

IPv6 implementation in mobile network Orange Poland

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Possible IPv6 implementation

- **DualStack**
 - single PDP ipv4v6
 - dual PDP, IPv4 & IPv6 simultaneously
- **IPv6-only**

DualStack

Single PDP IPv4v6

- PROS :
 - 100% IPv4/IPv6 content access
 - More?
- CONS:
 - Does not solve IPv4 depletion problem
 - Roaming issues
 - 2 adresses IPv4&IPv6 per one PDP
 - Licences cost, PCRF, LI, HSS etc



DualStack

Dual PDP IPv4&IPv6

- PROS :
 - 100% IPv4/IPv6 content access

- CONS:
 - 2 addresses IPv4&IPv6 per subscriber
 - 2 PDP's per subscriber
 - High costs
 - Does not solve IPv4 number problem



IPv6-only - NAT64+DNS64

IPv6-only PDP

- PROS:
 - One PDP per subscriber
 - IPv6 unlimited capacity
 - Cost effective
 - WP, Symbian, Android supported

- CONS:
 - IPv4 literals will not work
 - Authorisation problem



IPv6-only - CLAT+NAT64+DNS64

IPv6-only PDP

- PROS :
 - One PDP per subscriber
 - IPv6 unlimited capacity
 - Cost effective
 - Solve IPv4 depletion problem
 - Resign from DNS type=A querries* ?

- CONS:
 - User device must support RFC 6877
 - CLAT+DNS64 - problems with apps where IPv4 literals&domain names are used



IPv6-only - CLAT+NAT64+DNS-DualStack

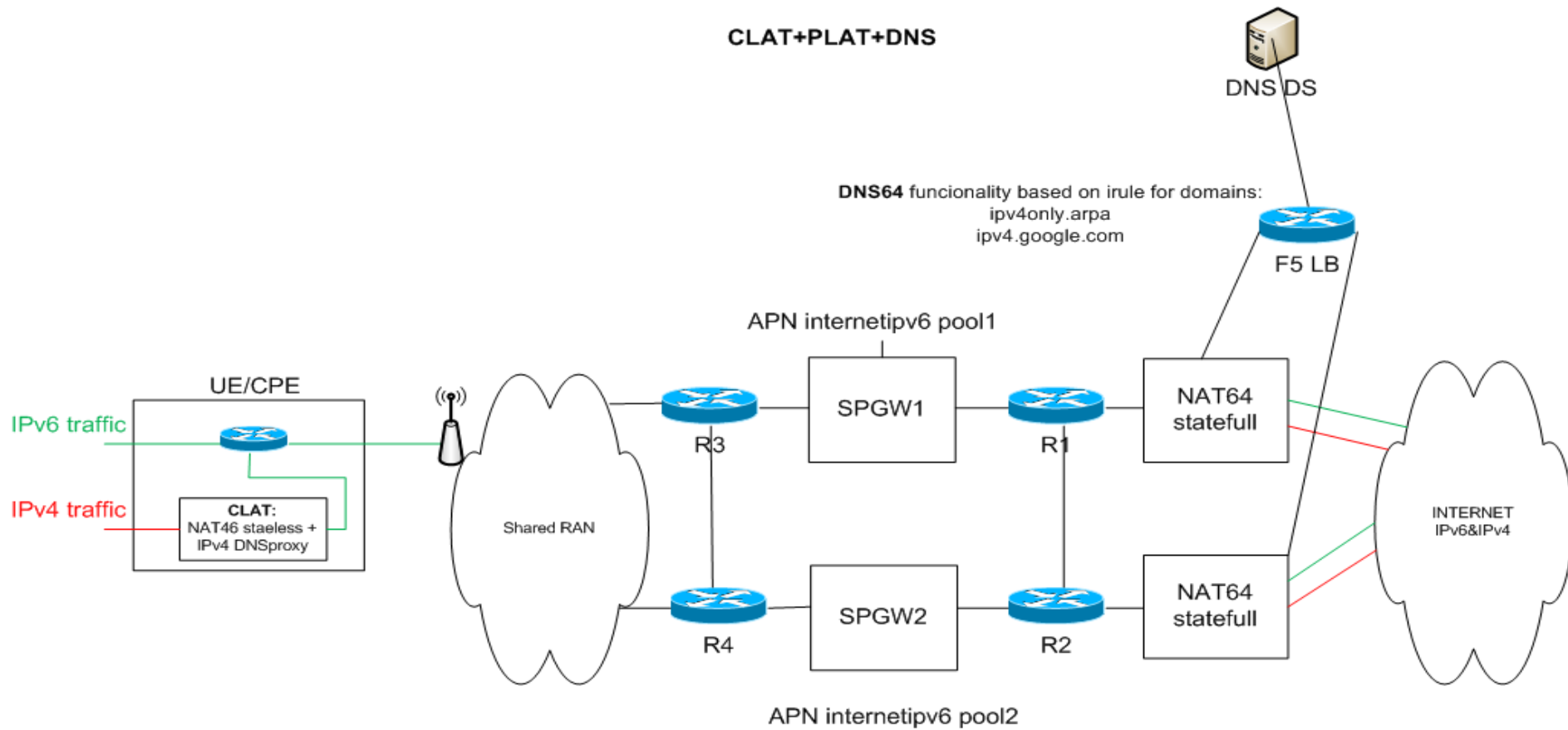
Orange Poland solution

IPv6-only PDP

- PROS :
 - resolve issues with apps seen in CLAT/DNS64
 - overall performance better than CLAT/DNS64
- CONS:
 - Each end device must support CLAT (RFC 6877)
 - DNS A query required

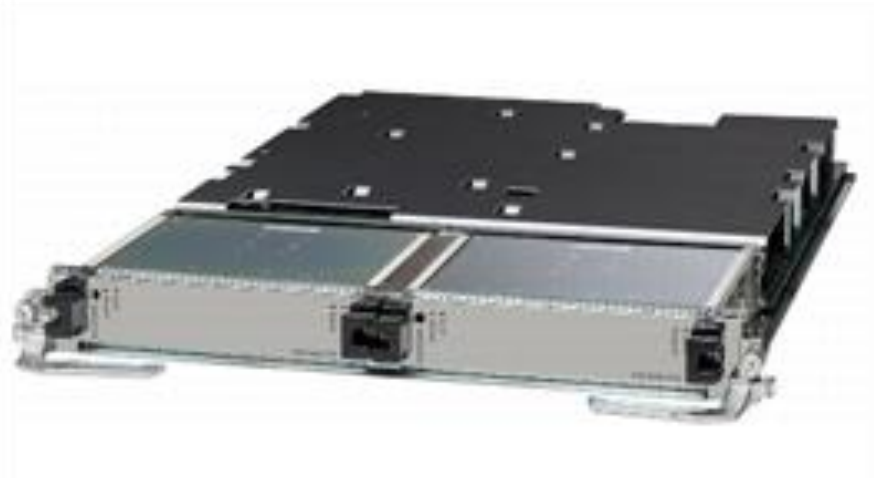


- DNS64 only for NAT64 prefix discovery



NAT64 box – Alg's

- FTP active, passive
- RTSP
- PPTP




Roaming 2G/3G & IPv6-only

- IPv6 or IPv4v6 is not populated in all roaming partners
 - IPv4 PDP guarantee failsafe automatic data roaming regardless of visited network

