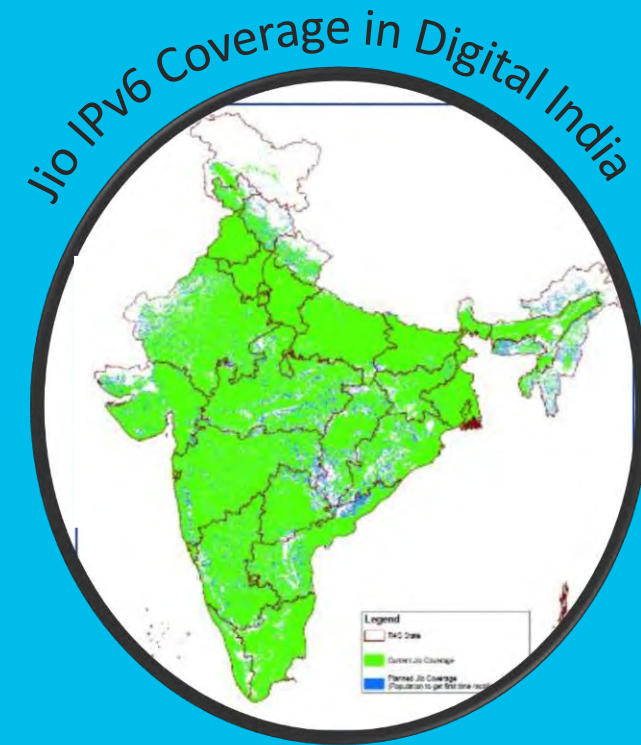


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Harnessing the power of IPv6 – 388Mn+ Subs

Ramesh Chandra, VP
Network Planning & Engineering, Reliance Jio

09th Sep 2020



Agenda

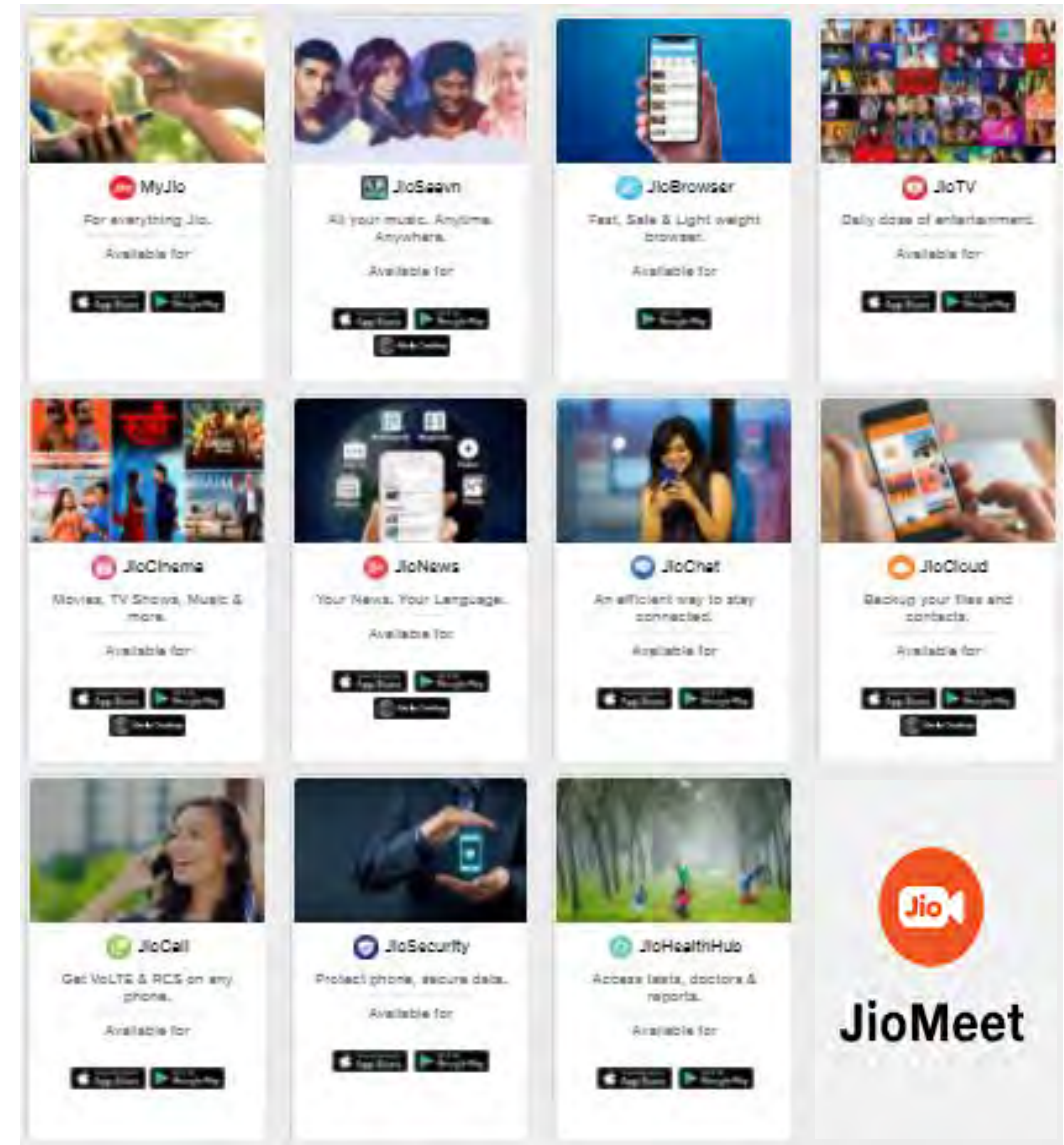
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- 1 Background
- 2 Jio's vision and initiatives
- 3 IPv6 strategy DS to IPv6 only
- 4 eco system challenges
- 5 Way forward
- 6 Summary

