

IPv6 Deployment in MBB 3G/4G Network

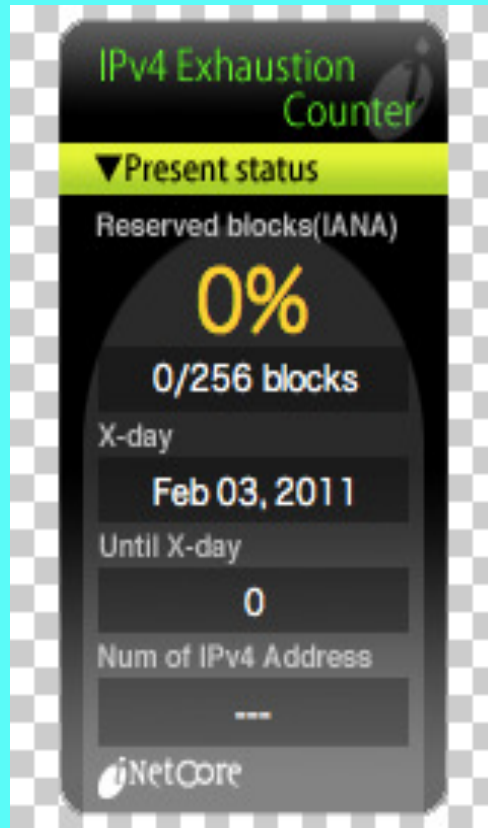
Agenda



- Motivation
- IPv6 Adoption Approach
- IPv6 Deployment Result

Motivation

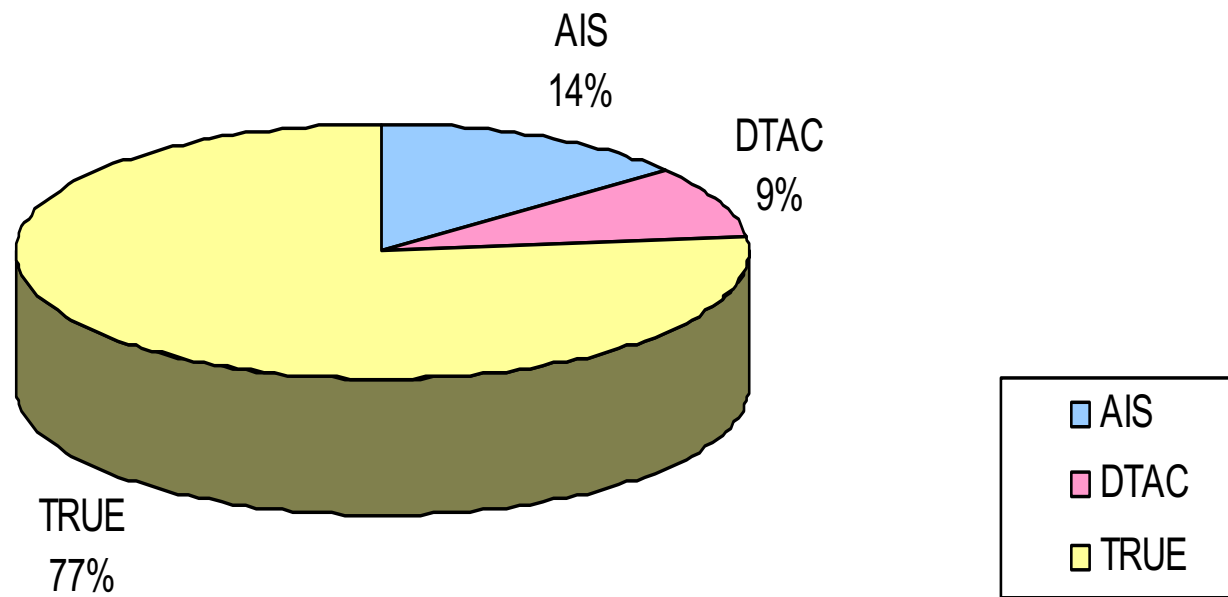
- IANA (Internet Assigned Numbers Authority) global IPv4 -address pool exhausted on FEB 03 2011



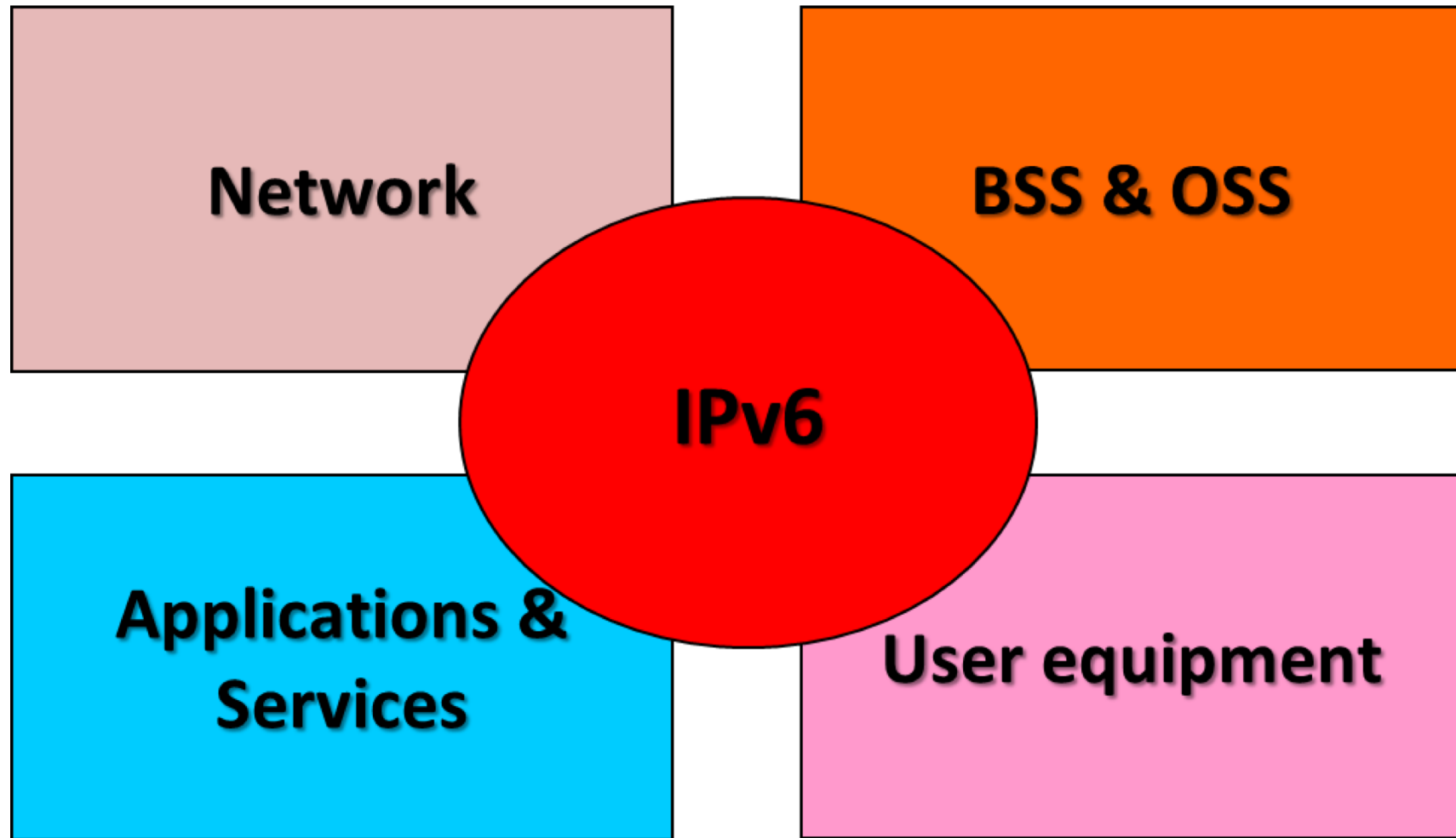
- Even private IPv4 addresses has become scarce

- Success of Mobile Internet and increase in Smartphone numbers is rapidly exhausting IPv4 address pools
- The coming massive IoT device which is served by Mobile Wireless Network
- 3GPP and IETF already have well defined standards
- Apple has announced that they will not allow the application which is not support IPv6 to be keep on Appstore since June 2016.