- failsafe mechanism for roaming case
 - Mechanism works for Android, Windowsphone
 - Roaming indicator triggers fallback to ipv4 APN

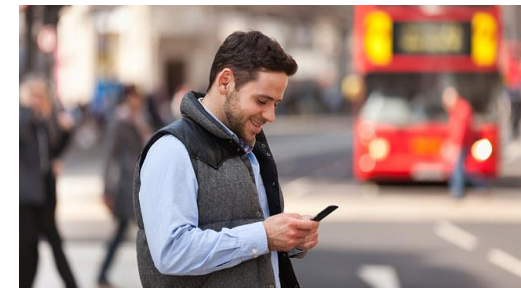
Roaming 2G/3G & IPv6-only fallback to IPv4 mechanism

 Informacje o urządzeniu

IMEI: 351869050156192
Phone number:
Current network: Telekom.de

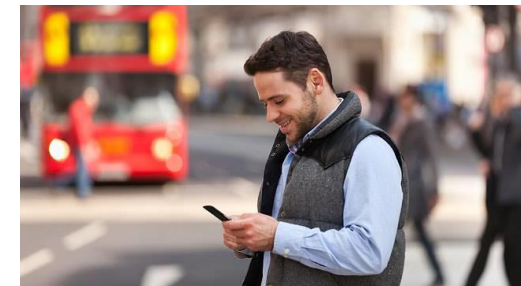
Run ping test

Ping IpAddr:
Ping Hostname(www.google.com):
HTTP Client test:
Signal strength: -111 dBm 1 asu
Location: LAC = 5791 CID = a96a7
Neighboring CID: unknown
CellInfo:
Roaming: Roaming
GSM service: Działła
GPRS service: Łączenie
Network type: UMTS:3
Message waiting: false
Call redirect: false
Call status: Idle
Radio resets: 0
Data attempts: 0
Data successes: 0
GSM disconnects: =====DATA=====



APN protocol
IPV6

APN roaming protocol
IPv4



LTE Roaming & IPv6-only

- Roaming to LTE network require IPv6 support on visted network
 - LTE is data only network – Terminal first attach always is HPLMN-default bearer*
 - * if ESM info transflag feature is used - selected bearer (terminal settings)

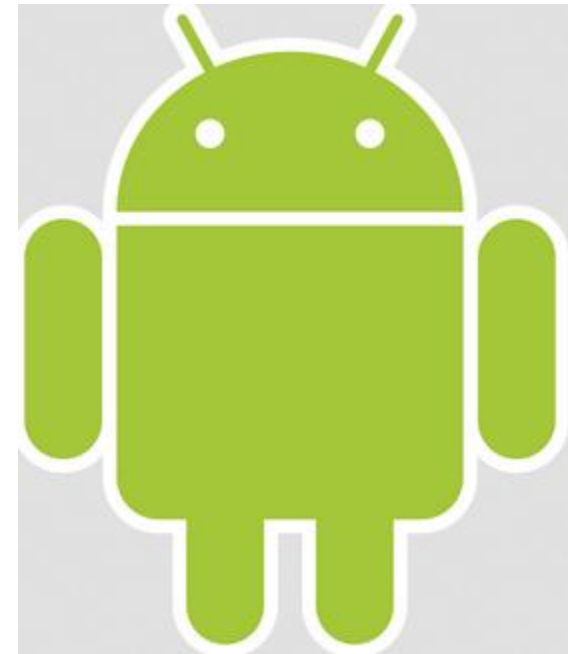
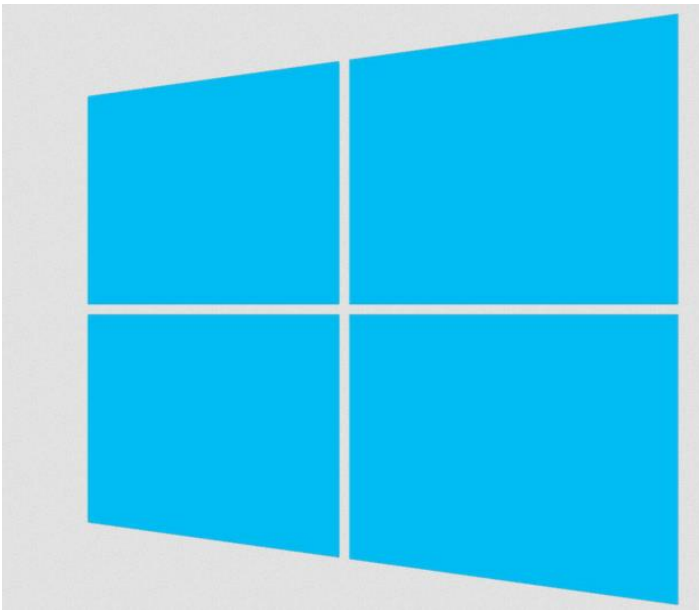
- Launching roaming LTE outbound require IPv6-only test scenarios
 - To avoid problems allow IPv4 attach for your IPv6 APN when roaming (HSS/PGW)

LTE Roaming & IPv6-only – APN settings

APN	Aktywność	Id	Nazwa	Typ
2g/3g	✓	1	www.idea.pl	ipv4
		3	mms	ipv4
		8	internet	ipv4
		9	wap	ipv4
		18	internetipv6	ipv6
		19	internetipv6	ipv4
		21	euinternet	ipv4
LTE	✓	3	mms	ipv4
		8 *	internet	ipv4
		9	wap	ipv4
		18	internetipv6	ipv4oripv6

IPv6 devices

- Android – JB4.3+
- WP 8.1+ – Nokia /Lumia
- iOS 10* - require DNS64, DNS AAAA query only