Background – A journey of Reliance Jio



- **Story of “Biggest / Largest /..”**
 - Biggest IPv6 / MPLS network infra
 - Highest subscriber on IPv6 : 388Mn+ *
 - Most IPv6 traffic consumed: 15EB+ /quarter*
 - Largest Video & Voice over LTE network – mostly IPv6
 - ..
- **Mobile Disruption to maturity**
 - Self reliance - E2E eco system with Content + Apps + Services
 - Sustainable model shift: 70% voice centric to 100% data centric



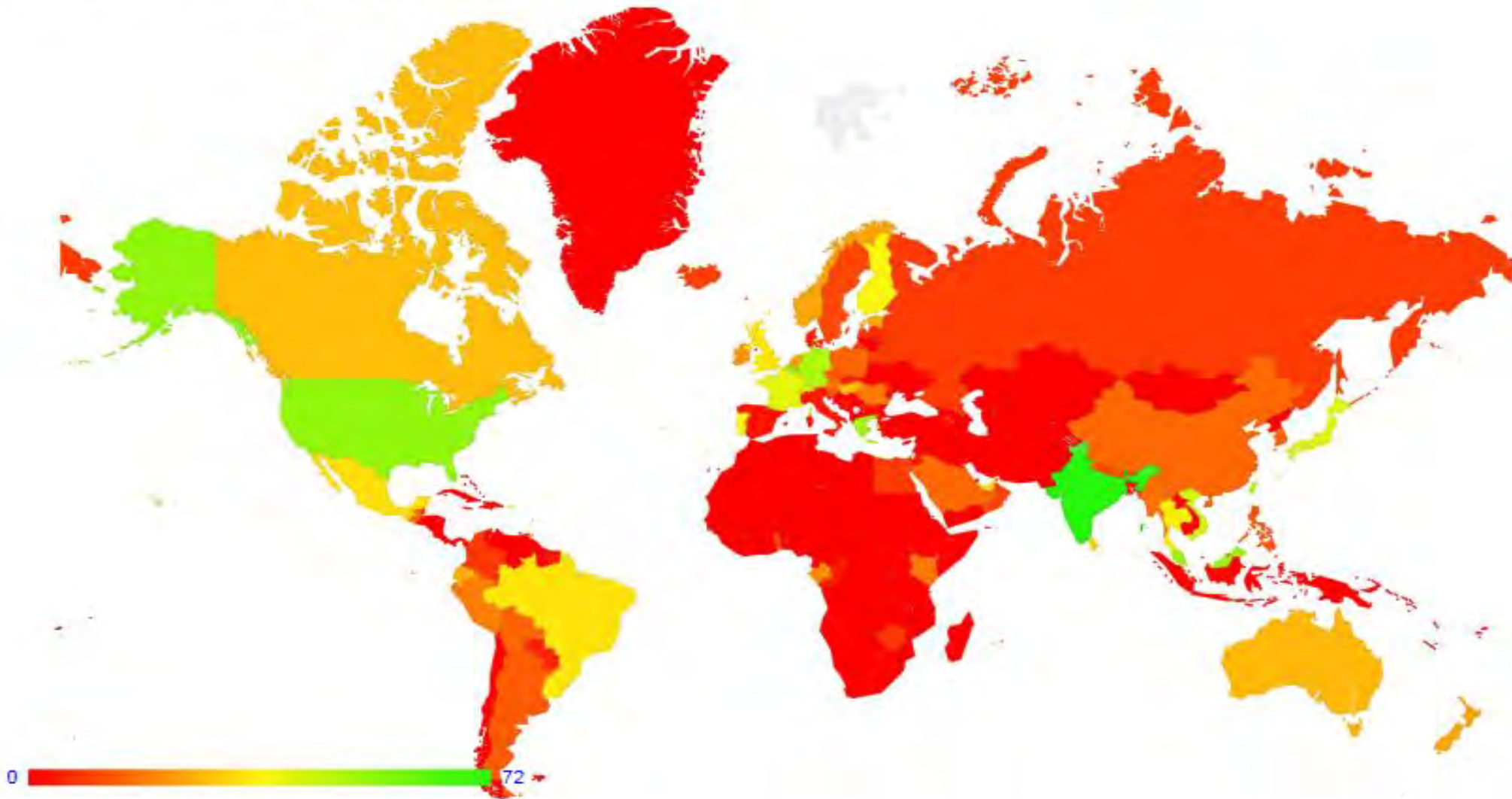
* Source https://main.trai.gov.in/sites/default/files/PR_No.40of2019.pdf

