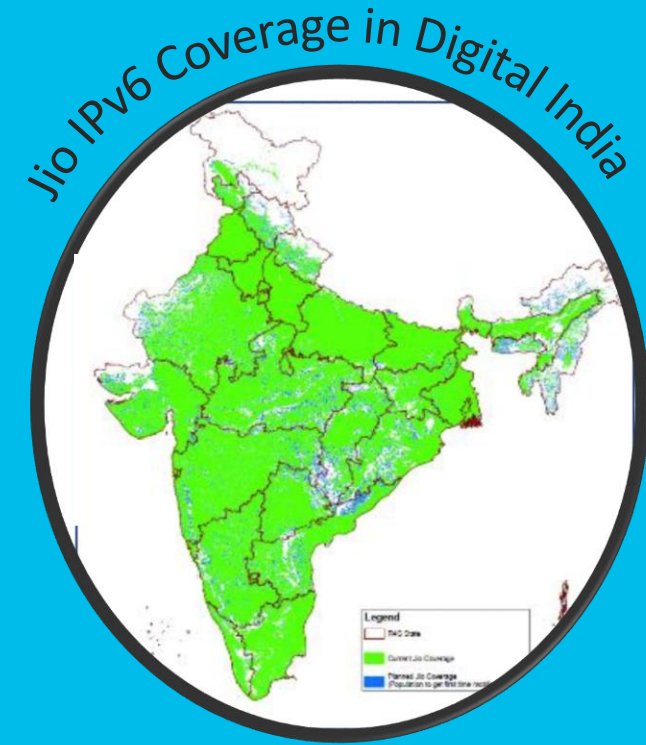


Leveraging IPv6 for Explosive growth – 306Mn+ Subs and counting

Ramesh Chandra, AVP
Network Planning & Engineering, Reliance Jio

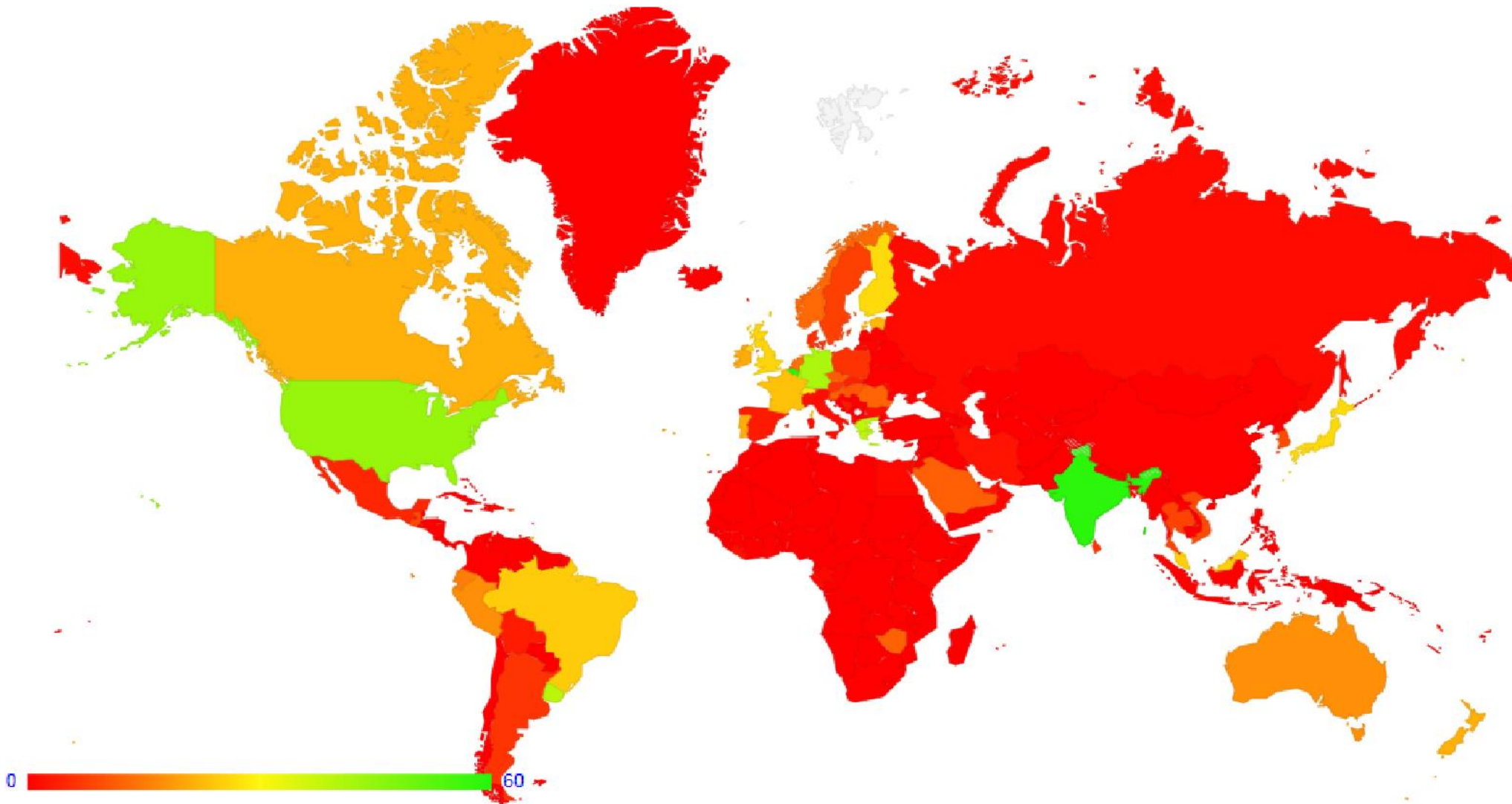
1st Jul 2019



Background – The Digital Global Story



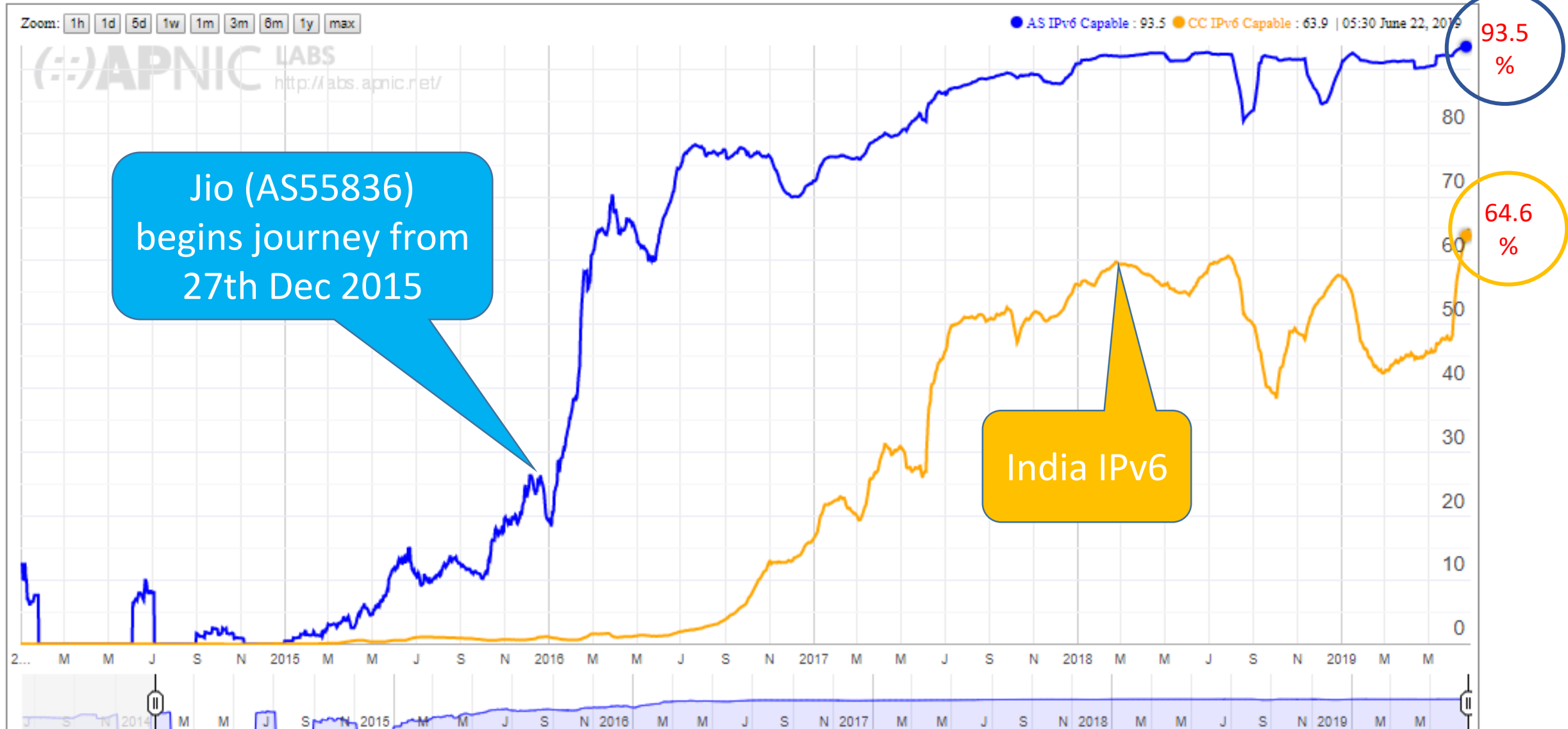
IPv6 Capable Rate by country (%)



India	65%
USA	57%
Belgium	57%
Germany	44%
Vietnam	39%
Malaysia	37%
Greece	36%
Finland	35%
Japan	33%
France	33%

Source: <https://stats.labs.apnic.net/ipv6/>

Background – The Digital Jio Story



Source: <https://stats.labs.apnic.net/ipv6/AS55836?a=55836&c=IN&x=1&s=0&p=0&w=30&s=1>