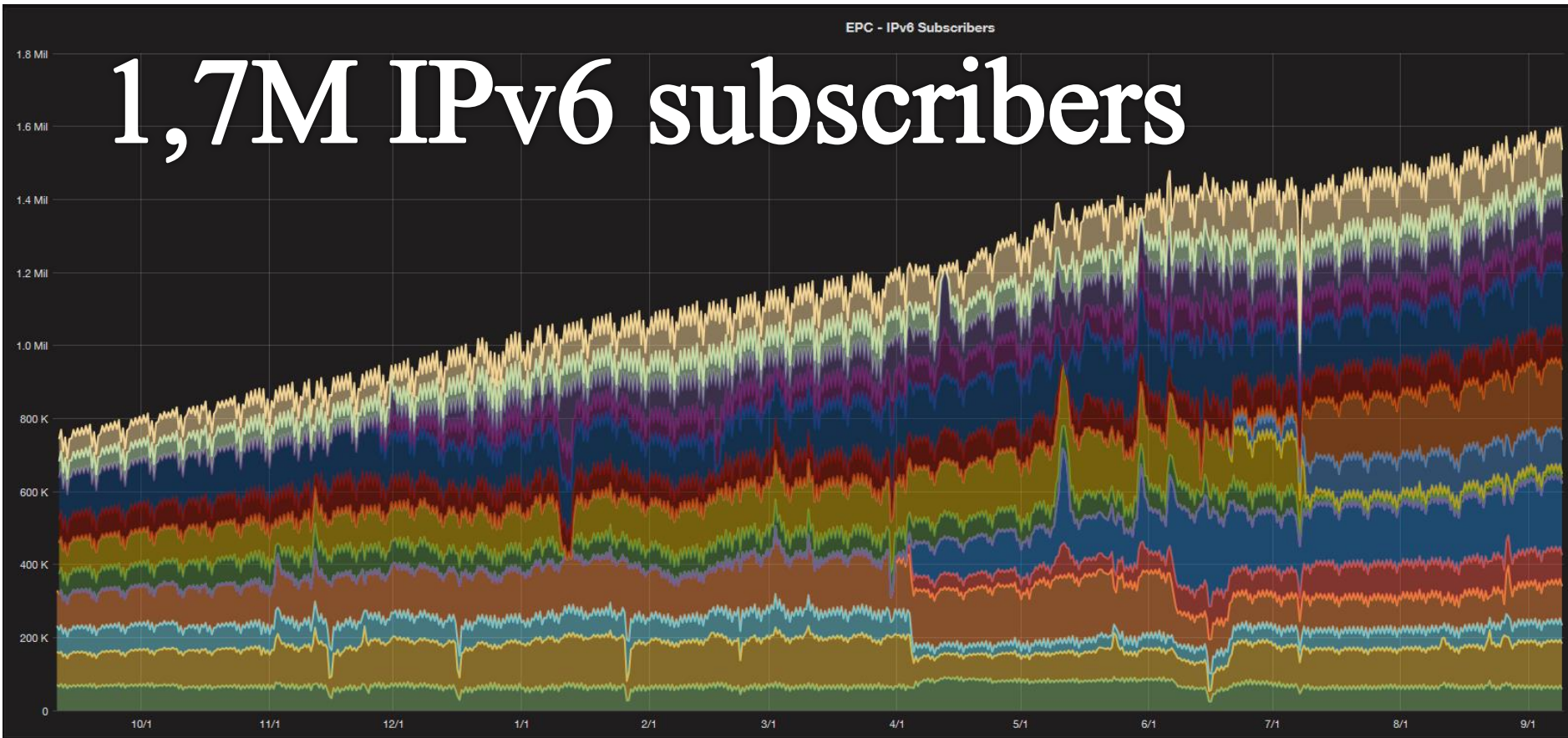
Tethering & IPv6-only

- Supported in Windowsphone & Android & iOS *
- * iOS IPv4 literals will not work - host interfaces are configured with IPv6-only – that means host must support IPv6

TIPS:






- IPv4 APN can be set for tethering...(customization)