IPv4 allocation Comparison: AIS-DTAC-TRUE

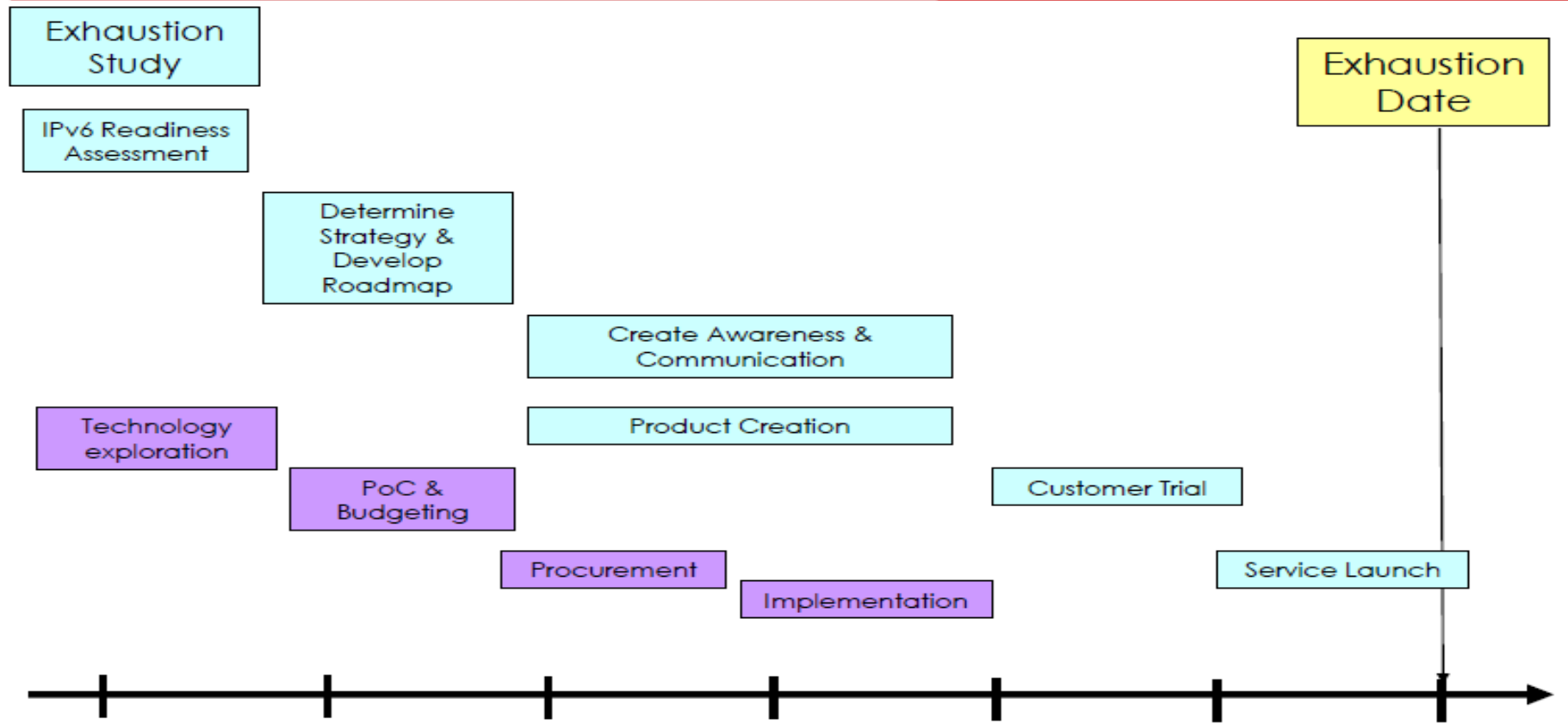


Impact of IPv6 migration



IPv6 Adoption Approach

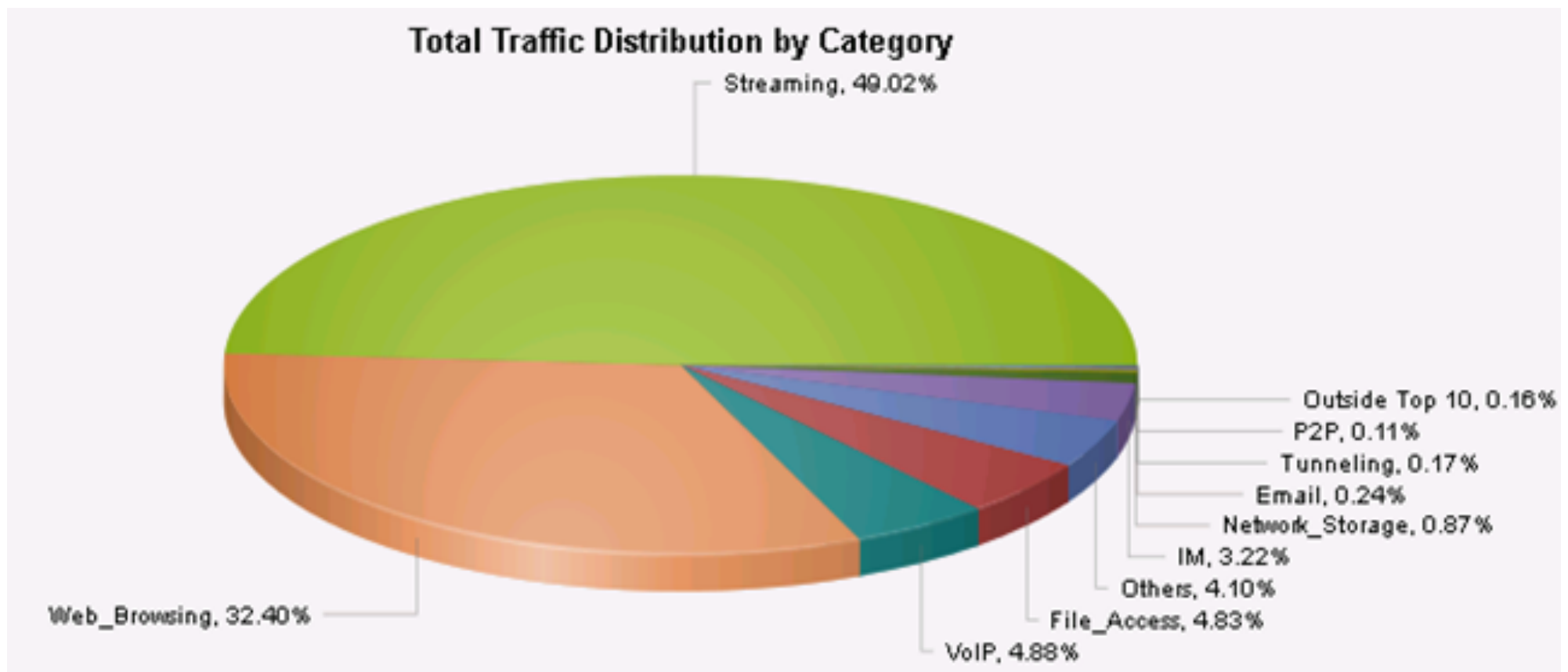
Sample Timeline



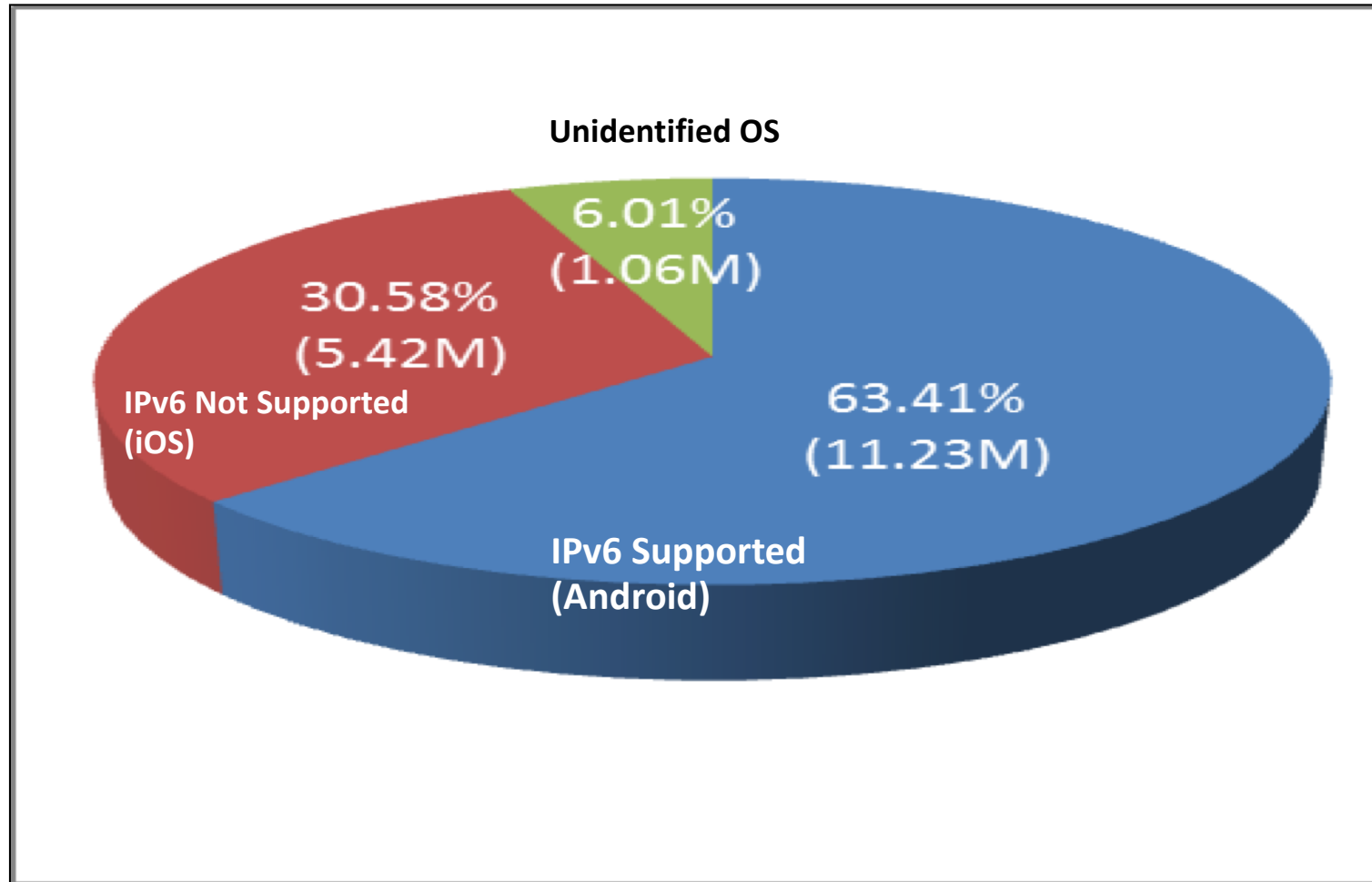
Plan for IPv6 adoption before exhaustion

- Full migration to IPv6 will be a multi-years program, so short term and long term solution should be defined.