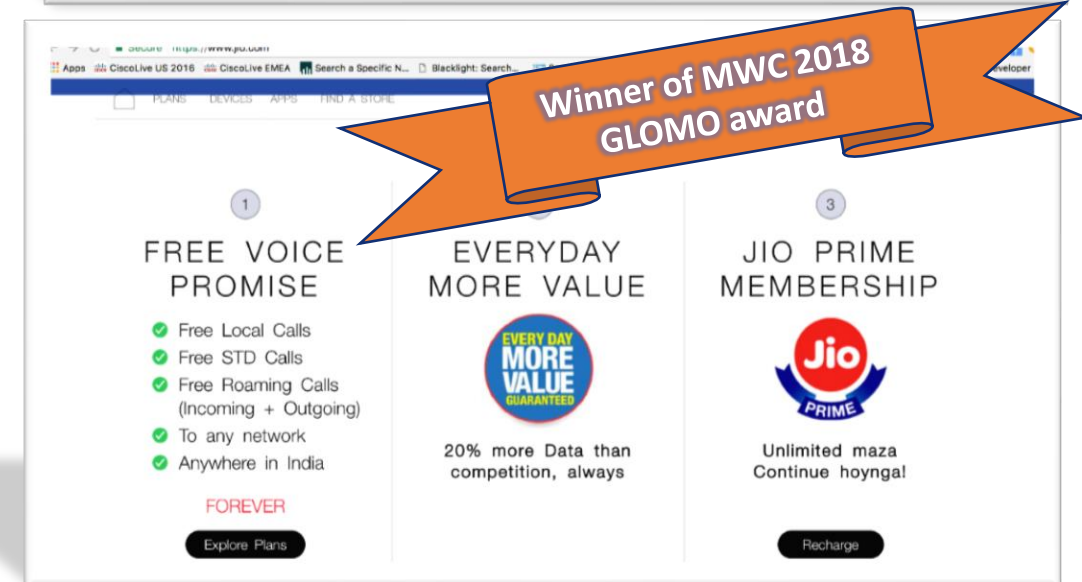
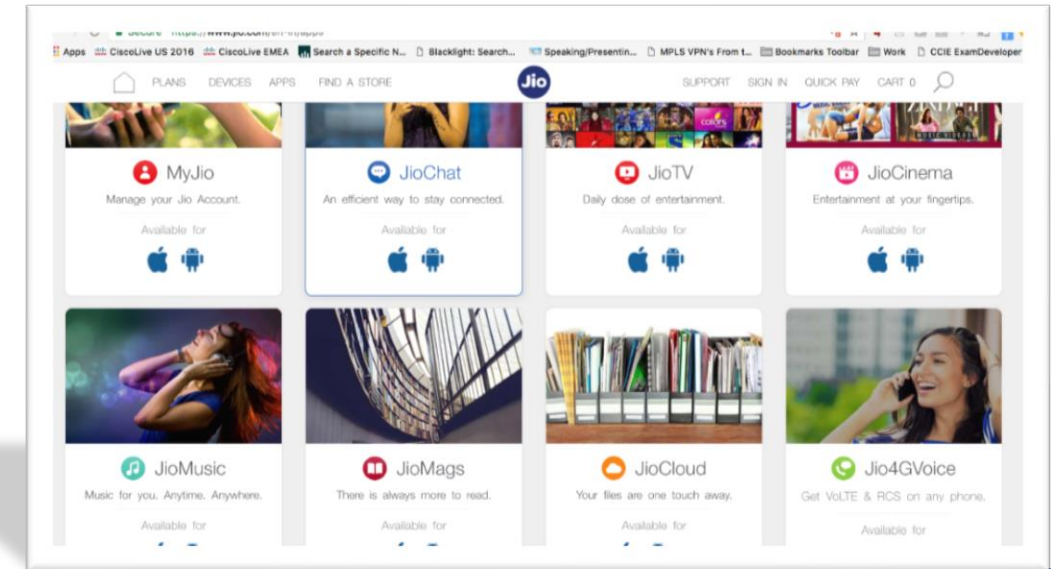
Agenda

- 1 Background
- 2 Jio's vision and initiatives
- 3 Single-Stack or Dual-Stack
- 4 way forward
- 5 challenges
- 6 Summary