- Orange Poland Statistics

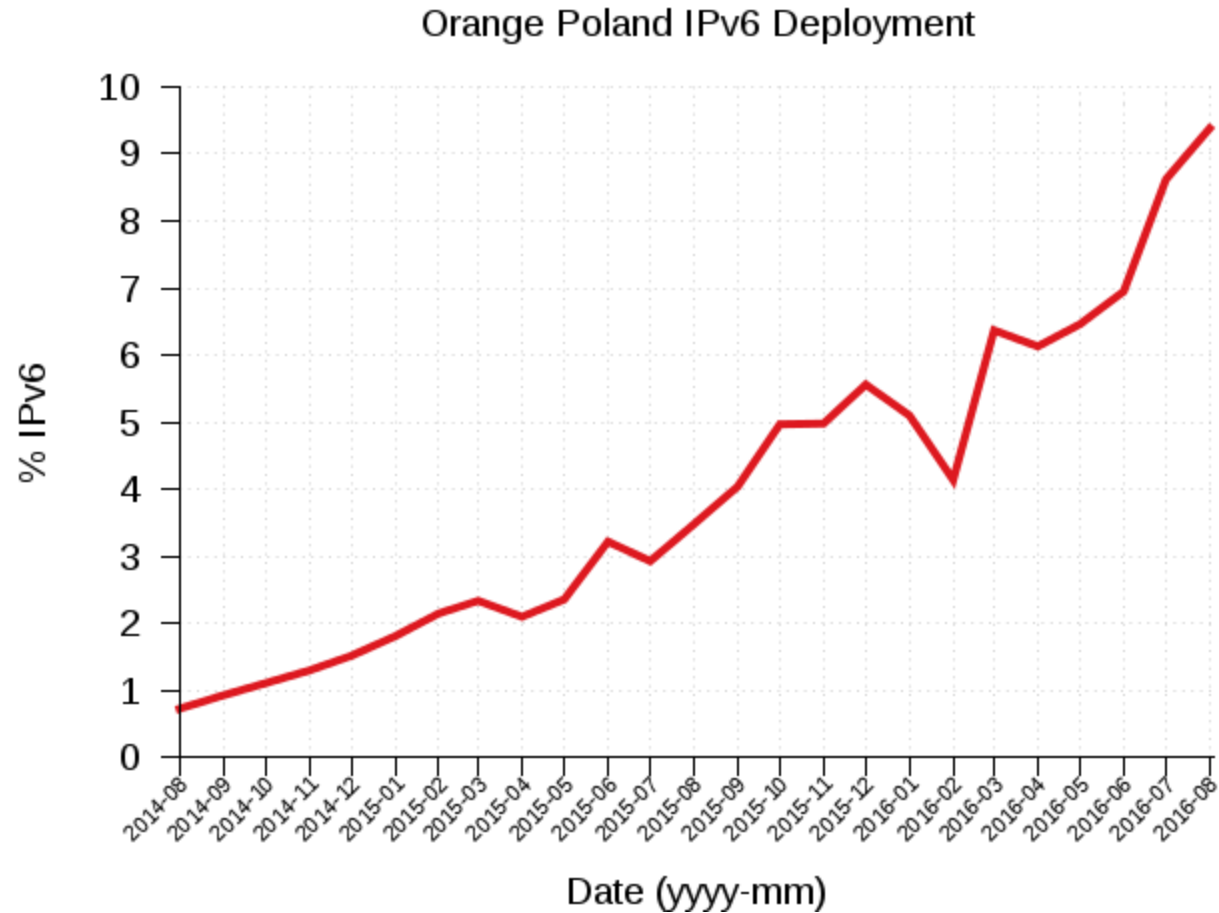


- World IPv6 Stats

Poland

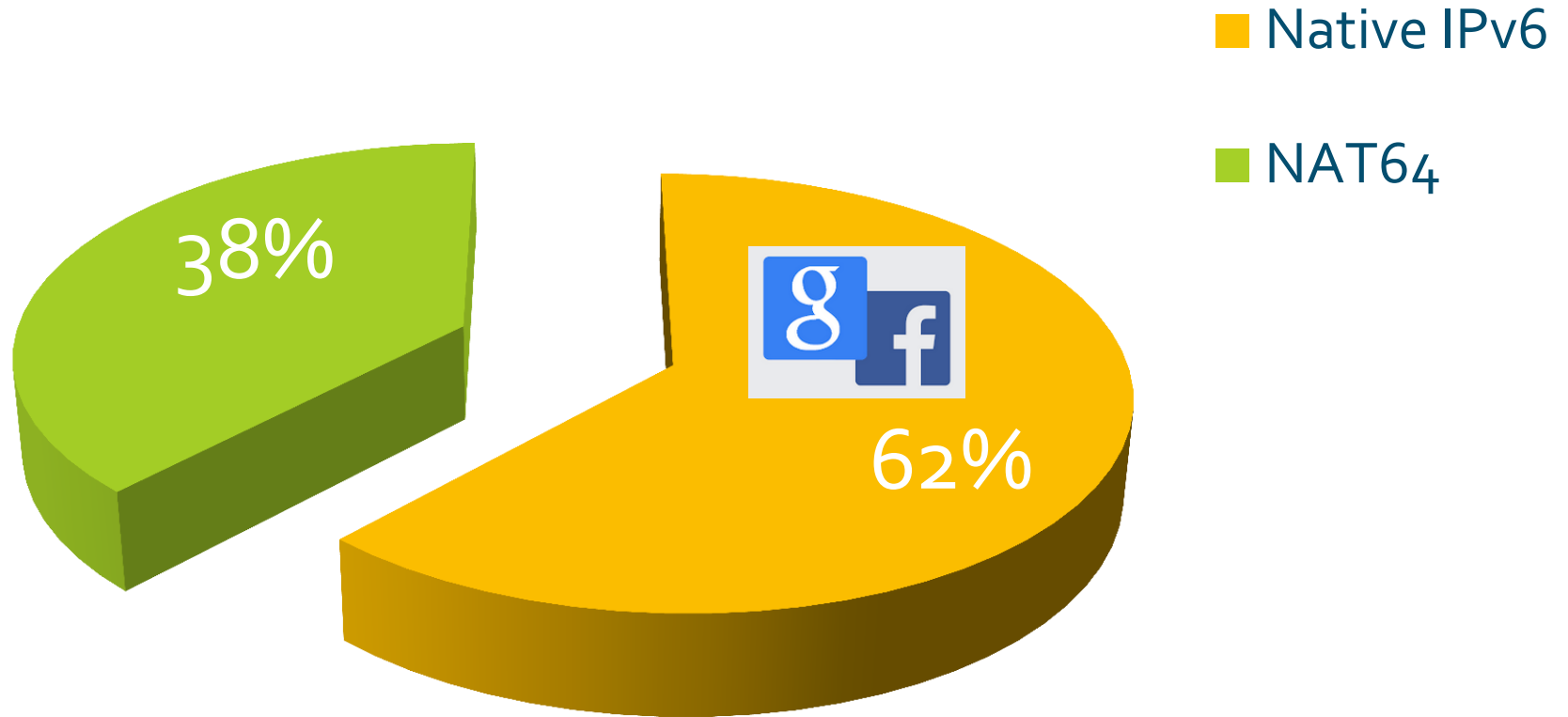
Historical Charts General Data **IPv6 Deployment** ⓘ : 21.06% (Prefixes : 36.78% | Transit AS : 47.51% | Content : 46.17% | Users : 3.25%)**Relative Index** ⓘ : 3.2 out of 10Ipv6 Prefixes Transit AS Content Users **Google Search / APNIC data** ⓘ : 3.25% / 2.2%**Estimation** ⓘ : 815 K IPv6 users**0,8 M vs 1,7M?**