Source: www.jio.com

Background – The Digital Global Story



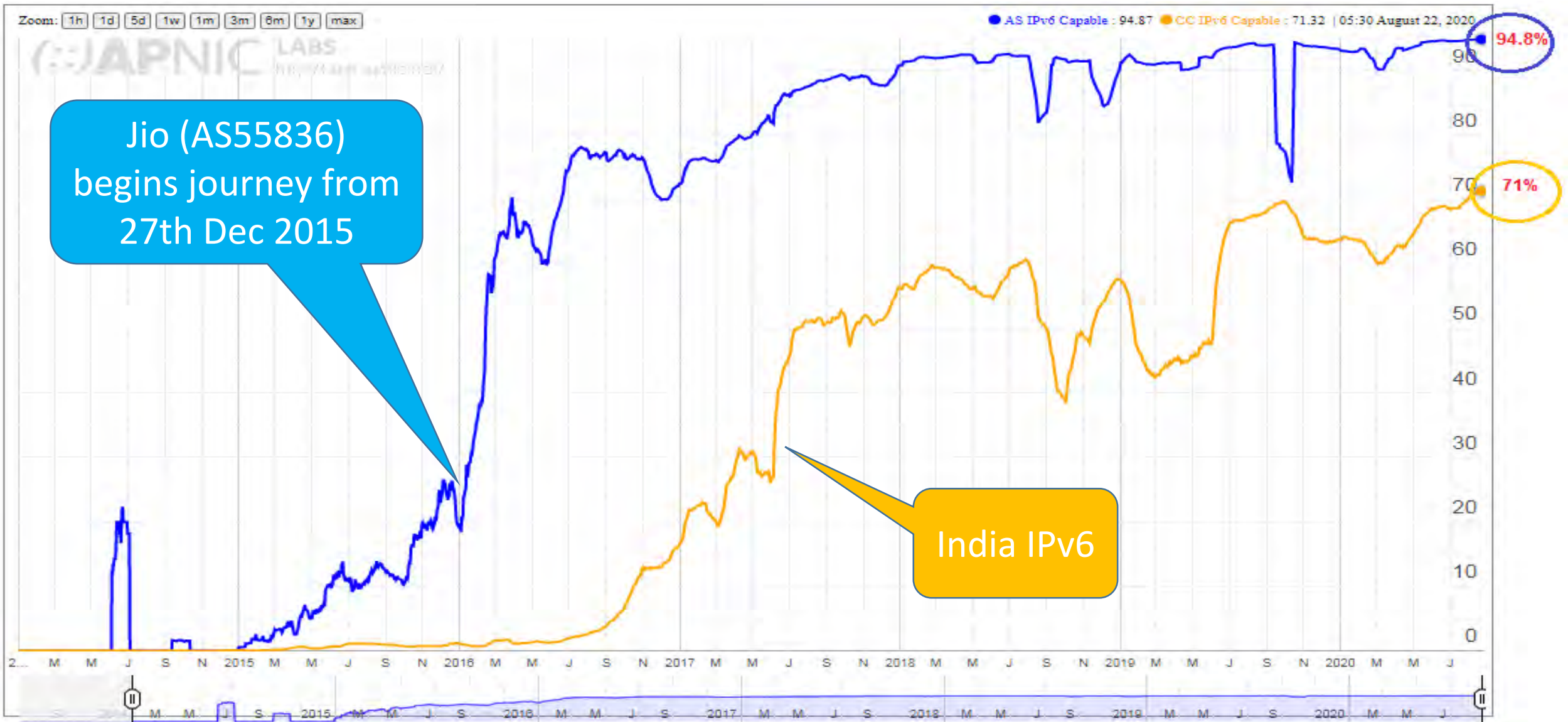
IPv6 Capable Rate by country (%)



India	71%
Caribbean	69%
Africa (E)	64%
Belgium	59%
USA	53%
Malaysia	52%
Greece	51%
Germany	49%
Taiwan	47%
Switzerland	44%