Background – A journey of Reliance Jio

Jio

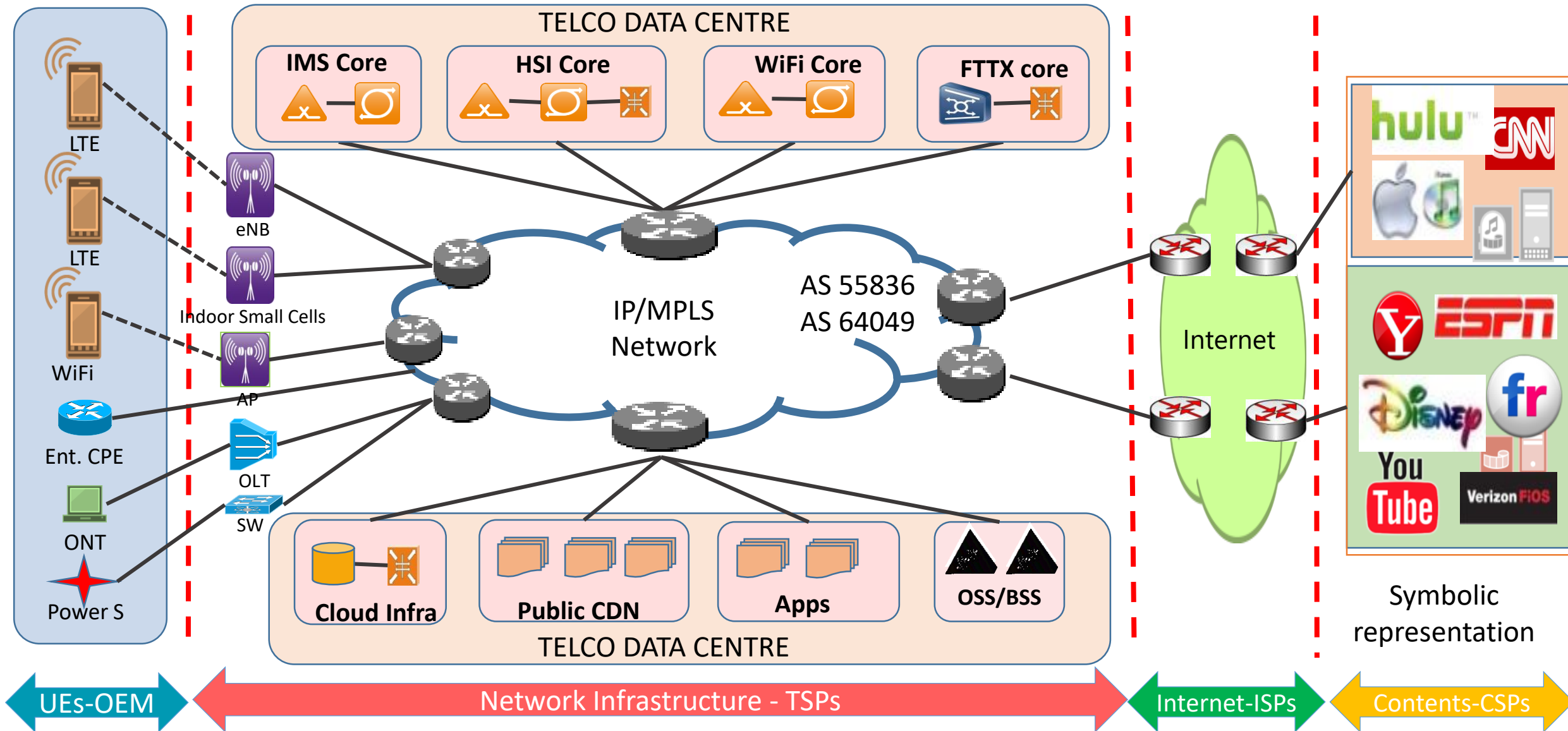
- **Story of “Biggest / Largest /..”**
 - Biggest IPv6 / MPLS network infra
 - Most IPv6 users on-net: 306Mn+ *
 - Most IPv6 traffic consumed: 11EB+ /quarter*
 - Largest Video & Voice over LTE network – mostly IPv6
 - ..
- **Story of Mobile Disruption**
 - Connectivity + Content + Apps + Services
 - Set the world record – fastest to 100M+ subs on-boarded (in 170 days)
 - Revenue model shift: 70% voice to 100% data



