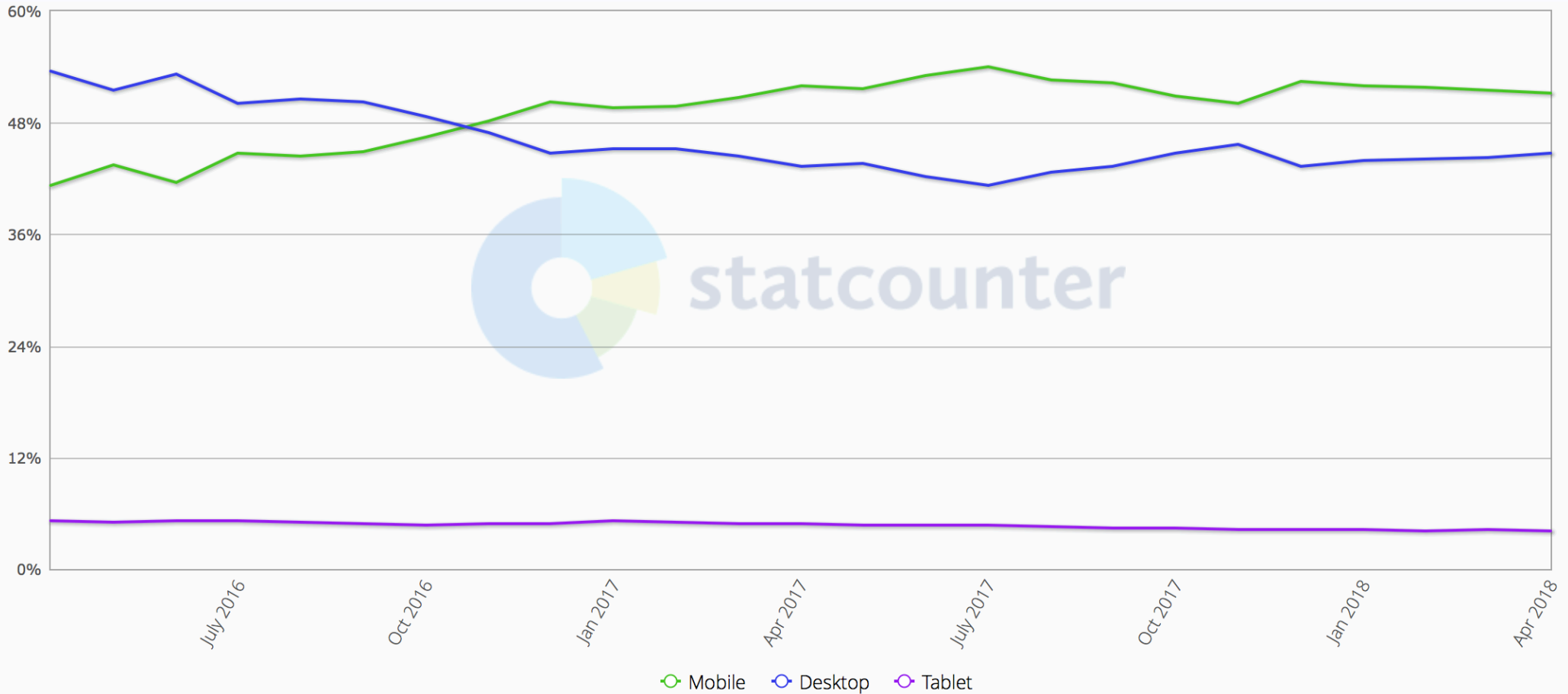
Industry Trend: Devices

Desktop vs Mobile vs Tablet Market Share Worldwide
Apr 2016 - Apr 2018

[source : http://gs.statcounter.com/platform-market-share/desktop-mobile-tablet]

Industry Trend: Devices

Desktop vs Mobile vs Tablet Market Share Worldwide

Apr 2016 - Apr 2018

Mobiles are now
50% of all visible devices

Mobile access services represent
75% of all Access Provider revenue

statcounter

○ Mobile   ○ Desktop   ○ Tablet

[source : http://gs.statcounter.com/platform-market-share/desktop-mobile-tablet]

