

UKNOF

IPV6-ONLY DEVICES

ON EE MOBILE

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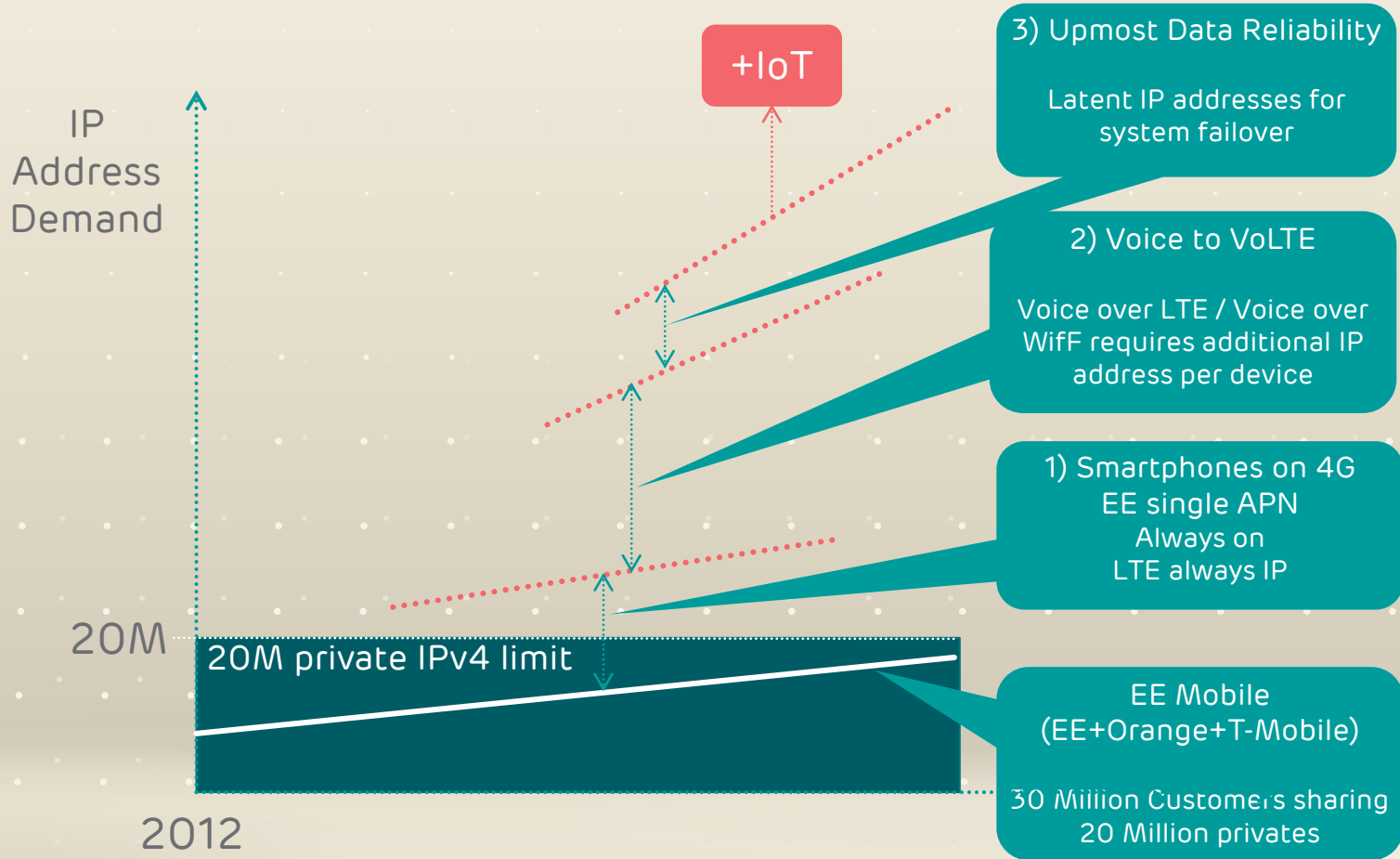


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# NAT is well established in Mobile ISPs

- **Mobile operators have extensive experience of Carrier Grade NAT for their internet services.**
- **Any stocks of public IPv4 are augmented by the 20 million private IPv4 ranges.**
- **The mobile web experience through Carrier Grade NAT (NAT44) has proven successful.**

# APPARENT 5 YEARS AGO - 20M PRIVATE IPS NOT SUFFICIENT



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# Beyond 20 Million – IPv4 Workaround or IPv6?