* Source https://main.trai.gov.in/sites/default/files/PR_No.40of2019.pdf

Source: www.jio.com

Telecom -IP eco system

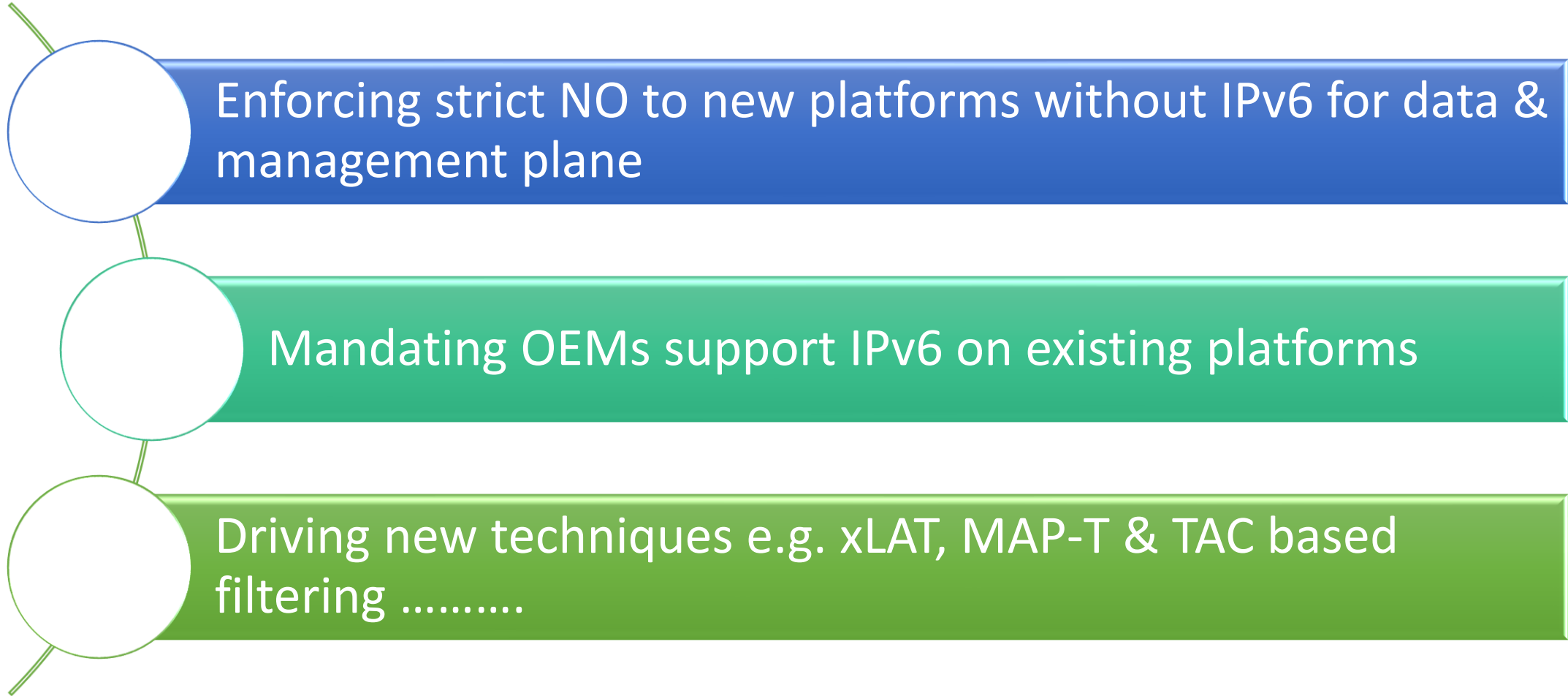


Reliance Jio Vision / Initiatives

- Drive Digital India Transformation - Make information available to every citizen at affordable price
- Drive IoT for energy efficiency, education, smart metering, smart building, healthcare and so on....
- Set benchmarks and deliver highest quality services

Challenges Faced

- IPv6 Readiness and adoptability by “Eco-system”
- Transition to IPv6 at no extra revenue
- Transition must be transparent to subscriber experience
- Evolution and maturity of transition technologies
- Limited IPv4 Availability



Enforcing strict NO to new platforms without IPv6 for data & management plane

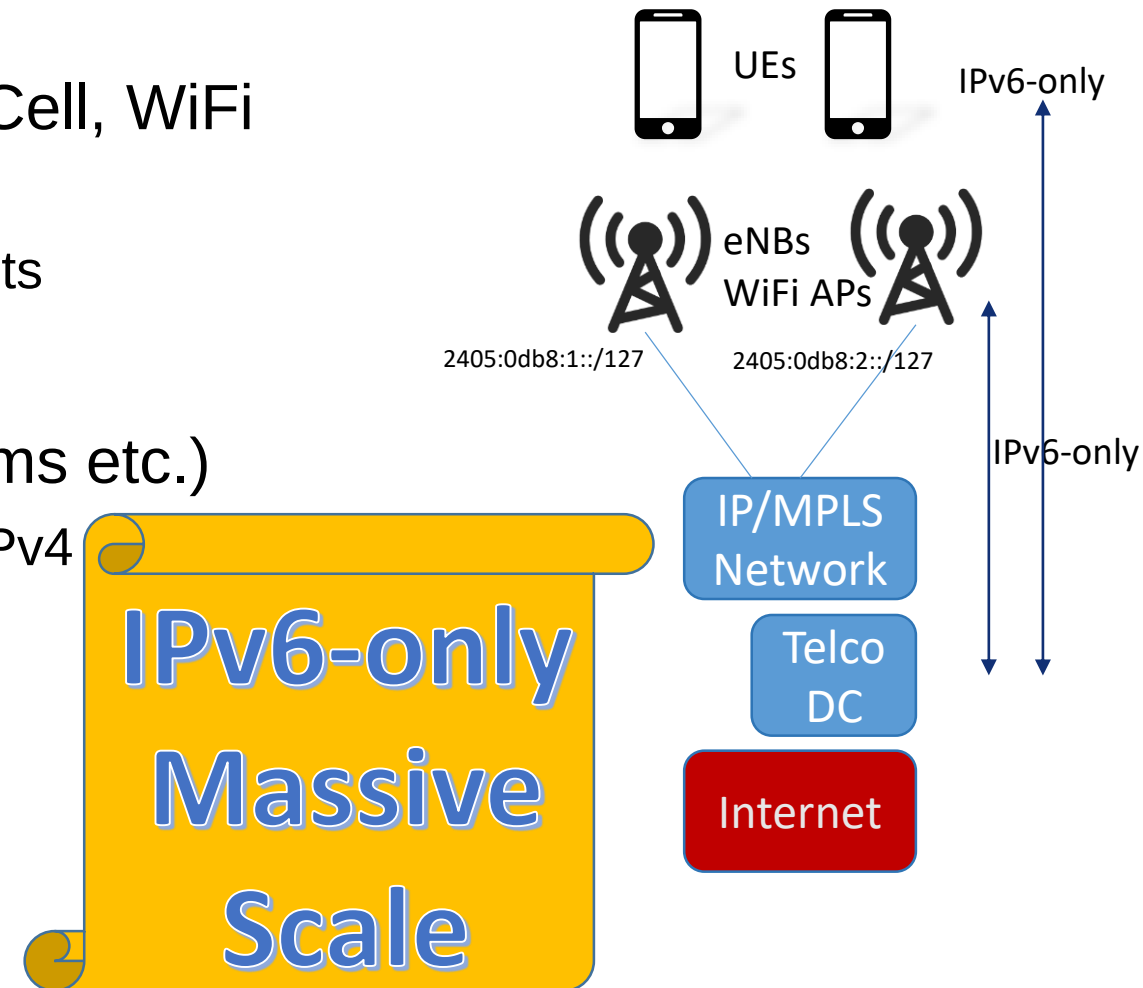
Mandating OEMs support IPv6 on existing platforms