World IPv6 stats

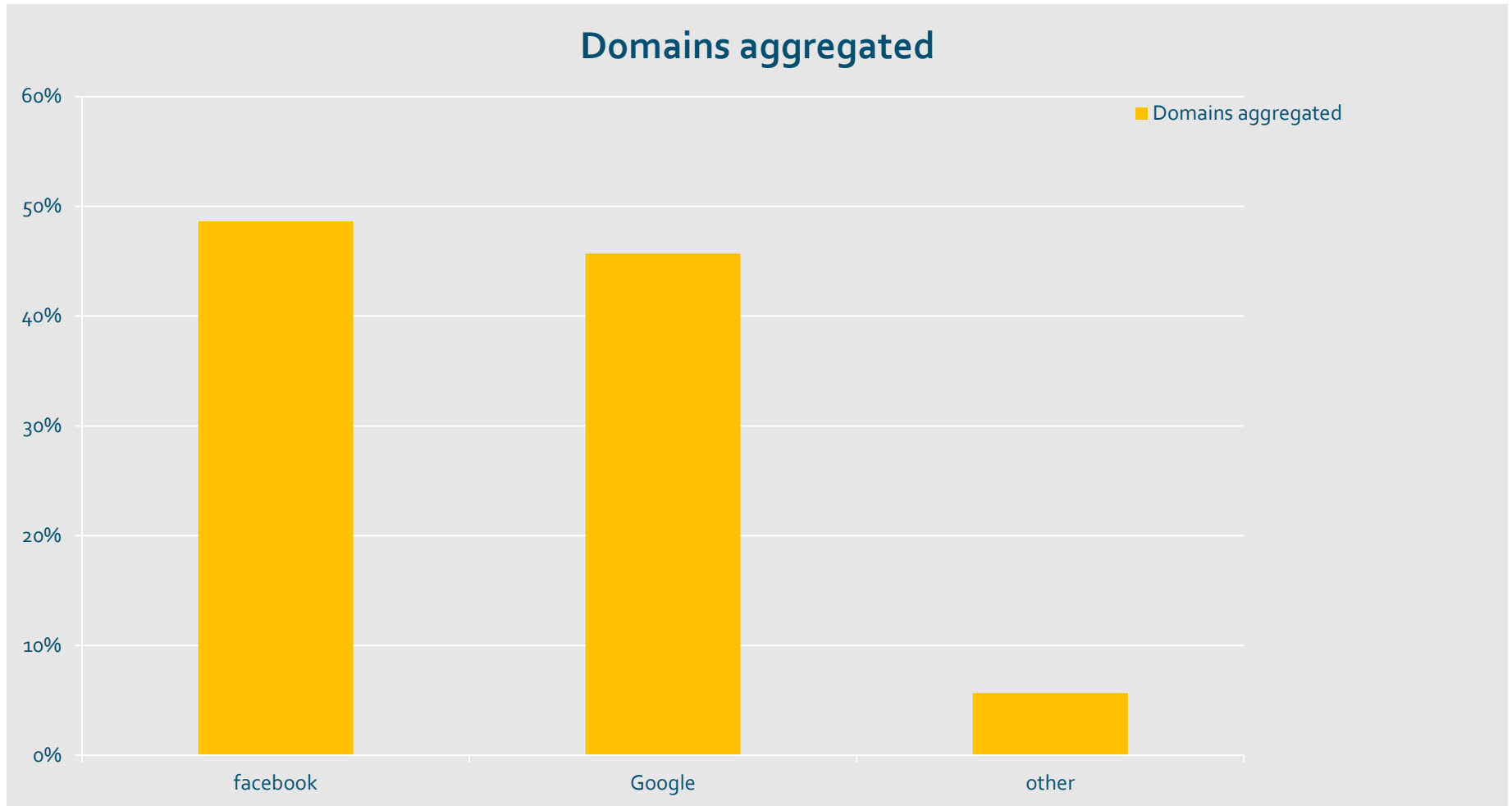


<http://www.worldipv6launch.org/apps/ipv6week/measurement/images/graphs/OrangePoland.png>