- New services introduction should include IPv6 support from Day 1 to avoid transition costs later
- New purchased network equipment must be IPv6 ready.
- IPv6 should be included as part of the normal hardware/software refresh cycles

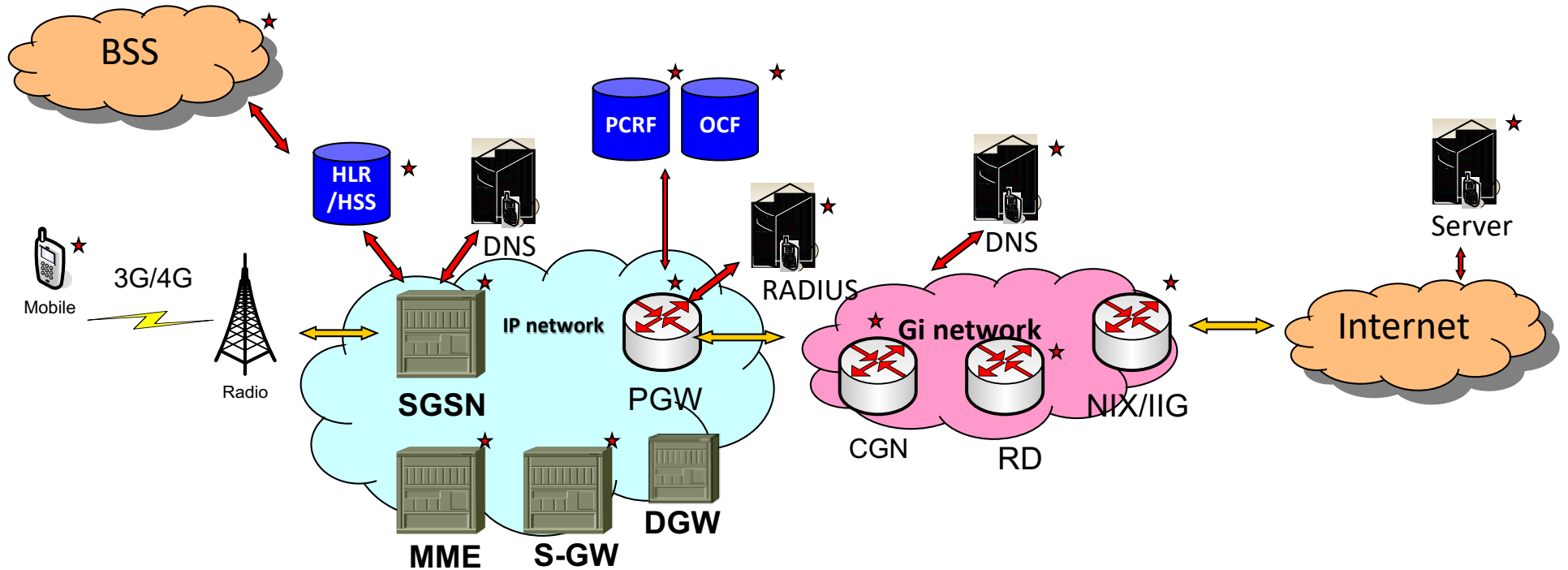
Traffic portion of IPv6 Internet service