## Questions being asked:

- **Compromised workarounds? Kludge internal numbering with overlapping private address space?**
- **IPv6 will reduce investment in NAT (and associated logging). But is it really a complete solution? Dualstack does not alleviate address exhaustion.**

*In EE we ensured the VoLTE APN was IPv6, not overlapping IPv4.*

*But for mobile data, is dualstack of benefit? Can IPv6-only succeed?*

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# Meanwhile, IPv6 in vast Data Centres

Meanwhile some big names were also asking similar questions on avoiding private IP address exhaustion (Facebook, Google, LinkedIn, Microsoft) – using IPv6-only in the cloud/data centre or within their networks.

*Common threads: Reachability, peer-to-peer, E2E openness, simplicity of singular node configuration, homogeneity*

Considering vast numbers of endpoints, has a consensus formed?  
i.e. IPv6 is the perennial solution to address number shortage.

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# Single stack may be better for the mobile mass market

Operating two IP address families per terminal is a burden:

- Radio Access Network Signalling (yes, this is fixed by IPv4v6 bearer in 3GPP Release 8+)
- Policy Control and Charging – IPv4 & IPv6 double the sessions (this issue never goes away)
- On the customers device, one is better than two (battery drain, Happy Eyeballs, Apps, DNS)
- Burden of operating of double network protocols forever on the network and for new services (.need to do this for some while yet though...)

And of course, an IPv6-only device returns an IPv4 address to the pool...😊

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# Main Mobile Experience Challenge – Application support

## Existence of “IPv4 Literals” hinders IPv6-only

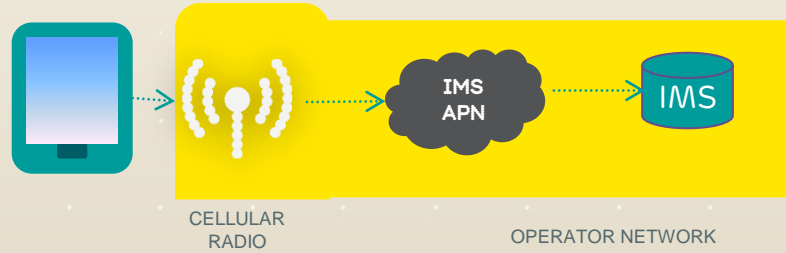
- **Client side**
  - “Traditional VPN client” configured to IPv4 VPN Gateway
  - Spotify client seeks an IPv4 server
  - A few other PC clients use IPv4 literal (Gaming, Skype PC)
- **Server side**
  - Web Server referral/redirect to IPv4 address
  - This is poor coding!
- **User input**
  - Typing into browser <http://100.3.2.1/login>