Driving new techniques e.g. xLAT, MAP-T & TAC based filtering

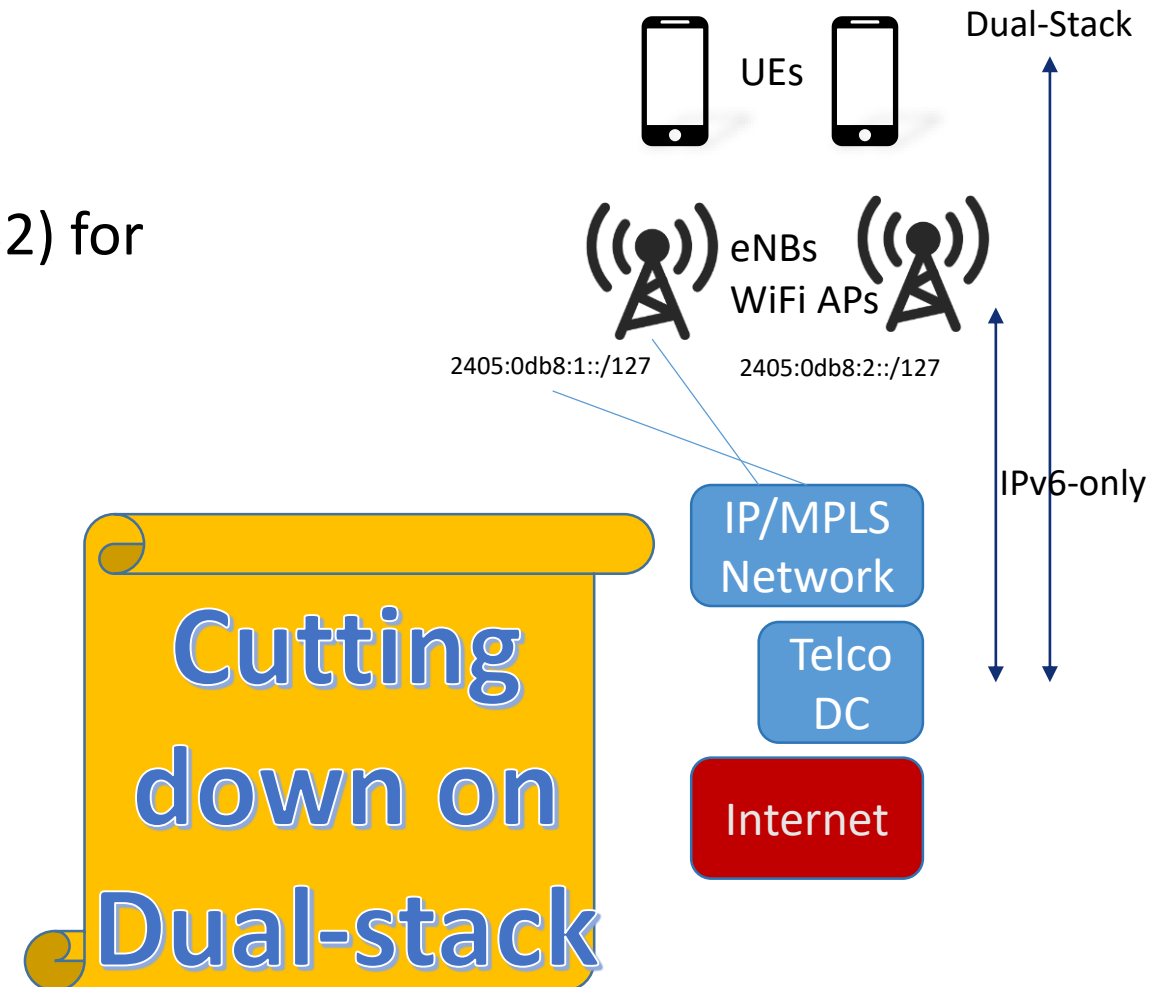
How well did that strategy work out?
What's the current state?

The Journey continues...

- Customers' LTE User Equipment (UEs)
 - ✓ 90% get IPv6-only (/64 prefix) for VoLTE
- Mobile Base Stations (e.g. eNodeB, Small Cell, WiFi AP)
 - ✓ 100% IPv6-only for eNB, Small cells, Access points
 - ✓ Node to EPC reachability in Telco DC
- Utilities (power systems, surveillance systems etc.)
 - ✓ SMPS, Access control systems etc. no more on IPv4
- Router/OLT Management over IPv6
 - ✓ Think SNMP, TACACS, NMS/EMS etc.



