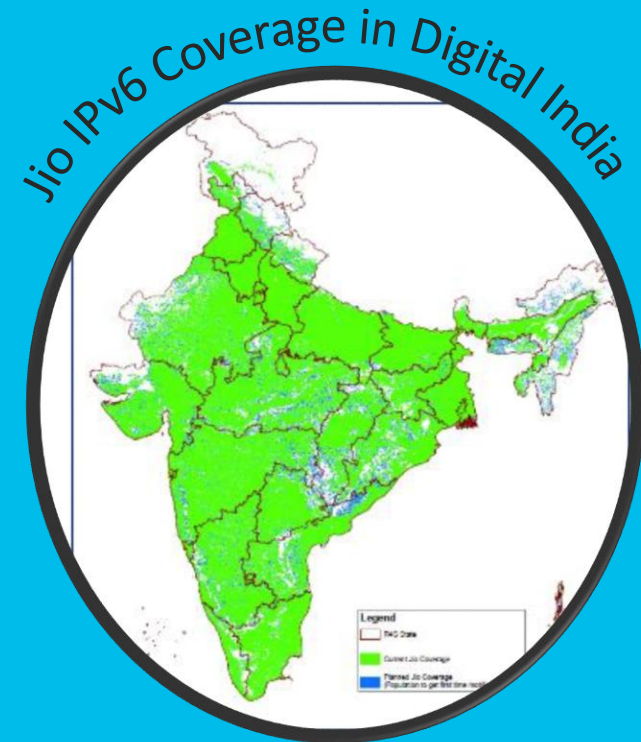


IETF109: IPv6-only adoption challenges and standardization requirements

Ramesh Chandra, VP
Network Planning & Engineering, Reliance Jio

19th Nov 2020



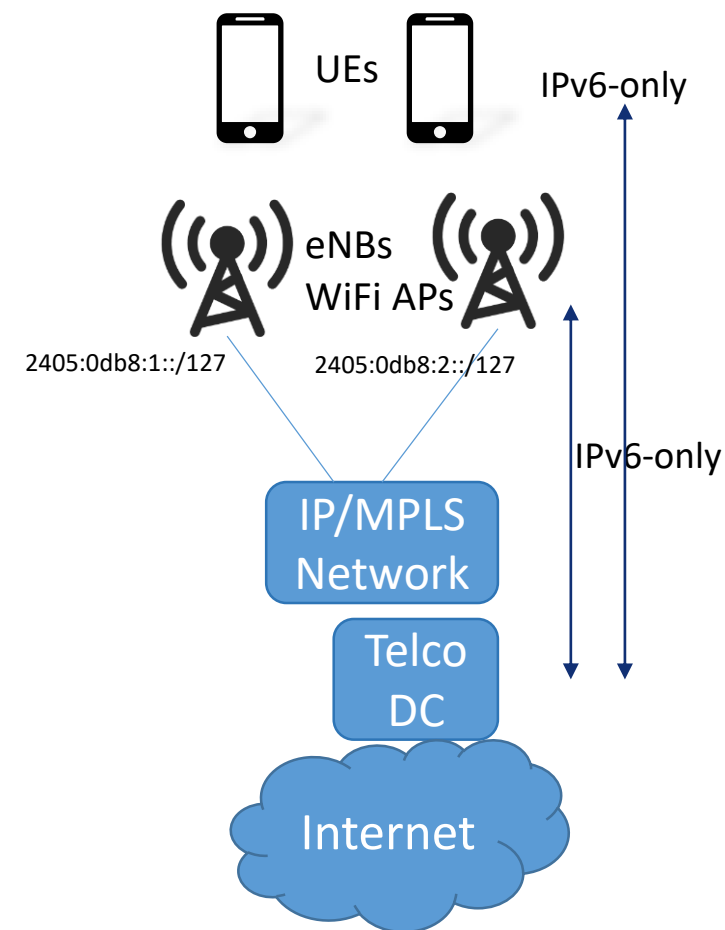
Coverage

- 1 Jio strategy and approach
- 2 Present status
- 3 Challenges
- 4 Solution options
- 5 Support required