**The IETF (RFC6877) gives a solution tailored for CGNAT networks – 464xlat.**

# MOBILE USECASES

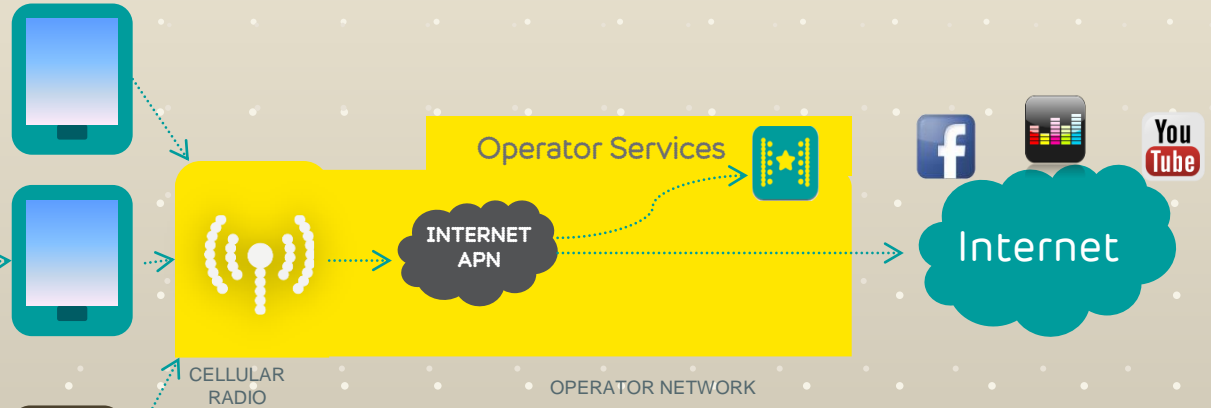
## 1. Voice/IMS

OPERATOR VOICE OVER  
IP / LTE / WIFI



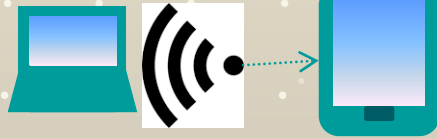
## 2a. Data

DATA FROM INTERNET  
OR OPERATOR SERVICE



## 2b. Tethered Data

WIFI TETHERING FROM  
HANDSET



## 3. Mobile Broadband

MYFI OR DONGLE



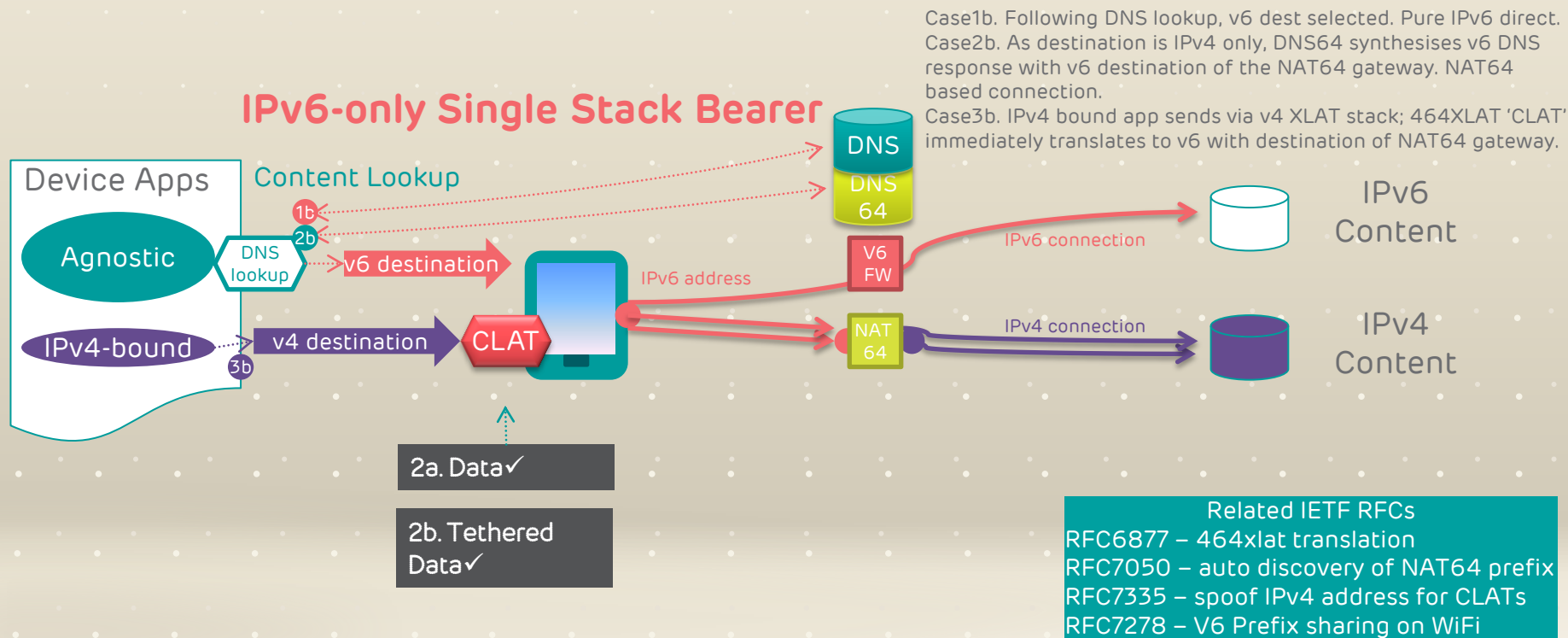
TETHERED  
DEVICE