- Why Dual-stack?
 - ✓ Apps/Applications, Content
- Customers LTE User Equipment (UEs)
 - ✓ 100% get both IPv6 (/64 prefix) and IPv4 (/32) for internet
- Customer's WiFi User Equipment (UEs)
 - ✓ Including devices on hotspot/tethering
- IP/MPLS Network, Telco DC
 - ✓ ISIS-MT, BGP etc.
- CDN,OSS/BSS
 - ✓ Mediation, fault, perf, DNS, AAA etc..



Single-Stack/IPv4-only – Any in the IP/MPLS or DC?

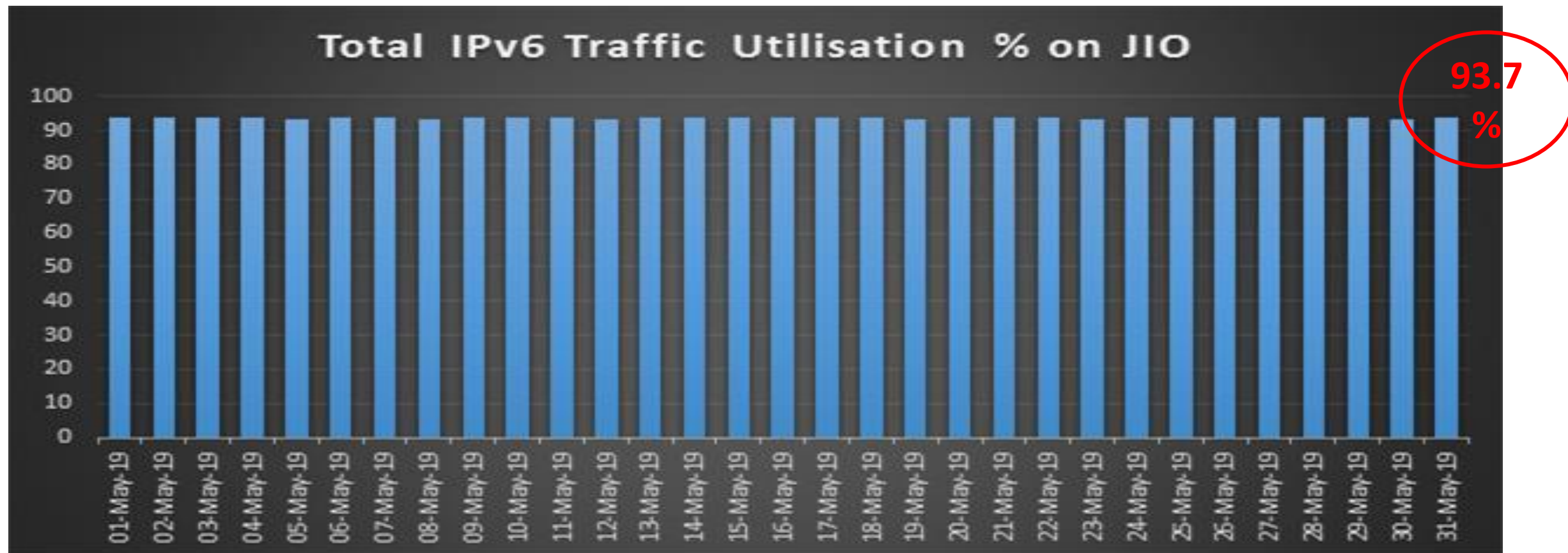


IPv4

Sorry, no
IPv4-only
found yet



Jio Cloud data Consumption on IPv6



- 93.7% requests served are on IPv6 constitute almost 95% of data volume
- Approx. 50% requests on Jio on IPv4 from other operators

- Speed up IPv6-only deployment for a bigger impact..
 - Transition Mobile UEs to IPv6-only LTE. Multiple technology options
 - More Wireline UEs (CPEs) with IPv6-only FTTx.
 - Control plane transition to only IPv6. SRv6/LDPv6 (RFC7552)
 - Timing (IEEE:1588v2, G.8275.2 ...) over IPv6
 - Apple devices transition to only IPv6
 - Whatsapp control & registration only on IPv6
 - Chipset readiness for devices and OTA communication



- Device OEM and chipset challenges
 - Chipset used in SIM a real bottleneck
 - ~ 24%* chipsets fail in cLAT compliance (RFC6877)
 - ~ 5%* devices fail VoLTE signalling on IPv6
- IPv6-only no good for user experience, if UE tethering is enabled
 - Back to Dual-stack or XLAT (RFC6877) becomes must
- Wireline devices to be pushed for only IPv6 (MAP-T/cLAT)

* Jio internal

- Use cases
 - Home automation, security surveillance, smart metering, building automation, automotive & transportation, healthcare.....
- Product limitations
 - DVR/NVR, cameras need IPv6 support
 - Sensors need IPv6 support
 - Chipset dependencies to be prioritised from major suppliers



Challenges - Health of web contents on DS/IPv6

..(3 of 3)



(as of 30th Jun 2019)