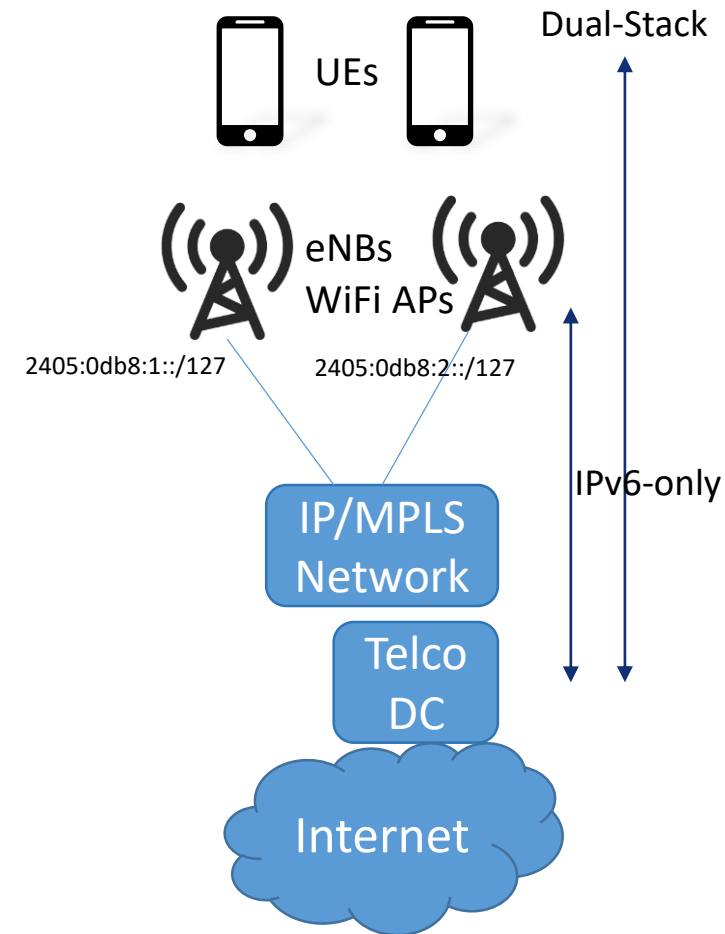
- Study on IP eco-system in 2015 reveals
 - Completely open market for user devices
 - Highly price sensitive geography
 - IPv6 adoption by OEMs at very niche stage
 - Early adoption by ASP/CDN providers
- Drive for IPv6 started at early
 - Mandated IPv6 a MUST for any technology selection
 - Formulated joint development program with OEMs

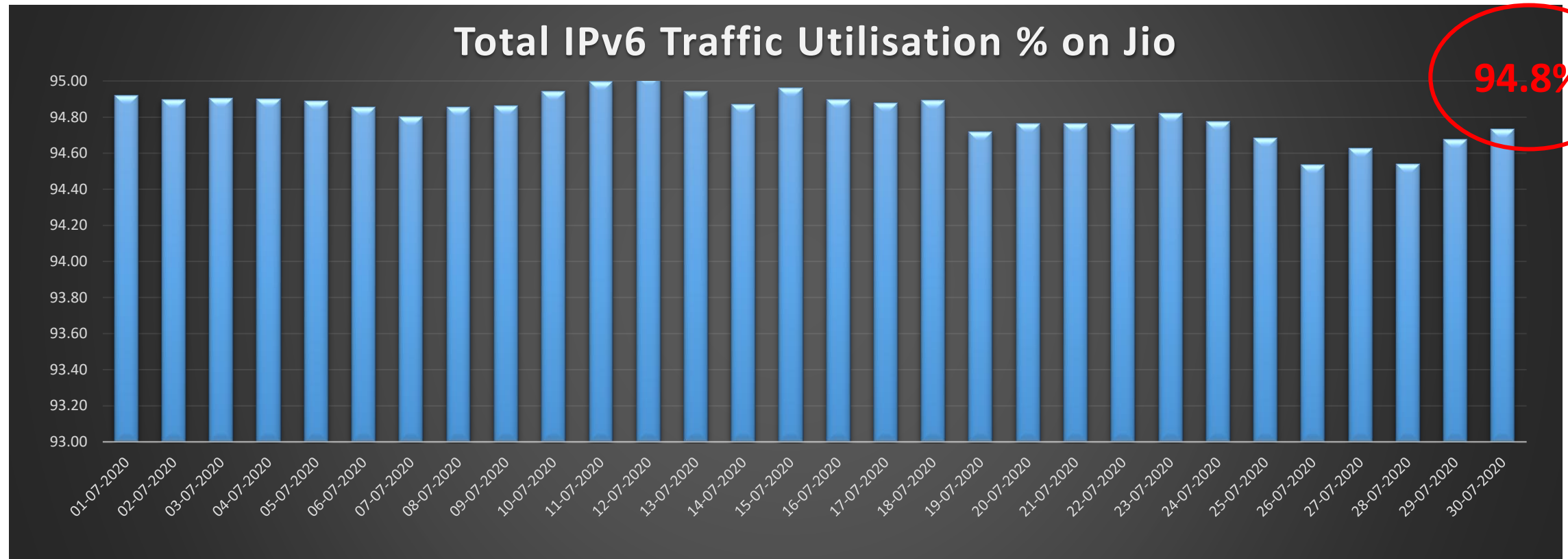
Dual stack was difficult but took challenge to uplift industry

- IPv6-only for 4G VVM User Equipment (UEs)
 - ✓ 90% get IPv6-only (/64 prefix) for VoLTE
- IPv6-only for network infrastructure
 - ✓ 100% for eNB, Small cells, Access points
- IPv6-only for management plane
 - ✓ 100% for all IP devices routers, switches etc..
- IPv6-only for Utilities (power systems, surveillance systems etc.)
 - ✓ 100% for SMPS, Access control systems etc.