WIFI

CELLULAR  
DEVICE



# HOW 464XLAT FIXES IPV4-BOUND APPS & SERVICES IPV6-ONLY WITH 464XLAT (RFC6877)



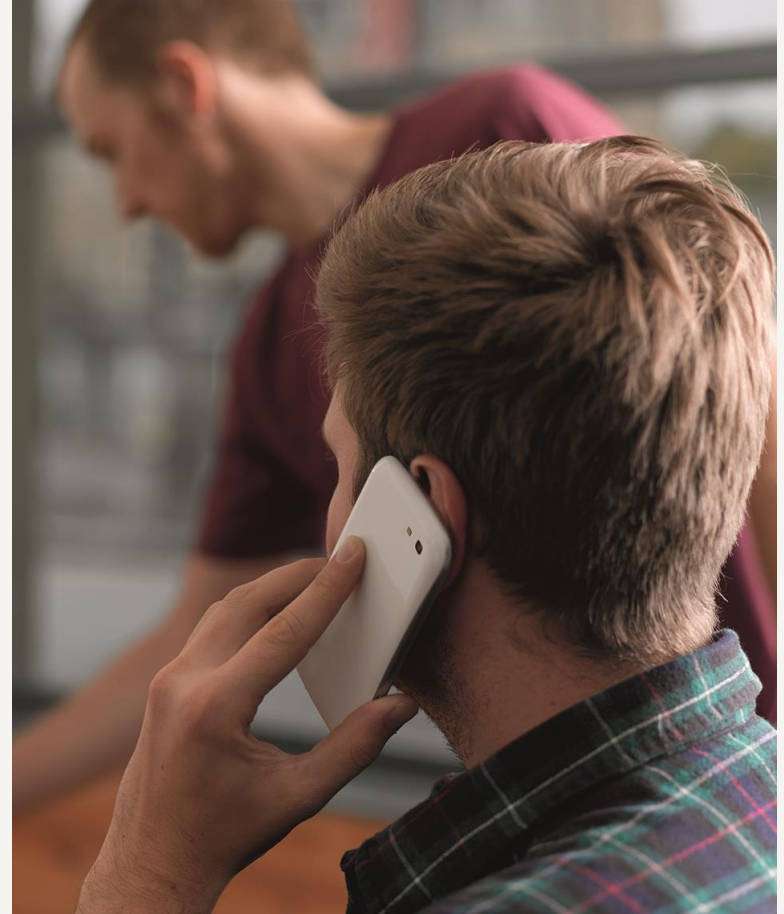
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# Eligible 464xlat smartphones

## IPv6-only with 464xlat (RFC6877)

- ✓ Android OS (default on EE build)
- ✓ All key devices from 2016 onwards:
  - ✓ Samsung GS6 Edge Plus and GS7's
  - ✓ HTC M10
  - ✓ LG G5, G5 SE, K7, K8
  - ✓ All Sony's from the Z5