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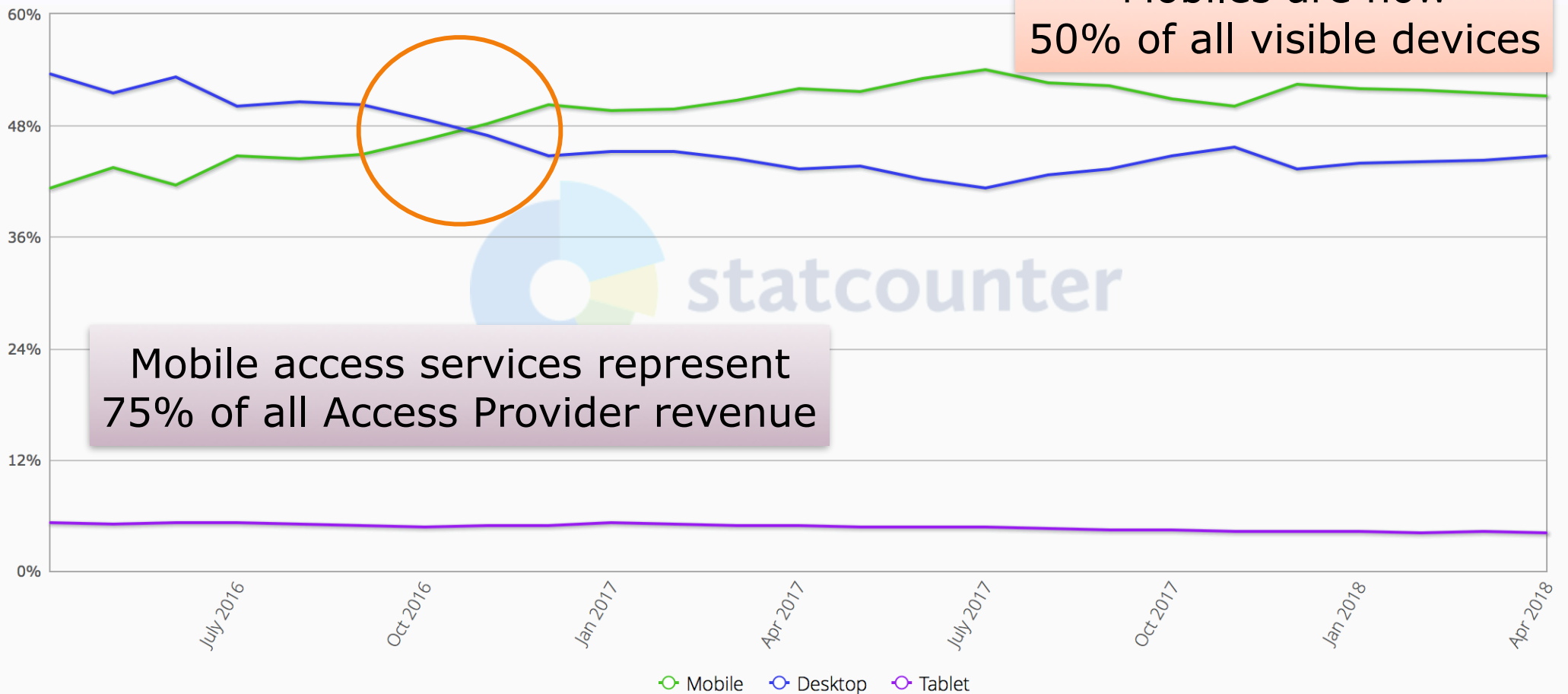
Industry trend: Mobile

- The mobile market is the market "**driver**" for Internet technology:
  - The PC and laptop market is in terminal decline
  - Mobiles represent the highest revenue sector, and show the highest growth numbers
  - The mobile Market was born and raised on NATs
    - The IPv4 model for cellular mobile service is still heavily based on CGNs

The true driver for IPv6 adoption in the Internet is in the mobile sector

IPv6 in Action: Mobile Devices

OS	Version	Installed by default	DHCPv6
Android	4.4	Yes	No
iOS	4.1	Yes	Yes
Windows Phone	8.1	Yes	Yes

- Android and Windows Phone support 464XLAT transition technology

- Apple iOS IPv6-only network support since version 9

- Since 2016 all Apple AppStore apps must include IPv6 support

[source : https://getipv6.info/display/IPv6/3GPP+Mobile+Networks]

IPv6 in Action: Mobile Networks

| Carrier	Economy	Note
Verizon Wireless	USA	Deployed dual stack transition technology in 2011
T-Mobile	USA	Deployed IPv6 transition technology (464XLAT) in 2012
SK Telecom	Korea	Deployed IPv6 transition technology (464XLAT) in 2014
Telstra	Australia	Deployed IPv6 transition technology (464XLAT) in 2016
Reliance Jio	India	Deployed dual stack transition technology in 2016

Observations

- IPv6 end-user readiness is increasing across region
  - Varies among region, economies, networks. There is no strong indication that specific sector-economy drivers are making IPv6 happen.

- Key market players taking lead on IPv6 continues have sizable impact on economy wide IPv6 readiness.

- Once IPv6 is enabled a network, end user readiness tends to grow rapidly.

- Initial roll-out followed by expansion to smaller market and regional ISPs as well as content, cloud, cable TV, and other service providers.

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What is IPv6?

Get IPv6

IPv6

Deploy IPv6

IPv6 in the region
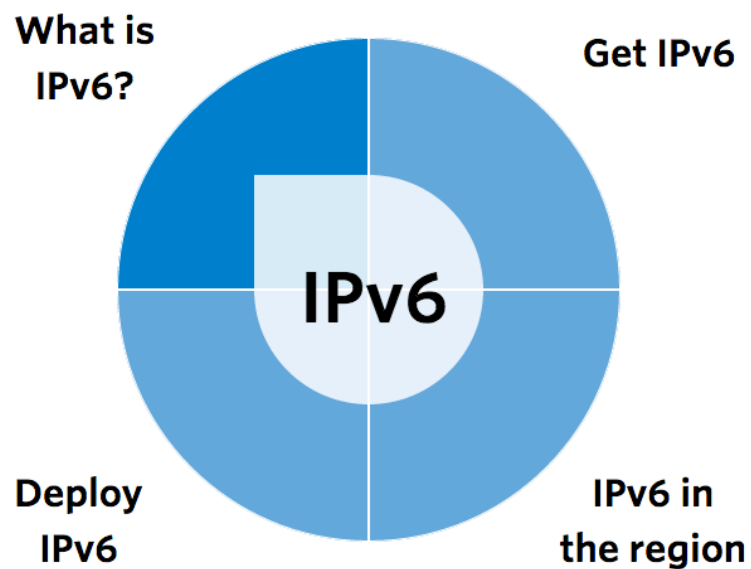
What is IPv6?	Why is it important?	What does IPv6 mean to me?	Benefits

apnic.net/ipv6

ขอบคุณครับ!

Thank You!

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