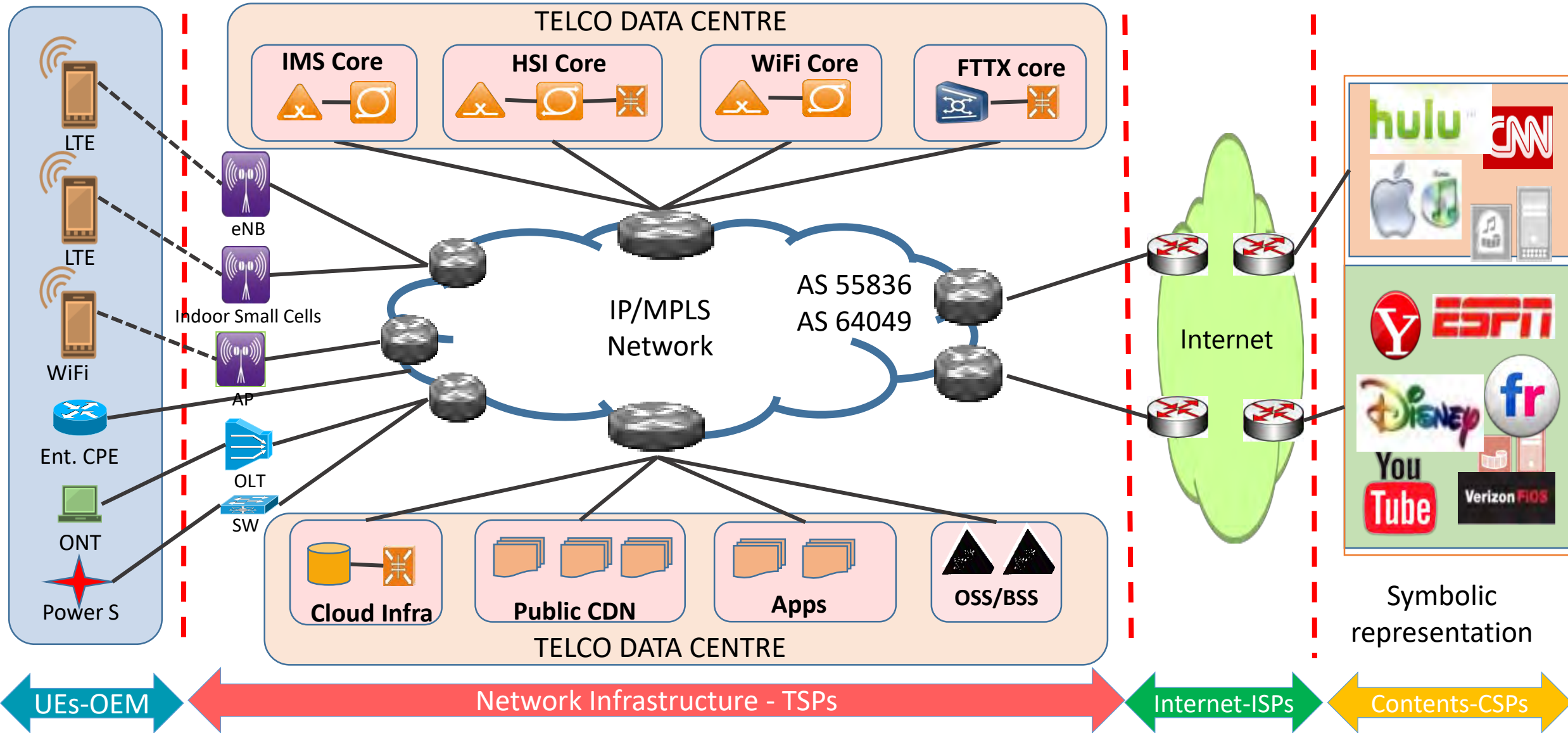
Source: <https://stats.labs.apnic.net/ipv6/>