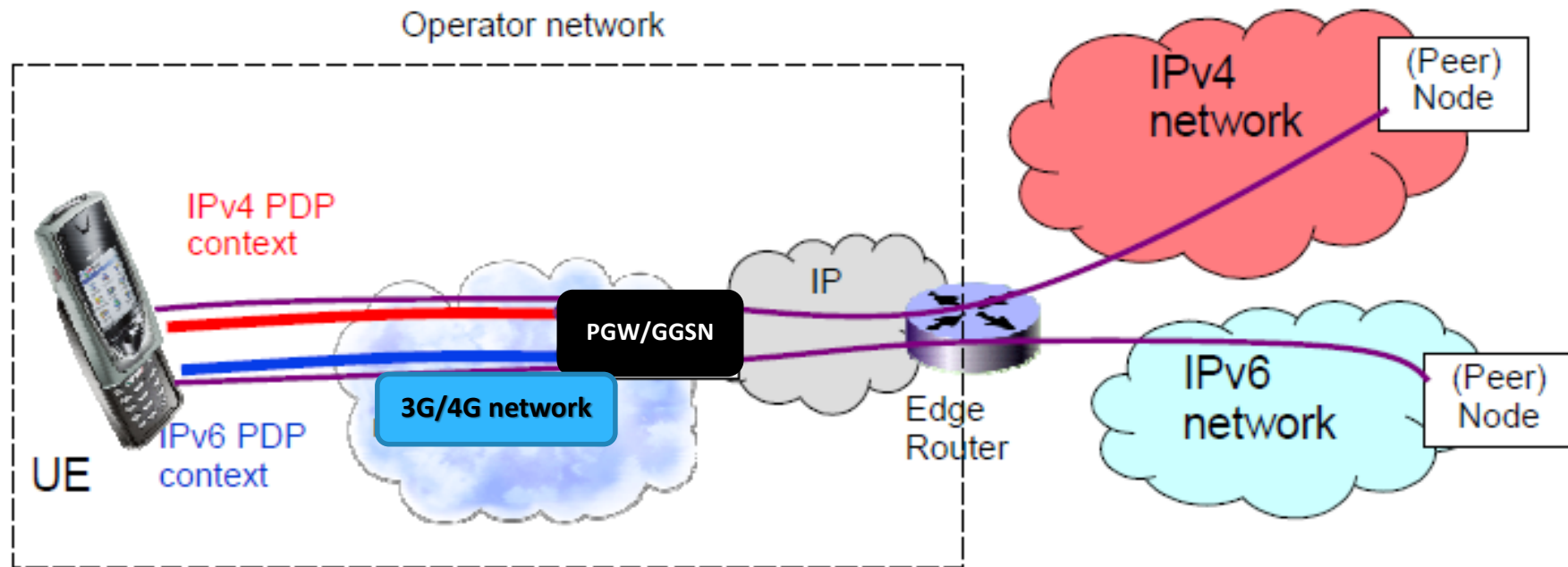
IPv6 supported devices in Mobile Network