OPL NAT64 flows

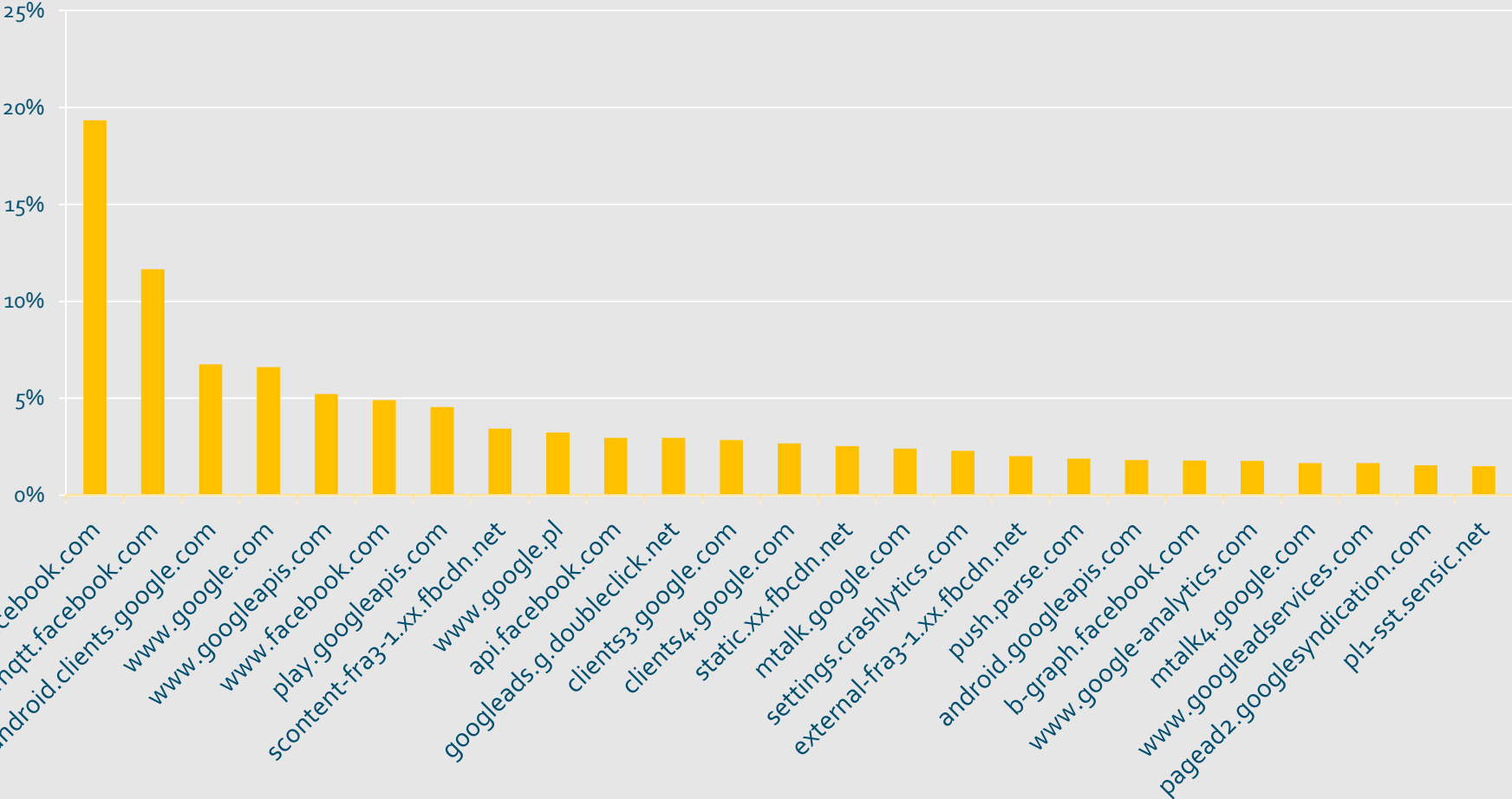


DNS top25



TOP 25 no. hits

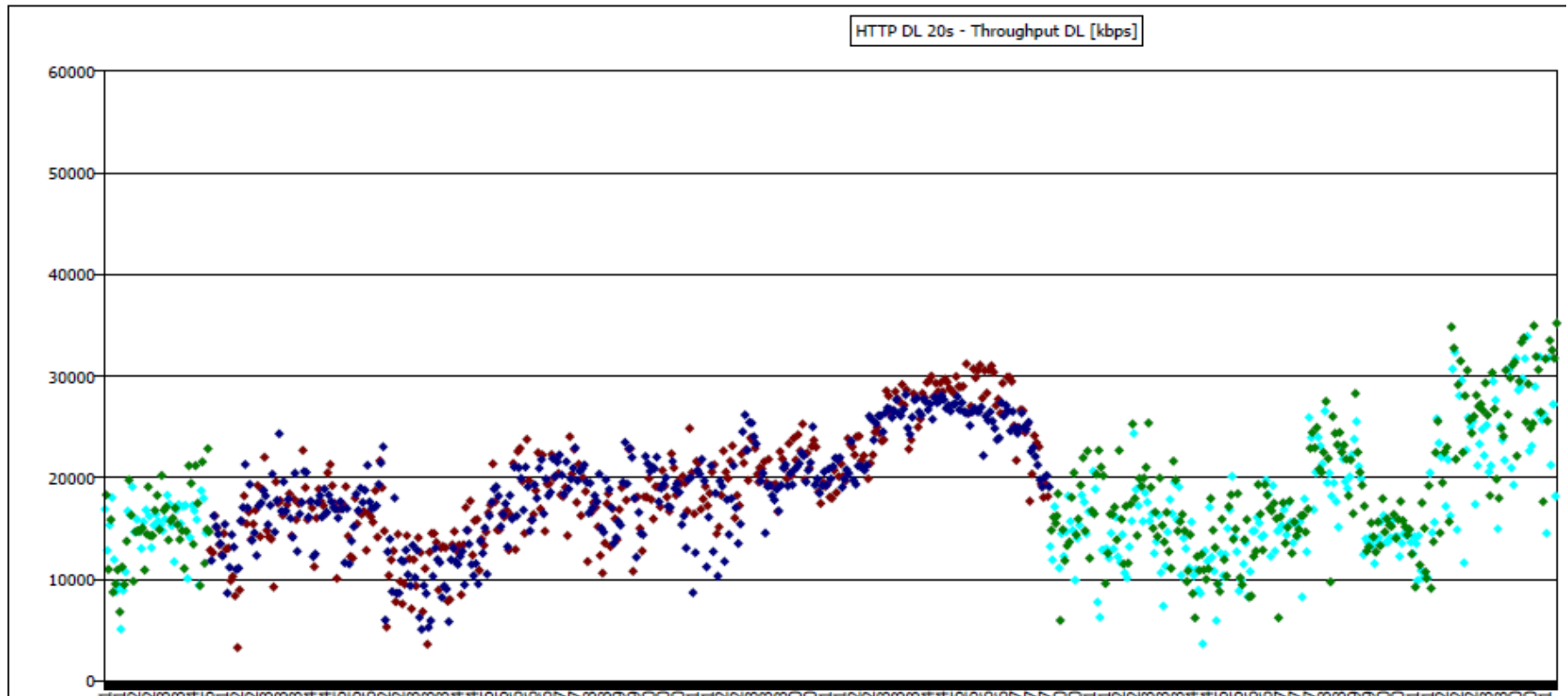
■ TOP domains



IPv6 is faster than IPv4?

FIX

FM

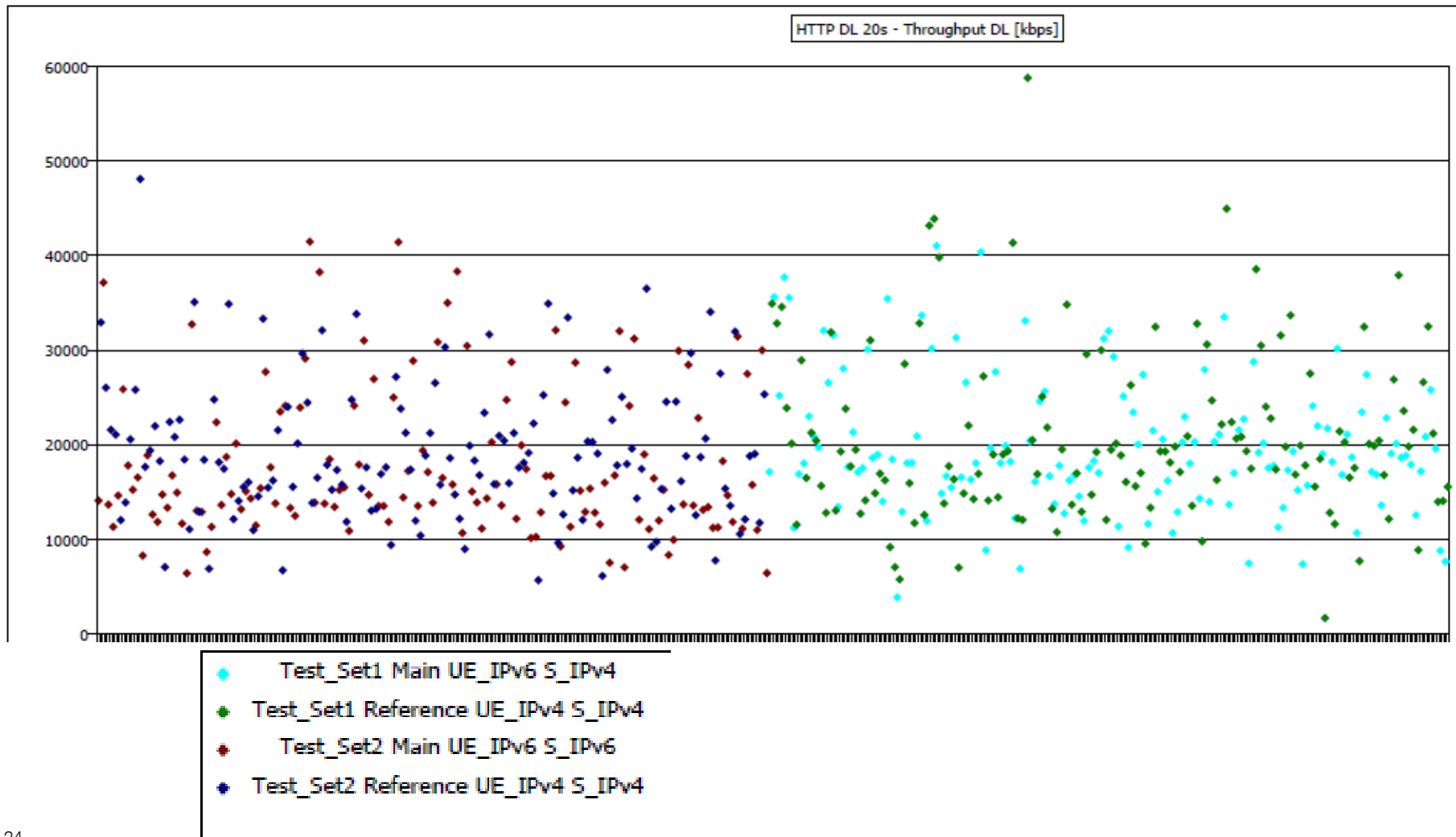


- ◆ Test_Set1 Main UE_IPv6 S_IPv4
- ◆ Test_Set1 Reference UE_IPv4 S_IPv4
- ◆ Test_Set2 Main UE_IPv6 S_IPv6
- ◆ Test_Set2 Reference UE_IPv4 S_IPv4