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>

Telecom -IP eco system



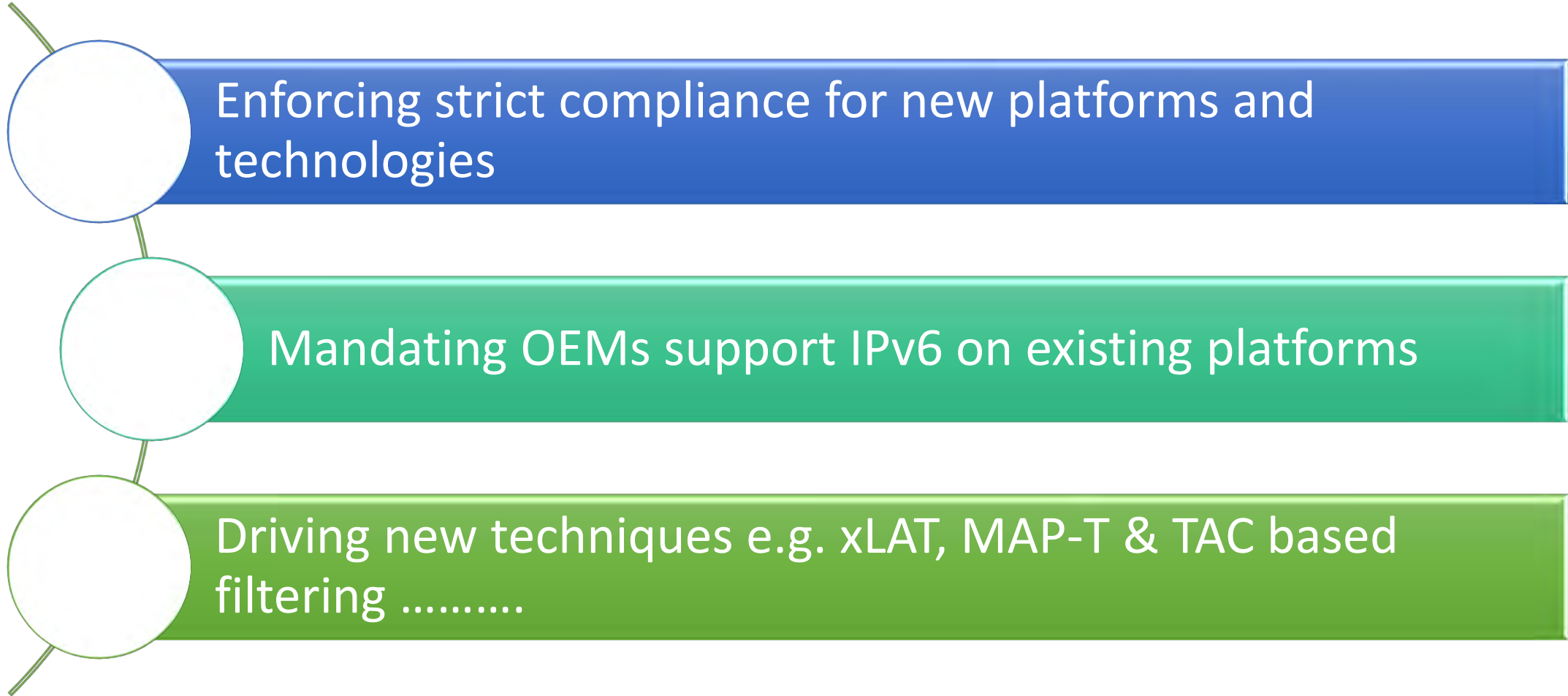
Symbolic representation

Reliance Jio Vision / Initiatives

- Drive Digital India Transformation
 - Make information available to every citizen at affordable price
 - Bridge the gender digital divide in India with W-GDP and USAID
- Enable IoT to bring leap jump in efficiency, effectiveness and improvement through new technologies. Sectors - energy efficiency, education, smart metering, smart building, healthcare and so on....
- Set benchmarks in industry and deliver highest quality of 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 – catalyst

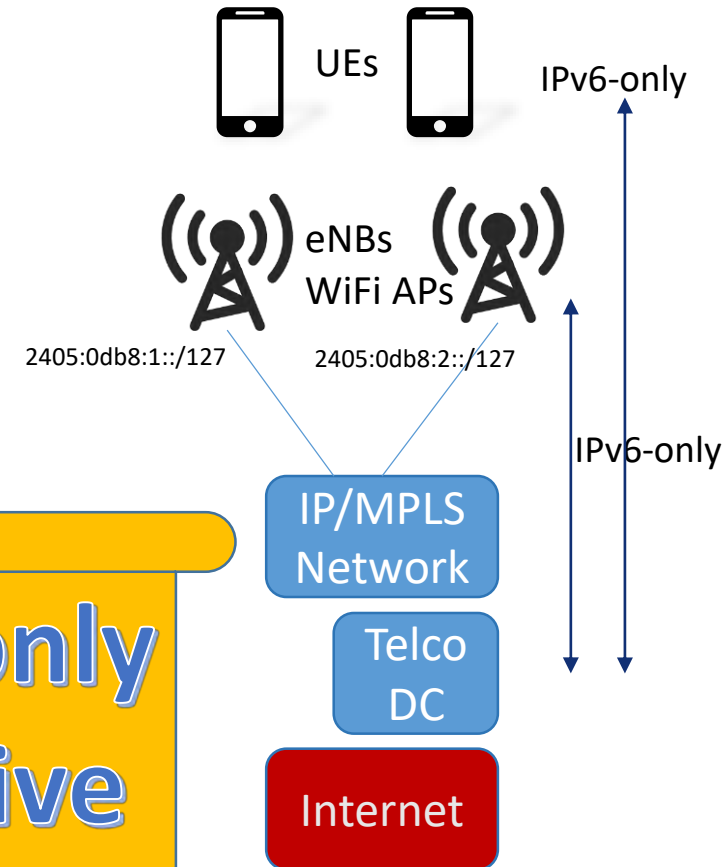


How well did that strategy work out?
What's the current state?