- Dual-stack 4G LTE and FTTH HSI services
 - User devices, devices behind hotspot/tethering
 - Applications, Public and private Content
 - NAT unavoidable
- Dual-stack Enterprise services
 - Legacy office LAN/WAN systems and application
 - Public IPv4 a MUST requirement
- Dual-stack OSS/BSS
 - Mediation, fault, perf, DNS, AAA etc..
- Core network infrastructure
 - ISIS-MT (RFC5120), BGP etc.



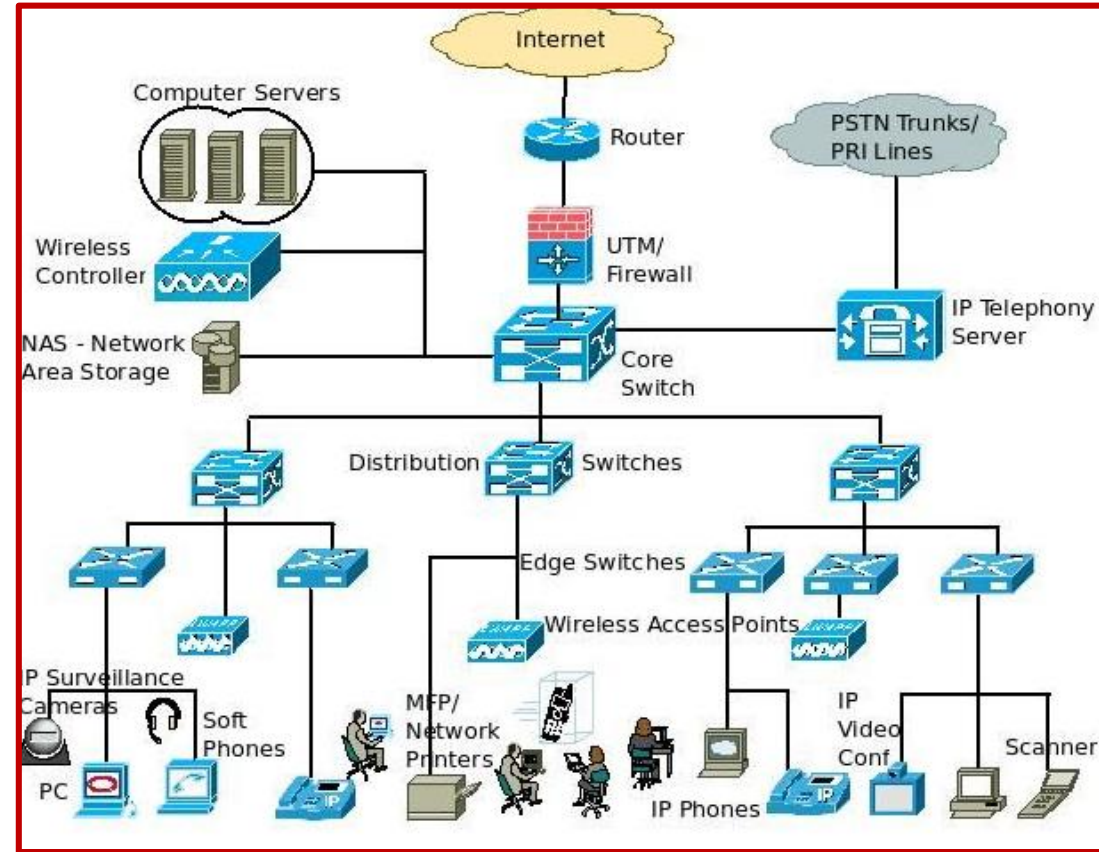


- 94.8% requests served on IPv6 amounting to 95% data
- Approx. 50% requests on Jio on IPv4 from other operators

- Device OEM and chipset challenges
 - ↓ ~ 8%* chipsets fail in cLAT compliance (RFC6877)
 - ↓ OEM implementation issues. Same chipset work in one device but fail in another
 - ↓ ~ 5-10%* devices fail VoLTE testing on IPv6
 - ↓ SIM firmware/driver limitations in upgrading IPv4 to IPv4v6 through TCP session
- Operator and environment challenges
 - ↓ SIM cards inventory in market have only IPv4 programmed
 - ↓ Unable to programme IPv4v6 in SIM due to device offline
 - ↓ Devices becomes unmanaged if IPv6-only assigned
 - ↓ Impact services during roaming