E2E Network Architecture of MBB 3G/4G

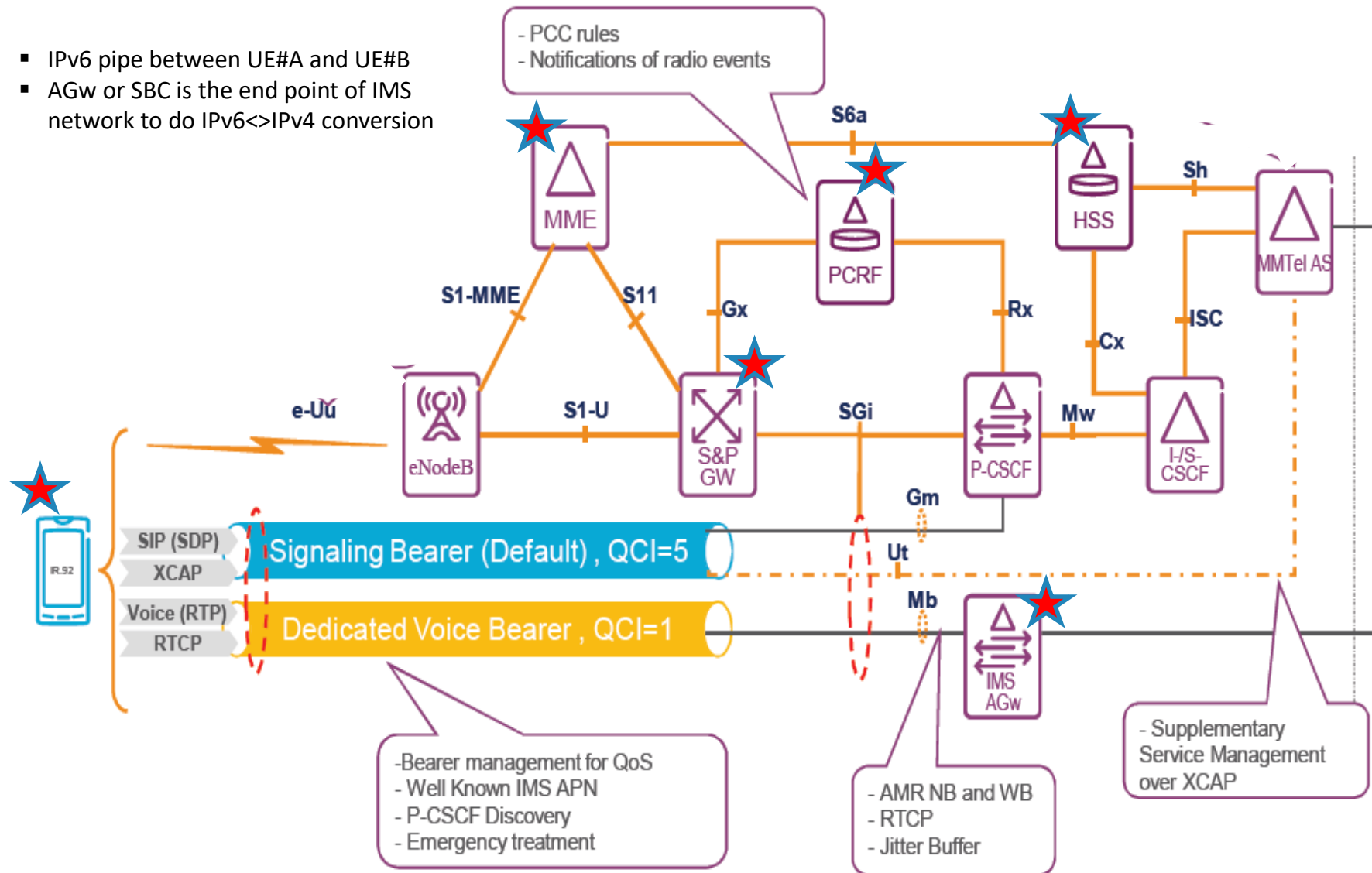


IPv6 deployment in mobile network

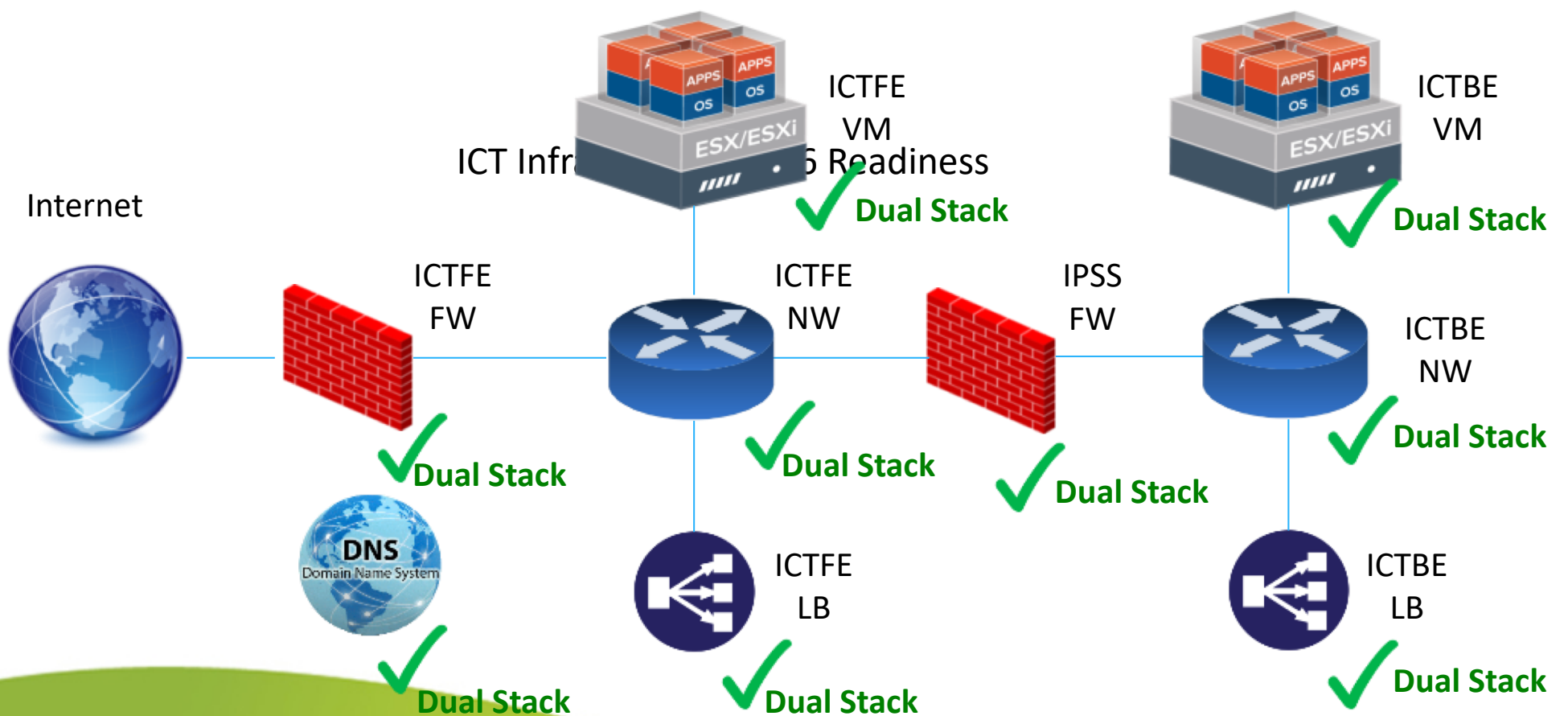


VoLTE Network Architecture

- IPv6 pipe between UE#A and UE#B
- AGw or SBC is the end point of IMS network to do IPv6<>IPv4 conversion



ICT Network Architecture for BSS&OSS



IPv6 migrations & Deployment Scope & Step

Migration Scope :

- All VoLTE Users apply with native IPv6 profile
- Mobile data users segment apply with Dual stack profile
- Mobile data service in domestic only
- Android device firstly and iOS later
- Machine Type segment

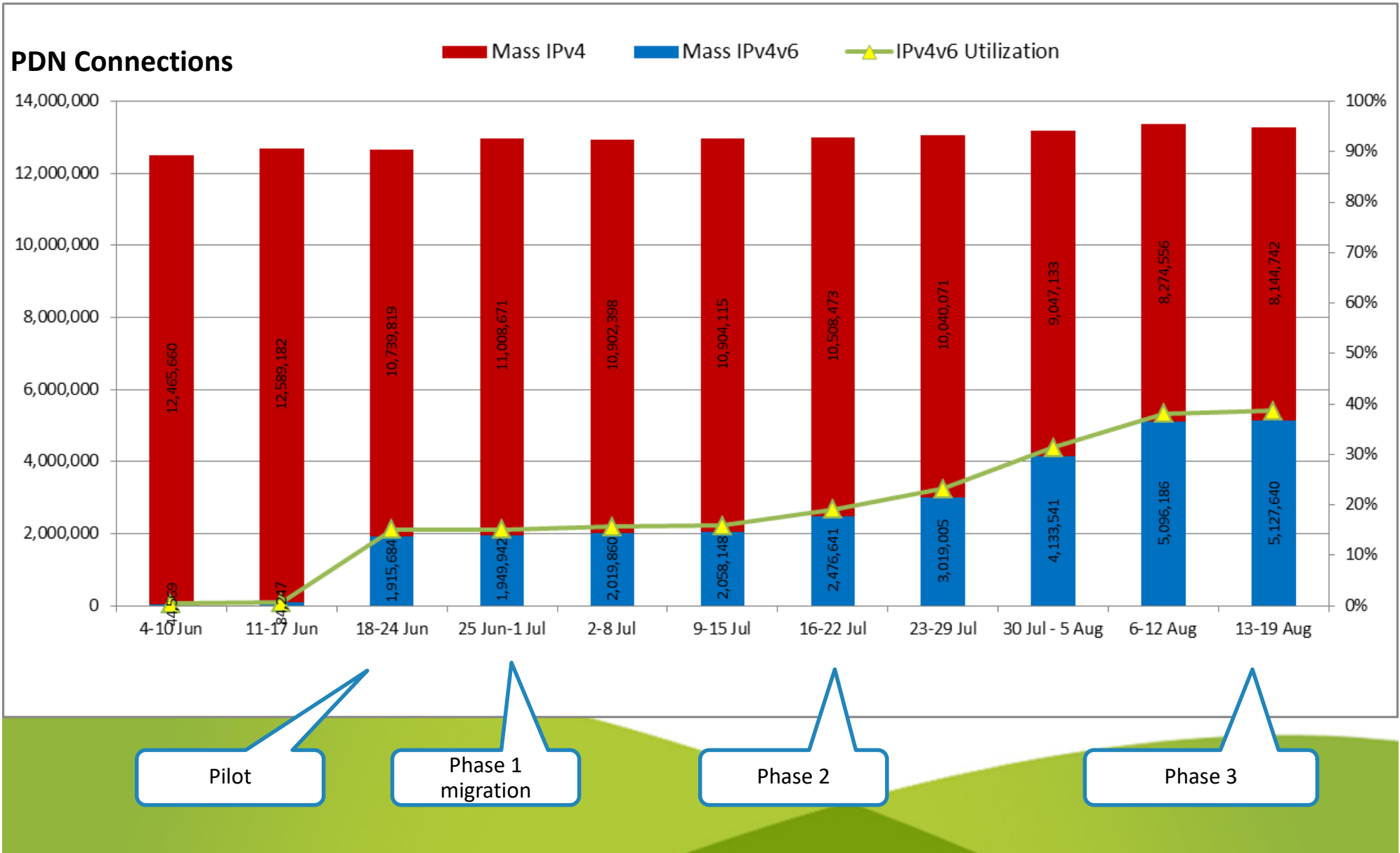
Deployment step:

- Network and BSS are ready
- User profile migration in HLR/HSS with phasing approach (Pilot, ph1,2,3,4)
- Monitoring and observing
- Customer complain handling

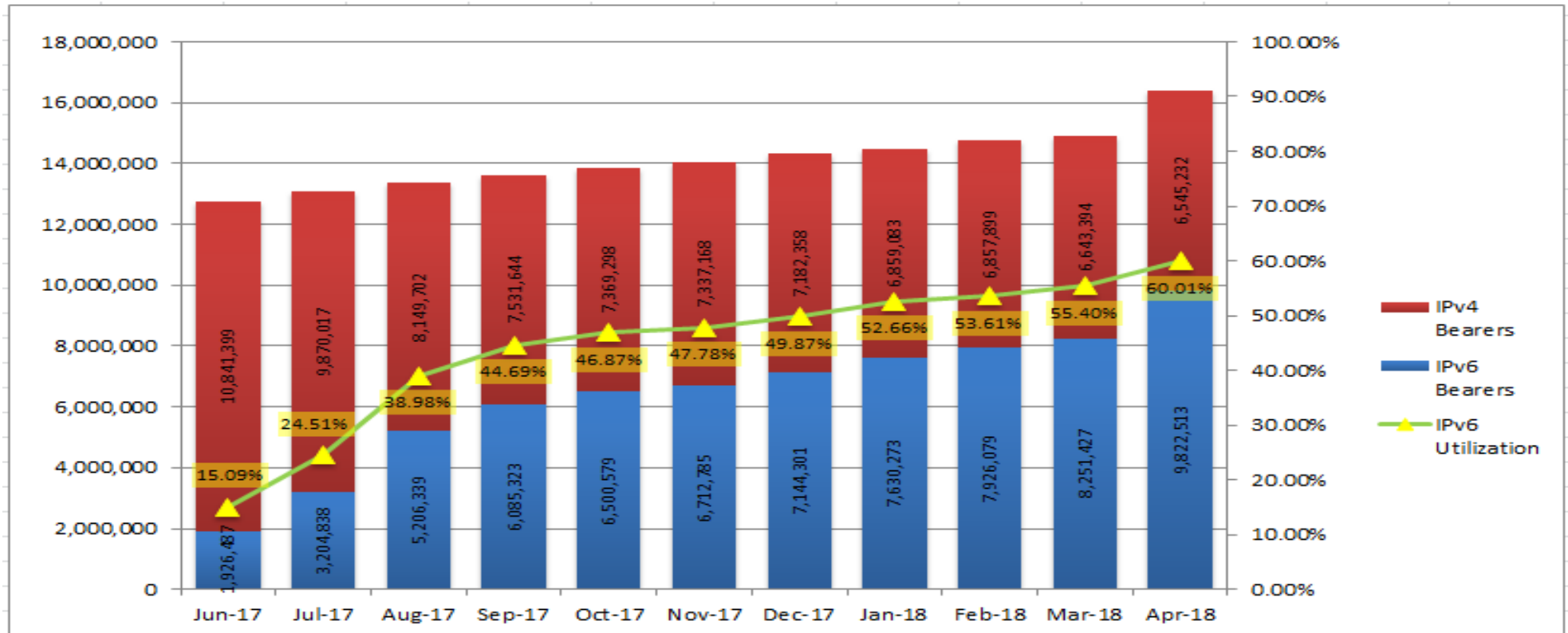
IPv6 Usage report

Deployment report :