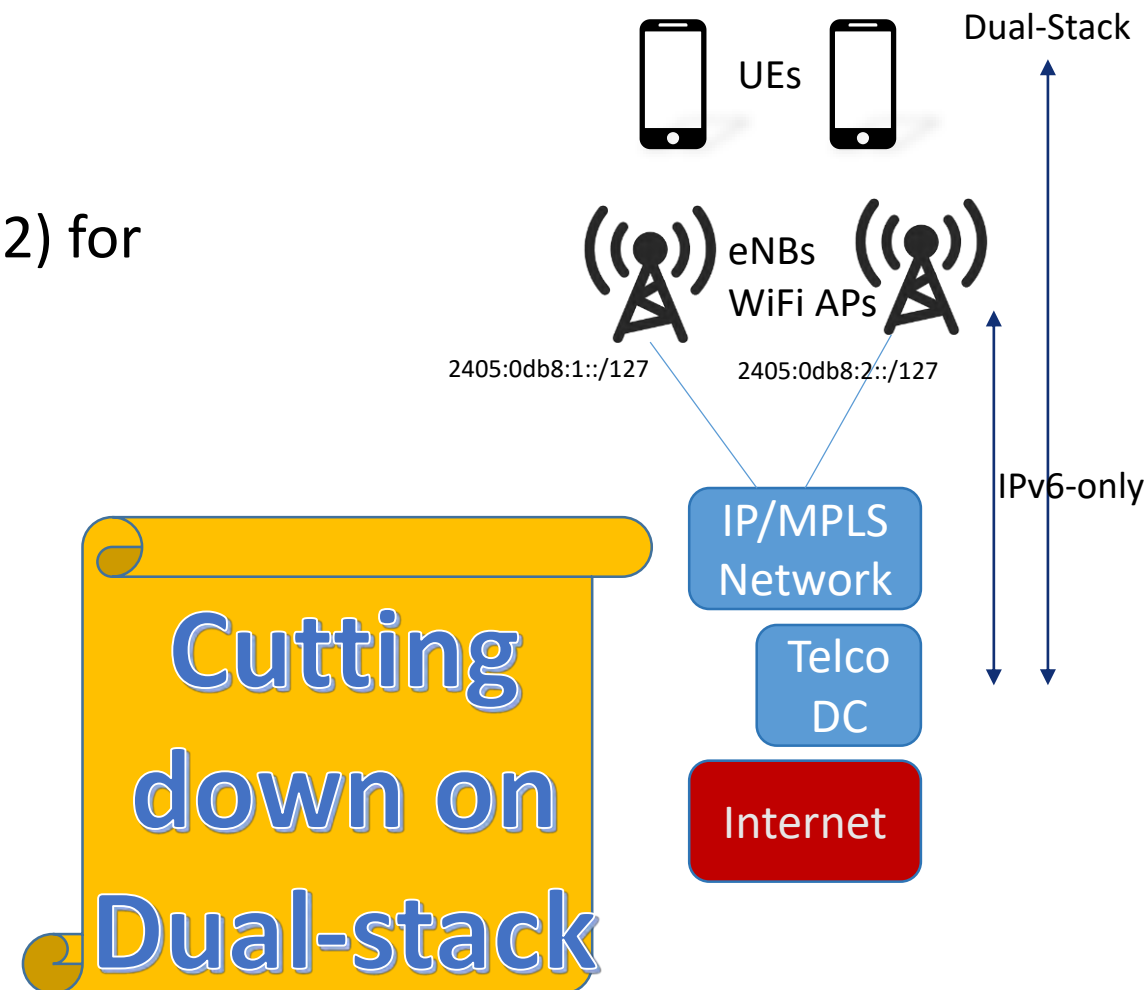
The Journey continues...

- 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.

**IPv6-only
Massive
Scale**



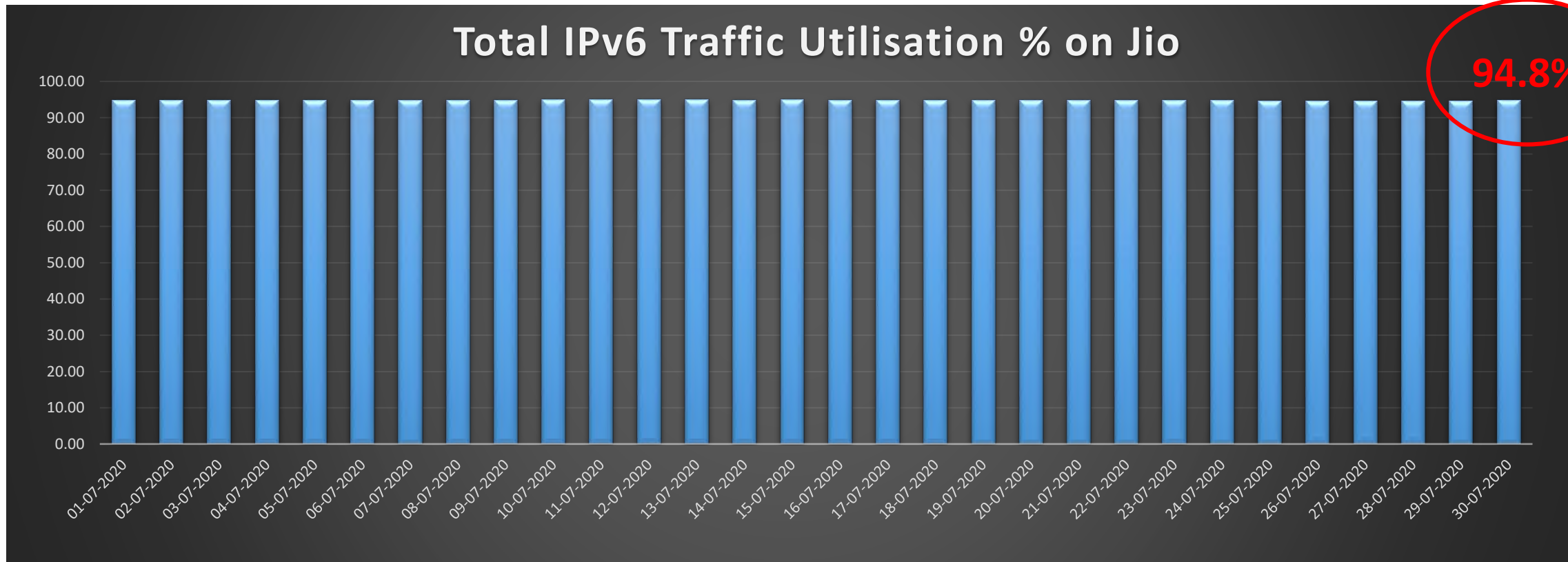
- Why Dual-stack?
 - ✓ Apps/Applications, Content
- Customers LTE User Equipment (UEs)
 - ✓ 100% get both IPv6 (/64 prefix) and IPv4 (/32) for internet
- Customer's WiFi User Equipment (UEs)
 - ✓ Including devices on hotspot/tethering
- IP/MPLS Network, Telco DC
 - ✓ ISIS-MT, BGP etc.
- CDN, OSS/BSS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