* Jio internal testing and validation

- Priority & motivation issue rather technology
- Demand for IPv4 growing
- Unused public IPv4



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

Challenges - Health of web contents on DS/IPv6

..(4 of 4)



(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

..(4 of 4)



(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

11 sites in Jul-2019 increased to just 12 in Aug-2020

[provider.html](#)

- cLAT (RFC6877) compliance standardization on mobile devices for
 - Chipset used on mobile devices
 - OEM compliances
- SIM firmware compliance for TCP based profile update
- MAPT (RFC7599) improvements required for FTTh/home services
 - For efficient use of public IPv4 resources
 - To meet regulatory requirements
- IPv6 support in chipset used by OEMs for
 - DVR/NVR, Cameras
 - IoT devices and sensors



- Timing and Sync standardization
 - IEEE1588v2, ITU-T G.8275.2 support on IPv6
 - PTP unicast over LACP
- Motivation for Enterprise/Business services
 - Beyond technology
 - Develop differentiated services only on IPv6
- Wider implementation of IPv6 based Control plane
 - SRv6 – reality now
 - LDPv6 (RFC7552)



- RFC6890 (updated in RFC8190)
 - 10.0.0.0/8 16 Mn RFC1918 private use
 - 100.64.0.0/10 04 Mn RFC6598 shared address space

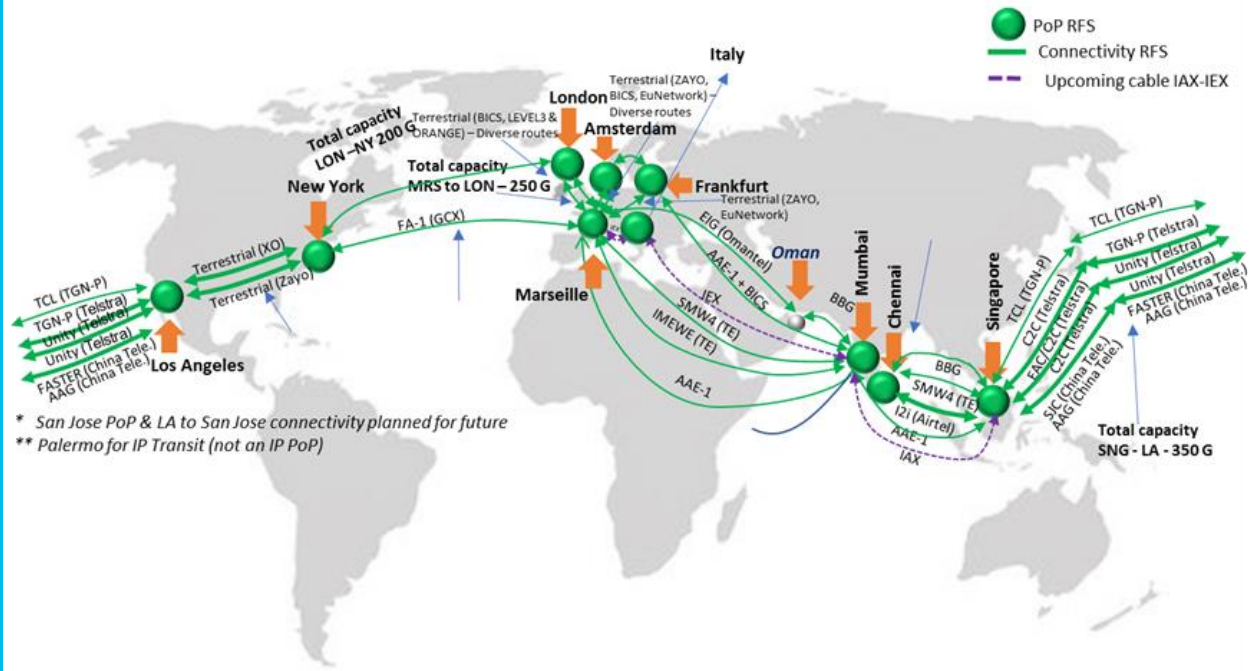
 - 0.0.0.0/8 16 Mn RFC1122 This host on this NW
 - 127.0.0.0/8 16 Mn RFC1122 loopback
 - 240.0.0.0/4 256 Mn RFC1122 reserved
- Private use of assigned blocks
 - Many class A blocks e.g. 21/22/29/30.0.0.0/8 being used as private only

- TSP/ISP need above blocks to meet subscriber scalability & operational simplicity
- Availability of routable blocks assigned for private use



Jio's Global presence

Thank you for your attention



* San Jose PoP & LA to San Jose connectivity planned for future
 ** Palermo for IP Transit (not an IP PoP)