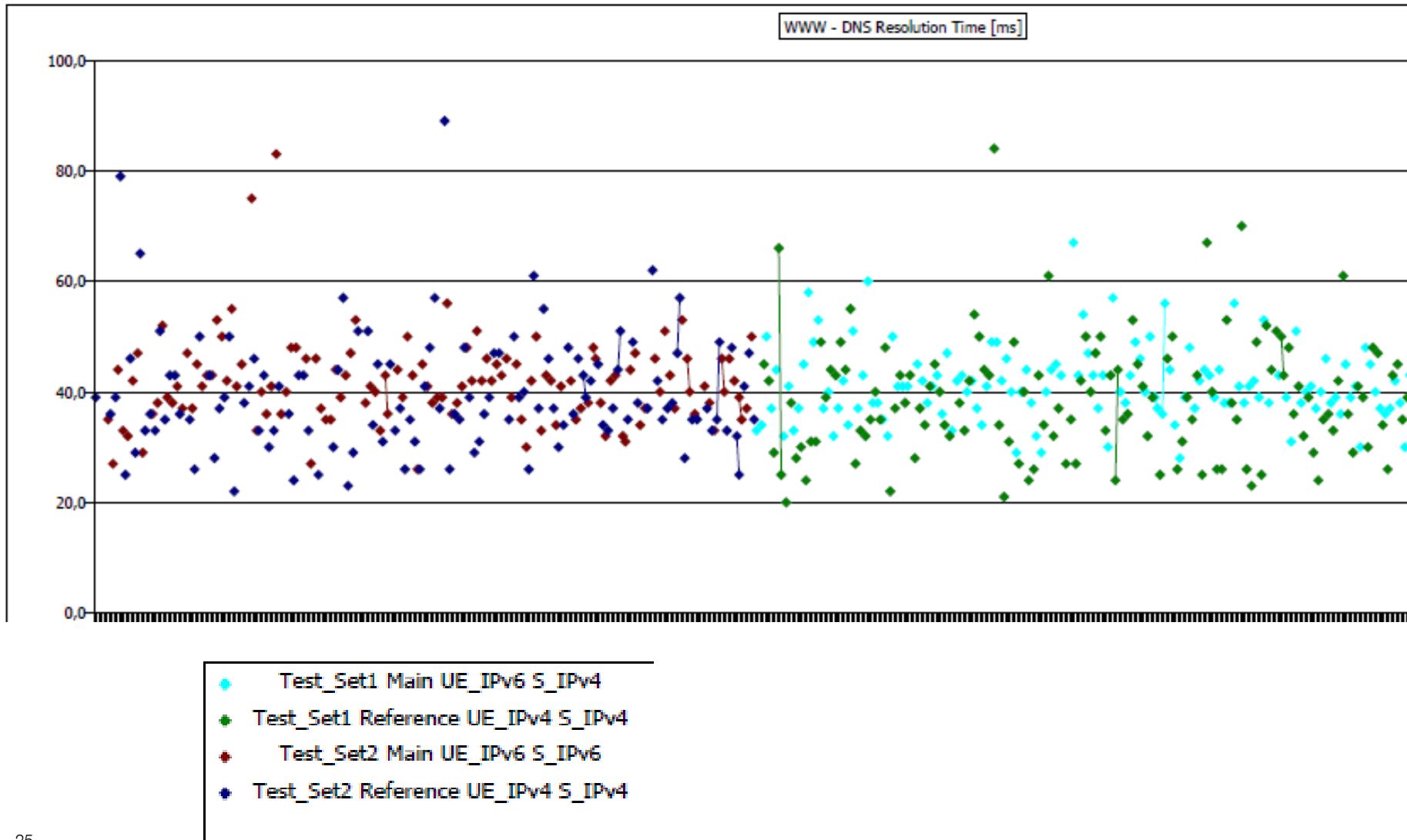
IPv6 is faster than IPv4?

DRIVE

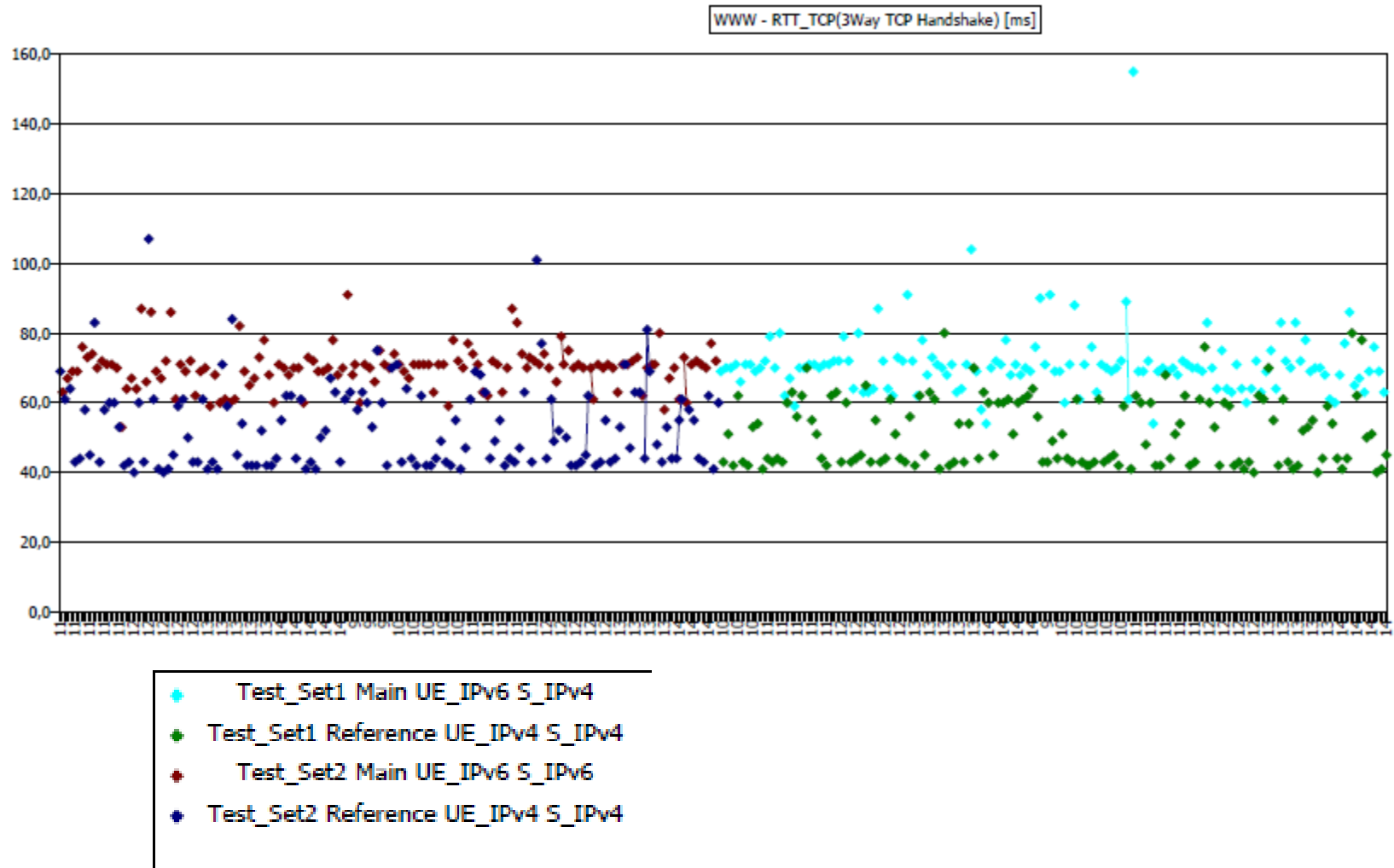
FM



IPv6 is faster than IPv4?