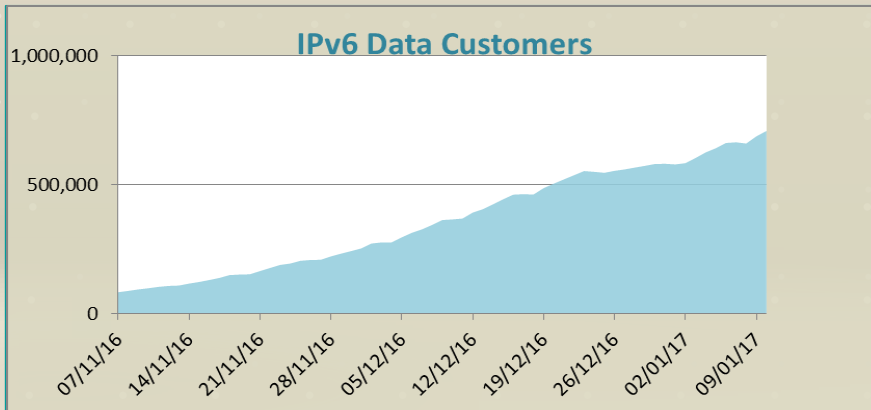
**And more to follow in 2017...**



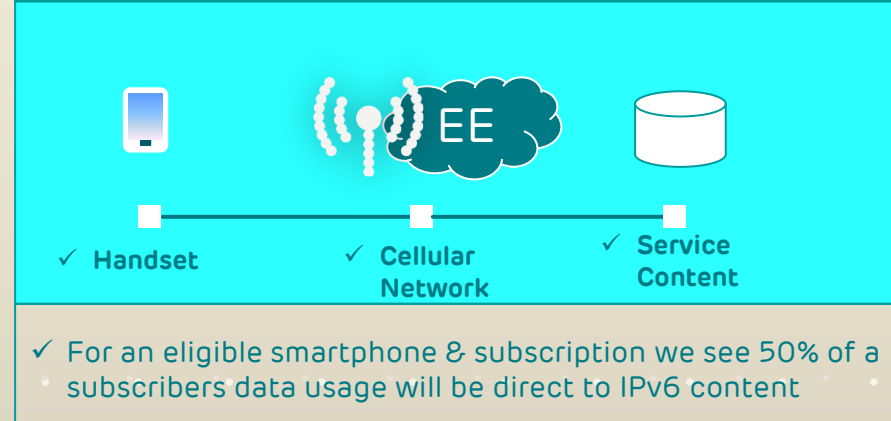
# EE IPV6 STATUS – JAN 2017

## WHAT THE EE NETWORK PROVIDES:

- ✓ In 2014 EE switched on an IPv6 IMS APN; VoLTE now default on for 4G devices that support it.
- ✓ In 2016 H2 EE provided a single Data APN providing IPv4 or IPv6 bearers:
  - ✓ Legacy devices request IPv4 – remain IPv4
  - ✓ Eligible devices that request IPv6/IPv4v6 – receive an IPv6 bearer by default
- ✓ Today only EE postpay consumers eligible.



## 50% DATA VOLUME



## DATA APN STATUS: 0.75M

- Currently 0.7 Million Mobile Data customers are using IPv6.
- About halfway through updating the subscriptions in EE postpay consumer base.
- By Feb we expect 1M customers on IPv6 data.

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# An alternative IPv6-only approach is emerging

## Provide an IPv6-only ecosystem protected against IPv4 literals:

- **Fix Apps**

- Police apps in the app store, ensure IPv6 compliance (no literals)

- **Fix Server-side**

- Build a bump-in-the-host approach, let the OS help repair literals
- And clients can perform synthesis of NAT64 destinations themselves (if they discover the NAT64 prefix e.g. RFC7050)

**This could enable a pure IPv6-only + DNS64/NAT64 environment**

**No need for 464xlat.**

**Potential challenge – IPv6-only tethering of any device (of unknown OS).**

THANK YOU



LET'S  
CHAT

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THANK YOU

Any questions?

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