No disturbance please. Looking for IPv4 only



Sorry, no IPv4-only found yet



- 94.8% requests served on IPv6
- Approx. 50% requests on Jio on IPv4 from other operators

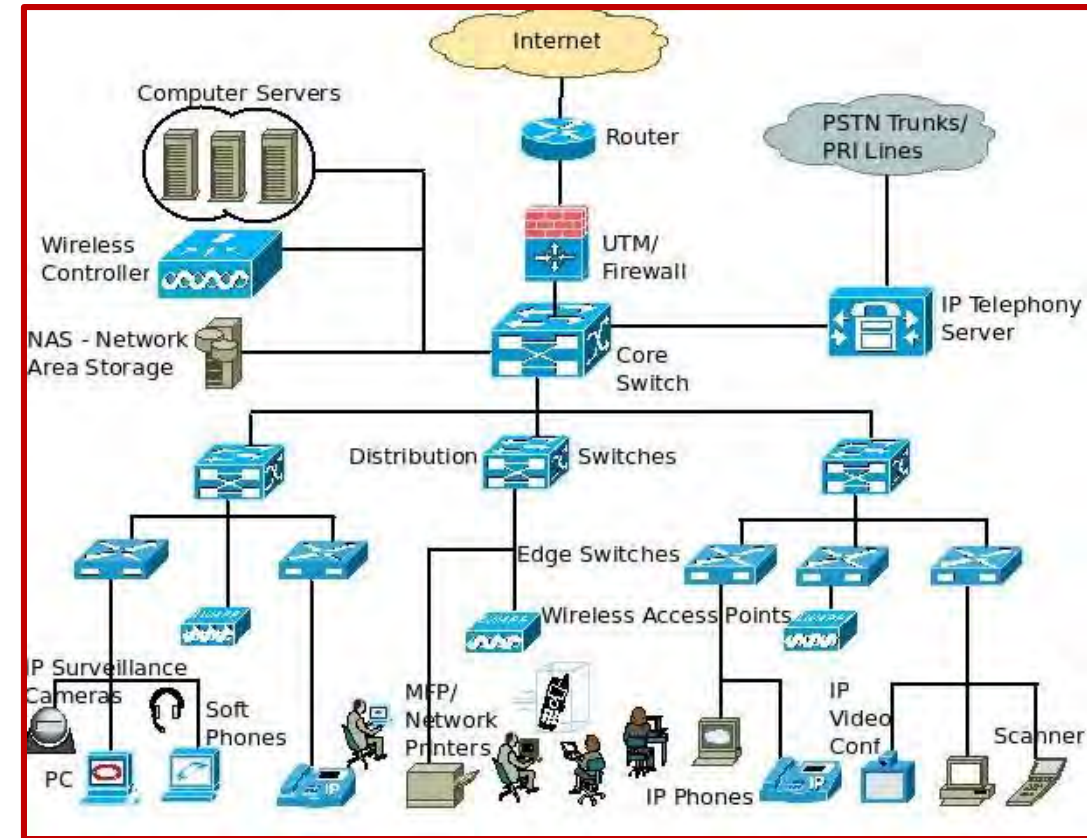
- Device OEM and chipset challenges
 - Chipset used in SIM was a real bottleneck
 - ~ 24%* chipsets fail in cLAT compliance (RFC6877)
 - ~ 5%* devices fail VoLTE signalling on IPv6
- IPv6-only no good for user experience, if UE tethering is enabled
 - Back to Dual-stack or XLAT (RFC6877) becomes must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