IPv6 is faster than IPv4?



Live demo

Connect to IPv6 hotspot

SSID: Voyager

PASSWORD: 12345678

IMPORTANT: visit only one page:

vyncke.org

thank you



backup



useful links

<http://Vyncke.org> – shows host IP address

<http://test-ipv6.com/> - test your IPv6

Google chrome dualstack proxy



Test IPv6 FAQ Mirrors

Test your IPv6 connectivity.

Podsumowanie Wykonane Testy Podziel się wynikami / Skontaktuj Inne strony IPv6 Dla Pomocy Technicznej

- Twój publicznie widoczny adres IPv4 to 66.249.93.24
Serwer pośredniczący, Via: 1.1 Chrome-Compression-Proxy
- Twój publicznie widoczny adres IPv6 to 2001:4860:4801:4017::2e
Serwer pośredniczący, Via: 1.1 Chrome-Compression-Proxy
- Twój dostawca usług internetowych (ang. ISP) to GOOGLE - Google Inc., US
- Korzystasz z IPv6, tak więc dołączyliśmy zakładkę, w której testujemy osiągalność wybranych stron IPv6. [Więcej informacji](#)
- Twoja przeglądarka ma do dyspozycji poprawnie działający adres IPv6 ale unika korzystania z niego. Takie zachowanie jest niepokojące. [Więcej informacji](#)
- We have detected that you are using a proxy. This means we are testing your proxy server, not your computer.
- Dobre wieści!** Twoja obecna konfiguracja będzie działać poprawnie jak tylko strony www zaczną korzystać z IPv6.
- Twój serwer DNS (prawdopodobnie prowadzony przez twojego dostawcę usług) wygląda jak by posiadał połączenie do Internetu z wykorzystaniem protokołu IPv6.

Ocena twojego przygotowania

10/10 do wykorzystania IPv6, w momencie gdy wydawcy treści internetowych będą zmuszeni do korzystania wyłącznie z IPv6

Google traffic & latency

If the Google system detects that for a given resolver IPv6 is substantially less reliable or significantly higher latency than IPv4, then

it stops returning AAAA records to that resolver

Penalty time +3,7 days or more...

OPL blacklisted 21.10.14

```
# Resolvers to which Google may not return AAAA records.# Copyright 2014 Google Inc. All Rights Reserved.# Last updated:
```

```
31.61.133.76/32 # AS5617 Poland
```

```
31.61.132.66/32 # AS5617 Poland
```

Published on

http://www.google.com/intl/en_ALL/ipv6/statistics/data/no_aaaa.txt

No AAAA for IPv6 network

No AAAA switch all native IPv6 traffic to
NAT64

All native Google IPv6 traffic is NAT64 traffic
= NAT64/logs +100%

```
tomasz@tomasz-Latitude-D830:~$ dig AAAA @2a00:f40:fffb::b53 google.pl

;<<>> DiG 9.8.1-P1 <<>> AAAA @2a00:f40:fffb::b53 google.pl
;(1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 35979
;; flags: qr rd ra; QUERY: 1, ANSWER: 0, AUTHORITY: 1, ADDITIONAL: 0

;; QUESTION SECTION:
;google.pl.      IN  AAAA

;; AUTHORITY SECTION:
google.pl.      125 IN  SOA  ns2.google.com. dns-admin.google.com. 1571285 900 900
1800 60

;; Query time: 46 msec
;; SERVER: 2a00:f40:fffb::b53#53(2a00:f40:fffb::b53)
;; WHEN: Fri Oct 24 15:28:39 2014
;; MSG SIZE  revd: 87
```



Disaster recovery

Make your DNS to retrieve missing AAAA from not blacklisted DNS'es – DSL/fix or backup

Disaster protection

NAT64/logs system must handle high flows increase +100% in very short time.

Monitor latency differences between IPv4 & Ipv6

Monitor Google NS servers & AAAA response.

Check you backup transit links focusing on latency to Google services

OPL APN design&architecture - available internet APN's

APN's	internet	vpn	vpn.static.pl
Address	IPv4	IPv4	IPv4
Routable	Private	Public	Public
Type	Dynamic	Dynamic	Static
Routing In	No	Yes	Yes

IPV6 APN's

APN's	internetipv6	vpnipv6	vpnipv6.static.pl
Address	IPv6	IPv6	IPv6
Routable	Global	Global	Global
Type	Dynamic	Dynamic	Static
Routing In	No	Yes	Yes

Windows 7/10 ipconfig /all – during tethering – WP/Android

Karta bezprzewodowej sieci LAN Połączenie sieci bezprzewodowej:

```
sufiks DNS konkretnego połączenia :
Opis . . . . . : TP-LINK 150Mbps wireless N PCI Express Adapter
Adres fizyczny . . . . . : A0-F3-C1-F3-B9-95
DHCP włączone . . . . . : Tak
Autokonfiguracja włączona . . . . . : Tak
Adres IPv6 . . . . . : 2a00:f41:1000:a460:2d30:3d4f:8e0c:bbb4(Preferowane)
Tymczasowy adres IPV6 . . . . . : 2a00:f41:1000:a460:3c5c:8897:7a76:ba94(Preferowane)
Adres IPV6 połączenia lokalnego . . . . . : fe80::2d30:3d4f:8e0c:bbb4%15(Preferowane)
Adres IPV4 . . . . . : 192.168.1.199(Preferowane)
Maska podsieci . . . . . : 255.255.255.0
Dzierżawa uzyskana . . . . . : 3 marca 2014 20:23:44
Dzierżawa wygasa . . . . . : 3 marca 2014 21:23:44
Brama domyślna . . . . . : fe80::d957:155a:5708:f9bc%15
                               192.168.1.1
Serwer DHCP . . . . . : 192.168.1.1
Identyfikator IAID DHCPv6 . . . . . : 346092481
Identyfikator DUID klienta DHCPv6 : 00-01-00-01-18-FA-27-D6-00-1A-A0-D3-6C-5C
Serwery DNS . . . . . : 2a00:f40:ffff::b53
                               2a00:f40:ffff::a53
                               192.168.1.1
NetBIOS przez Tcpi . . . . . : Wyłączony
```