PGW: Concurrent Active Dual Stack IPv4v6 PDN Connections



IPv4v6 PDN Connections

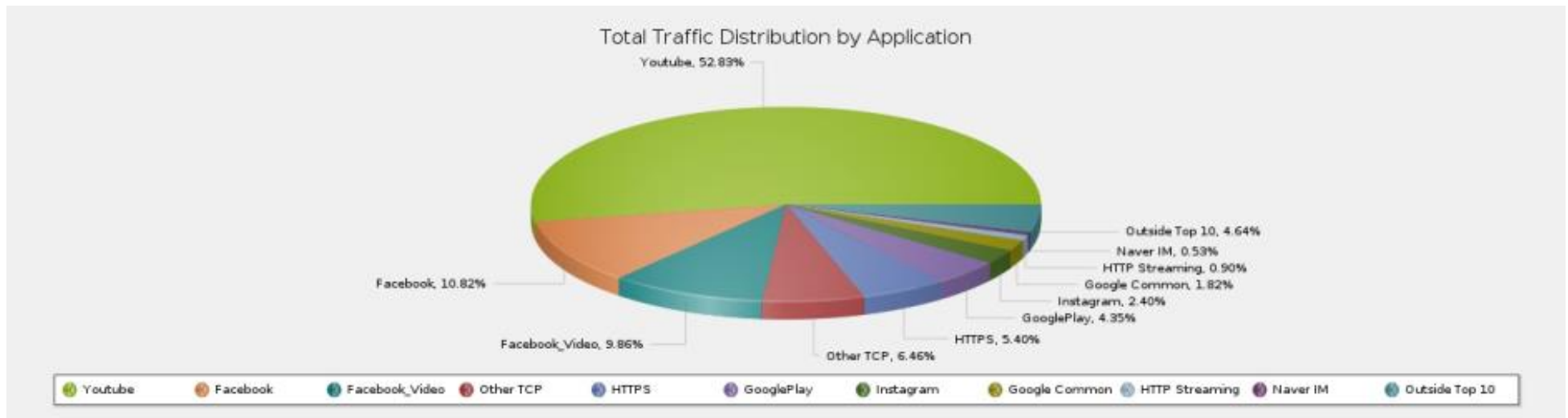


Phase 4 : iOS

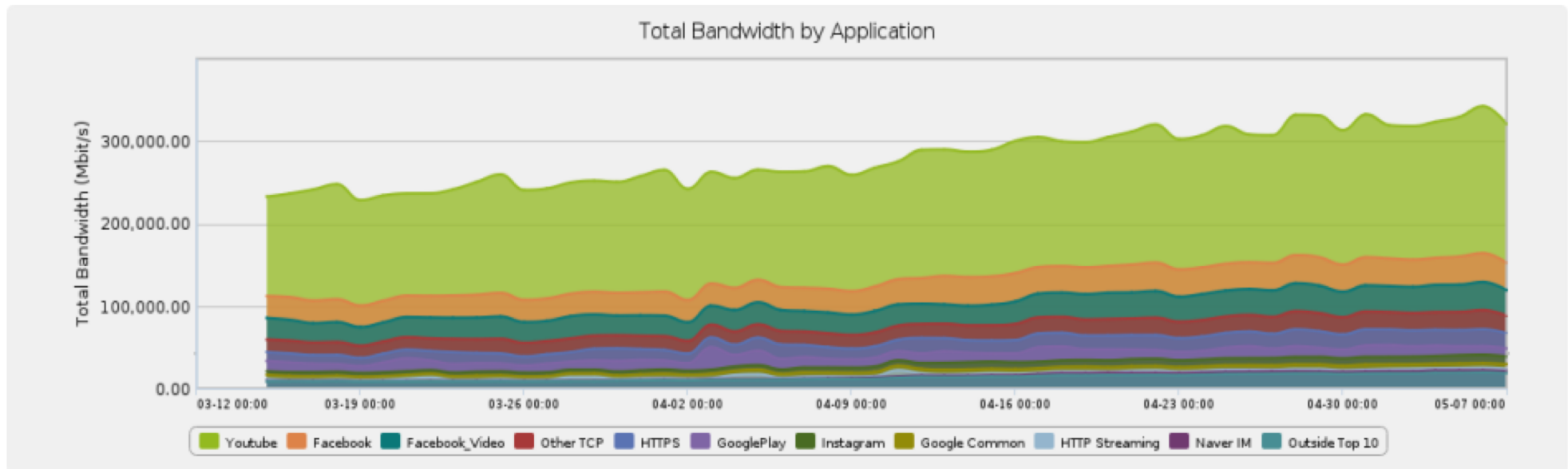


- 100% Dual-stack (IPv4v6) subscription for MBB subscriber.
- 60% dual-stack capable phone in MBB network.
- Apple already support dual-stack in CB IOS11.3 (Apr 18)

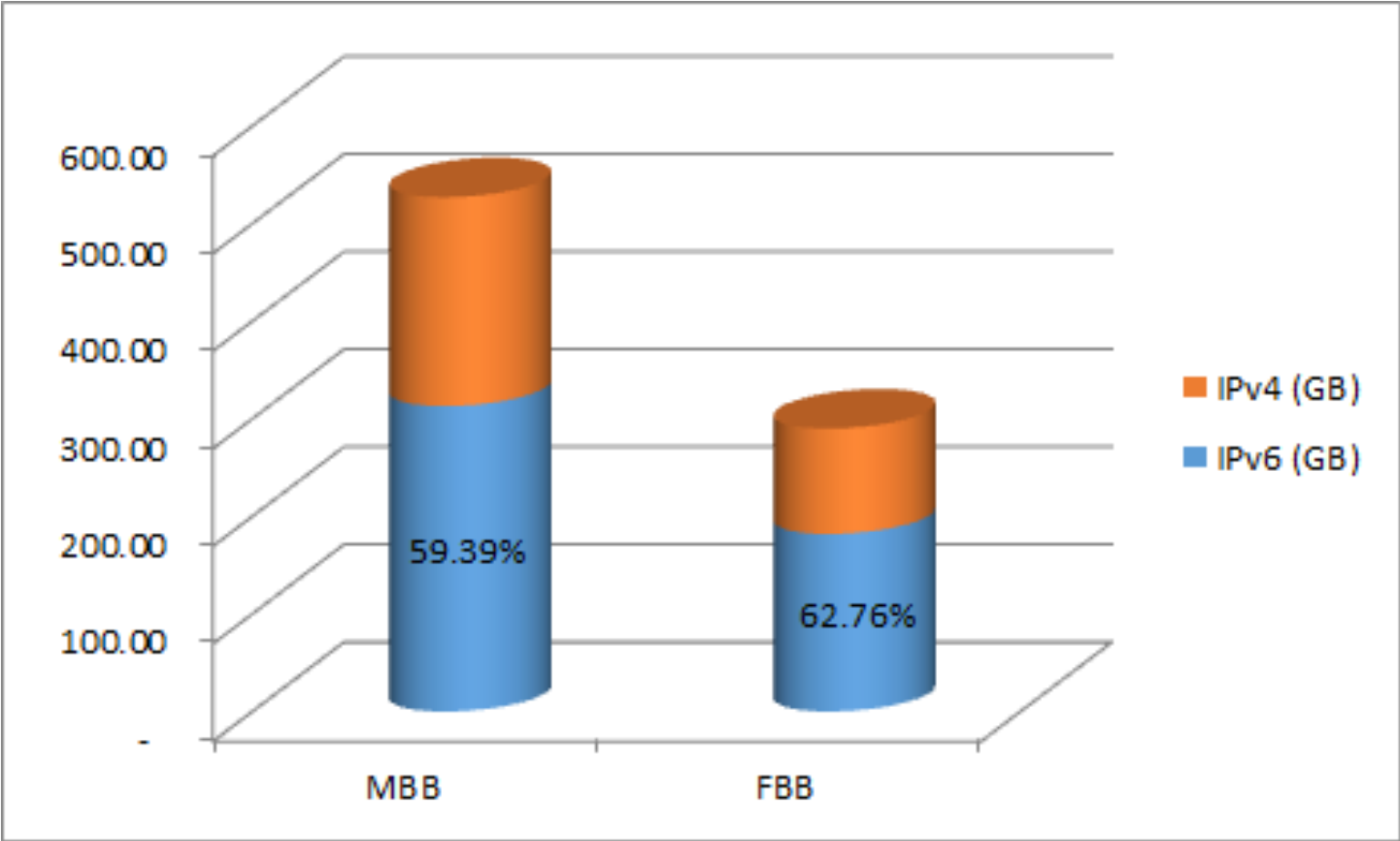
IPv6 %Usage by Application



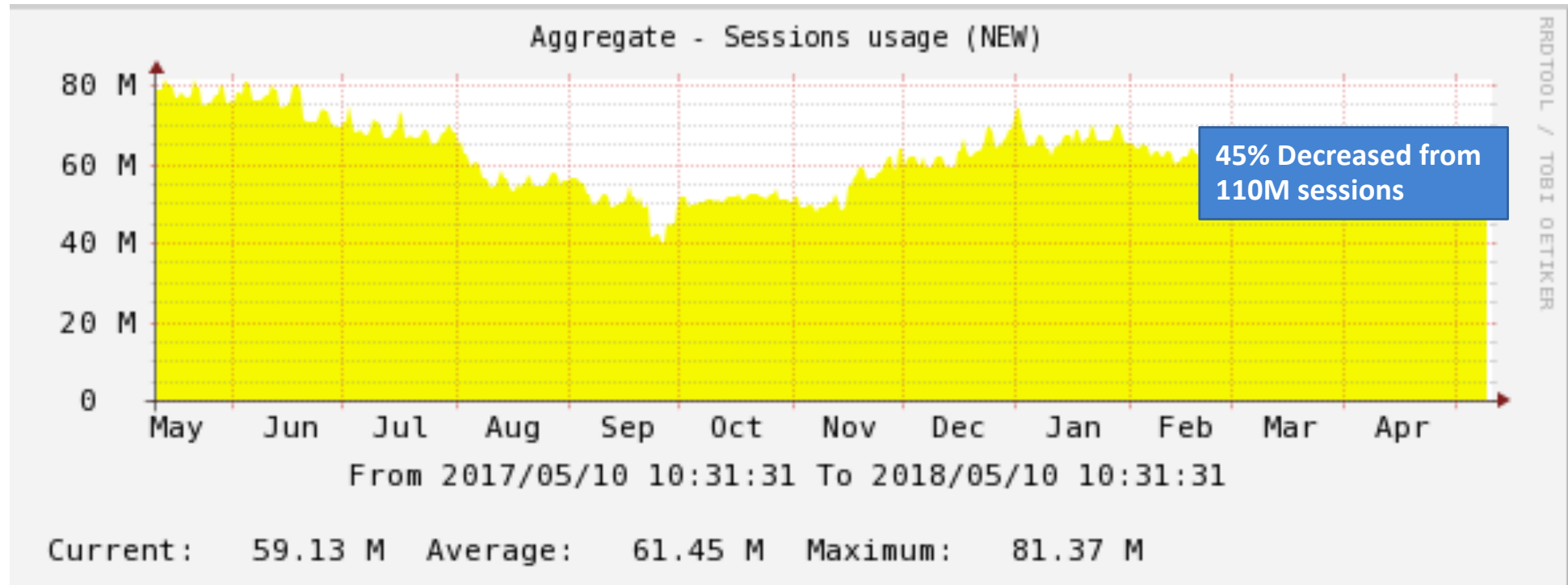
IPv6 Usage by Application Bandwidth Trend