* 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



- Slowest adoption
- Unused public IPv4
- Mindset & priority issue rather technology



Slow transition stressing TSP/ISP to provide IPv4 and delaying transition to IPv6

Challenges - Health of web contents on DS/IPv6

..(3 of 3)



(as of 25th Aug 2020)

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

Category: Ecommerce & shopping

Rank	websites
1	amazon.com
2	ebay.com
3	amazon.co.jp
4	amazon.de
5	rakuten.co.jp
6	craigslist.org
7	aliexpress.com
8	amazon.co.uk
9	walmart.com
10	taobao.com

Category: Finance

Rank	websites
1	paypal.com
2	chase.com
3	wellsfargo.com
4	bankofamerica.com
5	intuit.com
6	capitalone.com
7	investing.com
8	fidelity.com
9	sberbank.ru
10	patria.org.ve

Category: Games

Rank	websites
1	roblox.com
2	twitch.tv
3	pch.com
4	steampowered.com
5	steamcommunity.com
6	douyu.com
7	chess.com
8	gamepedia.com
9	nga.cn
10	epicgames.com

Category: Sports

Rank	websites
1	espn.com
2	marca.com
3	as.com
4	diretta.it
5	hupu.com
6	mlb.com
7	livescore.com
8	liveonscore.net
9	sports.yahoo.com
10	yr.no

Category: top visited websites

Rank	websites
1	google.com
2	youtube.com
3	facebook.com
4	twitter.com
5	instagram.com
6	baidu.com
7	xvideos.com
8	wikipedia.org
9	pornhub.com
10	xnxx.com

Category: Cloud Service Providers

Rank	websites
1	aws.amazon.com
2	www.kamatera.com
3	www.linode.com
4	www.digitalocean.com
5	www.rackspace.com
6	massivegrid.com
7	www.alibabacloud.com
8	www.liquidweb.com
9	azure.microsoft.com
10	cloud.google.com

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 25th Aug 2020)

Category: Ecommerce & shopping		
Rank	websites	DS /IPv6
1	amazon.com	✗
2	ebay.com	✗
3	amazon.co.jp	✗
4	amazon.de	✗
5	rakuten.co.jp	✗
6	craigslist.org	✗
7	aliexpress.com	✗
8	amazon.co.uk	✗
9	walmart.com	✗
10	taobao.com	✗

Category: Finance		
Rank	websites	DS /IPv6
1	paypal.com	✗
2	chase.com	✗
3	wellsfargo.com	✗
4	bankofamerica.com	✗
5	intuit.com	✗
6	capitalone.com	✗
7	investing.com	✓
8	fidelity.com	✗
9	sberbank.ru	✗
10	patria.org.ve	✗

Category: Games		
Rank	websites	DS /IPv6
1	roblox.com	✗
2	twitch.tv	✗
3	pch.com	✗
4	steampowered.com	✗
5	steamcommunity.com	✗
6	douyu.com	✗
7	chess.com	✗
8	gamepedia.com	✗
9	nga.cn	✗
10	epicgames.com	✗

Category: Sports		
Rank	websites	DS /IPv6
1	espn.com	✗
2	marca.com	✗
3	as.com	✗
4	diretta.it	✗
5	hupu.com	✗
6	mlb.com	✗
7	livescore.com	✓
8	liveonscore.net	✗
9	sports.yahoo.com	✗
10	yr.no	✓

Category: top visited websites		
Rank	websites	DS /IPv6
1	google.com	✓
2	youtube.com	✓
3	facebook.com	✓
4	twitter.com	✗
5	instagram.com	✓
6	baidu.com	✗
7	xvideos.com	✗
8	wikipedia.org	✓
9	pornhub.com	✗
10	xnxx.com	✗

Category: Cloud Service Providers		
Rank	websites	DS /IPv6
1	aws.amazon.com	✗
2	www.kamatera.com	✗
3	www.linode.com	✓
4	www.digitalocean.com	✗
5	www.rackspace.com	✓
6	massivegrid.com	✗
7	www.alibabacloud.com	✗
8	www.liquidweb.com	✗
9	azure.microsoft.com	✓
10	cloud.google.com	✓

- Only 20% 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>

What's next ?



- 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.
 - SIM Chipset IP for device management on IPv6
 - Control plane transition to only IPv6. SRv6/LDPv6 (RFC7552)
 - Timing (IEEE:1588v2, G.8275.2 ...) over IPv6
 - NTPv4 on IPv6
 - Apple devices with iOS 13.0 support xLAT - done
 - WhatsApp control & registration on IPv6



- **IPv6 – enabler of Jio’s exponential growth**
 - IPv6 enabled user devices. (soon to be IPv6-only)
 - End to end eco system development rather limited to connectivity only
- **Partnership with Technology suppliers helped to strengthen IPv6-only**
- **Technology evolution through standard bodies**
 - xLAT, Timing, applications and contents

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

Jio's Global Presence

Thank you for your attention