Category: ecommerce & shopping

Rank	web sites	DS/IPv6
1	amazon.com	
2	ebay.com	
3	allexpress.com	
4	amazon.de	
5	taobao.com	
6	amazon.co.jp	
7	craigslist.org	
8	amazon.co.uk	
9	tmall.com	
10	ebay.co.uk	

Category: finance

Rank	web sites	DS/IPv6
1	paypal.com	
2	chase.com	
3	wellsfargo.com	
4	bankofamerica.com	
5	sberbank.ru	
6	capitalone.com	
7	onlinesbi.com	
8	intuit.com	
9	allpay.com	
10	americanexpress.com	

Category: Games

Rank	web sites	DS/IPv6
1	twitch.tv	
2	discordapp.com	
3	roblox.com	
4	steamcommunity.com	
5	steampowered.com	
6	granbluefantasy.jp	
7	gamepedia.com	
8	mini1.cn	
9	mbga.jp	
10	gamespot.com	

Category: sports

Rank	web sites	DS/IPv6
1	espn.com	
2	cricbuzz.com	
3	mlb.com	
4	marca.com	
5	sports.yahoo.com	
6	hupu.com	
7	as.com	
8	espnricinfo.com	
9	sports.naver.com	
10	lequipe.fr	

Category: top visited web sites

Rank	web sites	DS/IPv6
1	google.com	
2	youtube.com	
3	facebook.com	
4	baidu.com	
5	yahoo.com	
6	wikipedia.com	
7	amazon.com	
8	twitter.com	
9	pornhub.com	
10	instagram.com	

Category: cloud service providers

SN	web sites	DS/IPv6
1	AWS.amazon.com	
2	Azure.microsoft.com	
3	cloud.google.com	
4	VMWare.com	
5	IBM.com	
6	Oracle.com	
7	Alibabacloud.com	
8	kamatera.com	
9	salesforce.com	
10	verizonenterprise.com	

Guess
support of
DS/IPv6 on
top 60 web
sites in 6
categories
???

Sources: <https://www.similarweb.com/top-websites>, <https://ipv6-test.com/validate.php>, <https://www.guru99.com/cloud-computing-service-provider.html>

Challenges - Health of web contents on DS/IPv6

..(3 of 3)



(as of 30th Jun 2019)

Category: ecommerce & shopping

Rank	web sites	DS/IPv6
1	amazon.com	✗
2	ebay.com	✗
3	allexpress.com	✗
4	amazon.de	✗
5	taobao.com	✗
6	amazon.co.jp	✗
7	craigslist.org	✗
8	amazon.co.uk	✗
9	tmall.com	✗
10	ebay.co.uk	✗

Category: finance

Rank	web sites	DS/IPv6
1	paypal.com	✗
2	chase.com	✗
3	wellsfargo.com	✗
4	bankofamerica.com	✗
5	sberbank.ru	✗
6	capitalone.com	✗
7	onlinesbi.com	✓
8	intuit.com	✗
9	allpay.com	✗
10	americanexpress.com	✗

Category: Games

Rank	web sites	DS/IPv6
1	twitch.tv	✗
2	discordapp.com	✗
3	roblox.com	✗
4	steamcommunity.com	✗
5	steampowered.com	✗
6	granbluefantasy.jp	✗
7	gamepedia.com	✗
8	mini1.cn	✗
9	mbga.jp	✗
10	gamespot.com	✗

Category: sports

Rank	web sites	DS/IPv6
1	espn.com	✗
2	cricbuzz.com	✗
3	mlb.com	✗
4	marca.com	✗
5	sports.yahoo.com	✗
6	hupu.com	✗
7	as.com	✗
8	espnricinfo.com	✗
9	sports.naver.com	✗
10	lequipe.fr	✗

Category: top visited web sites

Rank	web sites	DS/IPv6
1	google.com	✓
2	youtube.com	✓
3	facebook.com	✓
4	baidu.com	✗
5	yahoo.com	✓
6	wikipedia.com	✓
7	amazon.com	✗
8	twitter.com	✗
9	pornhub.com	✗
10	instagram.com	✓

Category: cloud service providers

SN	web sites	DS/IPv6
1	AWS.amazon.com	✗
2	Azure.microsoft.com	✓
3	cloud.google.com	✓
4	VMWare.com	✓
5	IBM.com	✗
6	Oracle.com	✗
7	Alibabacloud.com	✗
8	kamatera.com	✓
9	salesforce.com	✗
10	verizonenterprise.com	✗

- Only 18% in top 60
- Overall would be much lower

Sources: <https://www.similarweb.com/top-websites>, <https://ipv6-test.com/validate.php>, <https://www.guru99.com/cloud-computing-service-provider.html>

- Jio's exponential growth enabler is IPv6
 - IPv6 enabled user devices. (soon to be IPv6-only)
 - IPv6 traffic ~11EB+ per quarter (and growing)
- Partnership with Technology suppliers helped to strengthen IPv6-only
- Jio no longer encouraging IPv4 addresses (driving \$ savings)
 - Minimize Stateful NAT64/44 investment

Jio has embraced IPv6-only, so can you ...

Jio's Global Presence

Thank you for your
attention