Usage portion from Google Edge Network (GGC)



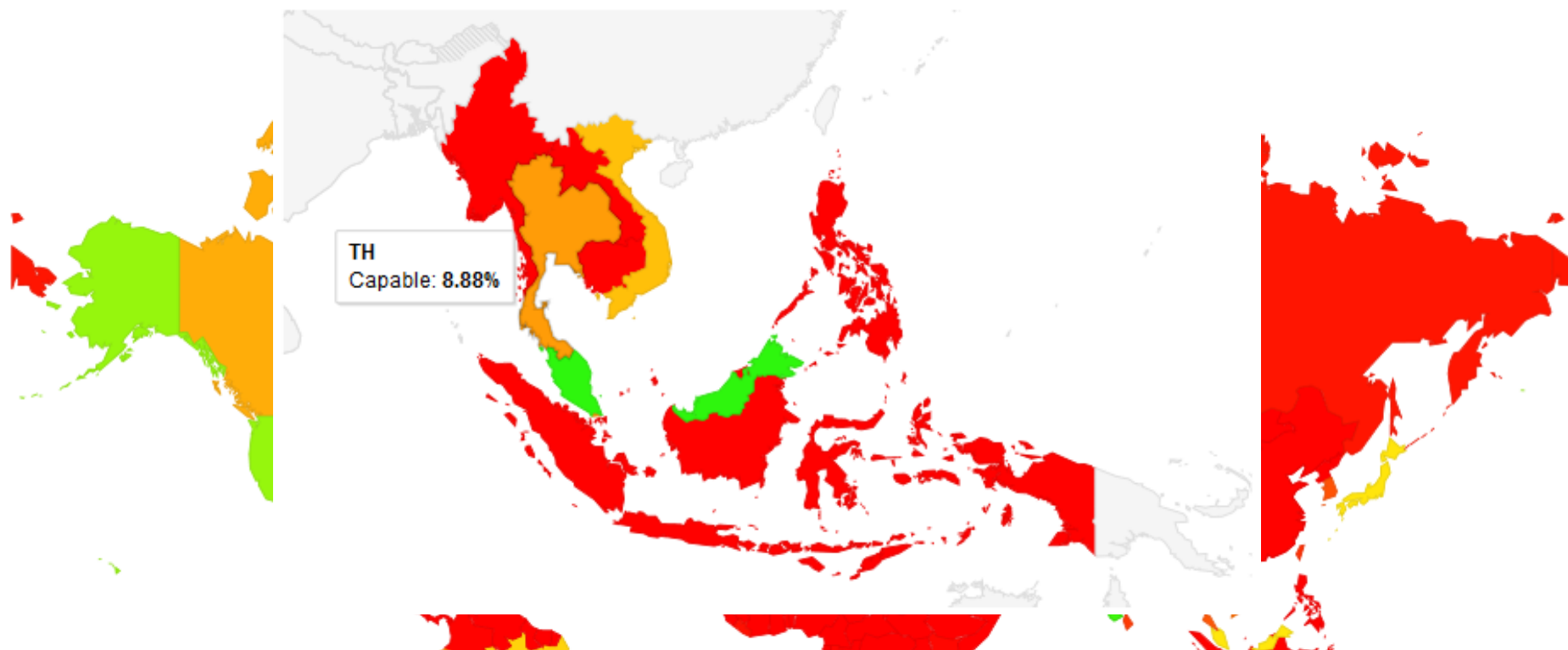
CGNAT Usage report



APNIC :

IPv6 Capable Rate by country (%)


Region Map for South-Eastern Asia (035)



ASN	AS Name	IPv6 Capable	IPv6 Preferred	Samples
AS17552	TRUE-AS-AP True Internet Co.,Ltd.	0.02%	0.00%	505,792
AS45629	JASTEL-NETWORK-TH-AP JasTel Network International Gateway	0.03%	0.02%	443,093
AS131445	AIS3G-2100-AS-AP Advance Wireless Network	36.68%	36.11%	327,913
AS23969	TOT-NET TOT Public Company Limited	0.02%	0.00%	261,620
AS132061	REALMOVE-AS-AP Realmove Company Limited	0.01%	0.00%	257,670
AS24378	ENGTAC-AS-TH-AP Total Access Communication PLC.	0.01%	0.00%	250,715
AS133481	AIS-FIBRE-AS-AP AIS Fibre	60.23%	58.09%	144,953
AS131090	CAT-IDC-4BYTENET-AS-AP CAT TELECOM Public Company Ltd,CAT	0.03%	0.02%	41,562

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

Problems and Solutions after Migration

Problem	Customer Impact	Interim Solution	Current Status
<p>SS Galaxy Core prime and I mobile I-STYLE217 can't use data service (Android 4.4.4)</p>  <p>Number of sub : 336,691 during 1-9 Aug 2017</p>	<p>Yes (About 1,000 complaints per day)</p>	<p>Rollback subscription profile to IPv4 only.</p>	<ul style="list-style-type: none"> - Rollback subscription profile on 9 Aug 2017 (336,691 users) - Samsung will provide FOTA soon (tentative Oct 2017).
<p>Some handset did not support IPV6 but customer select "IPV6 only" on his handset data services. SAMSUNG: GalaxyTab3_V DTAC: Eagle4.5 SAMSUNG: Galaxy_S_Duos3 HUAWEI: Baggio</p>	<p>Yes (Some Customers who manually changed a PDN type to IPv4v6)</p>	<p>Advise customer to change phone setting to a proper PDP type</p>	<p>Phone not support IPV6 but some customers manually changed a setting to be Dual stack IPv4v6</p>

Problems and Solutions after Migration

Problem	Customer Impact	Interim Solution	Current Status
<p><u>10 Aug 2017:</u> NEXT-G did not support IPV6 SS Galaxy S7, S7 edge , S8 and S8 edge. The FOTA for support NextG have bug , can't use IPv6 with Ookla speed test.</p>	<p>No (Show low speed test result)</p>	<p>Rollback subscription profile for NextG Package to IPv4 only. Set subscription profile to IPV4 Once customer subscribe to NEXT-G</p>	<p>- Rollback subscription profile on 16 Aug 2017 (30,000 users) - New FOTA software available and already test . Samsung plan to finish and launch within OCT 2017.</p>

3S Benefits

- Secure our company business
- Secure our network resource to support the growth of usage
- Secure our network investment



Challenges :

- 1) How to have a good collaboration with Device vender esp Apple
- 2) How to handle some use case scenario such as Roaming scenario
- 3) Customer complain handling and immediate re-solving

