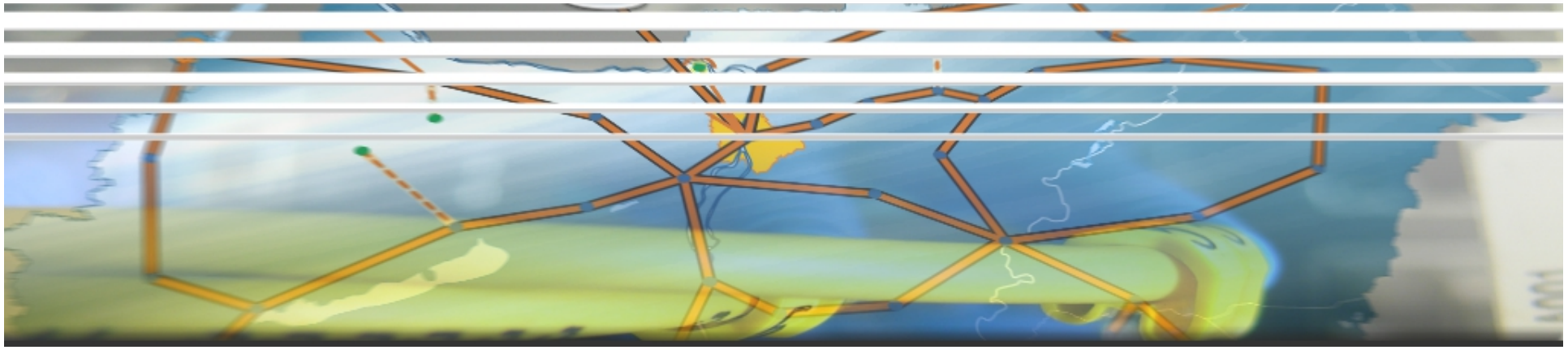
Két IPv6 mese



2013. március 7.
HBONE ülés

Mohácsi János
Hálózati igh.
NIIF Intézet

Mesék az IPv6-ról és implementációkról

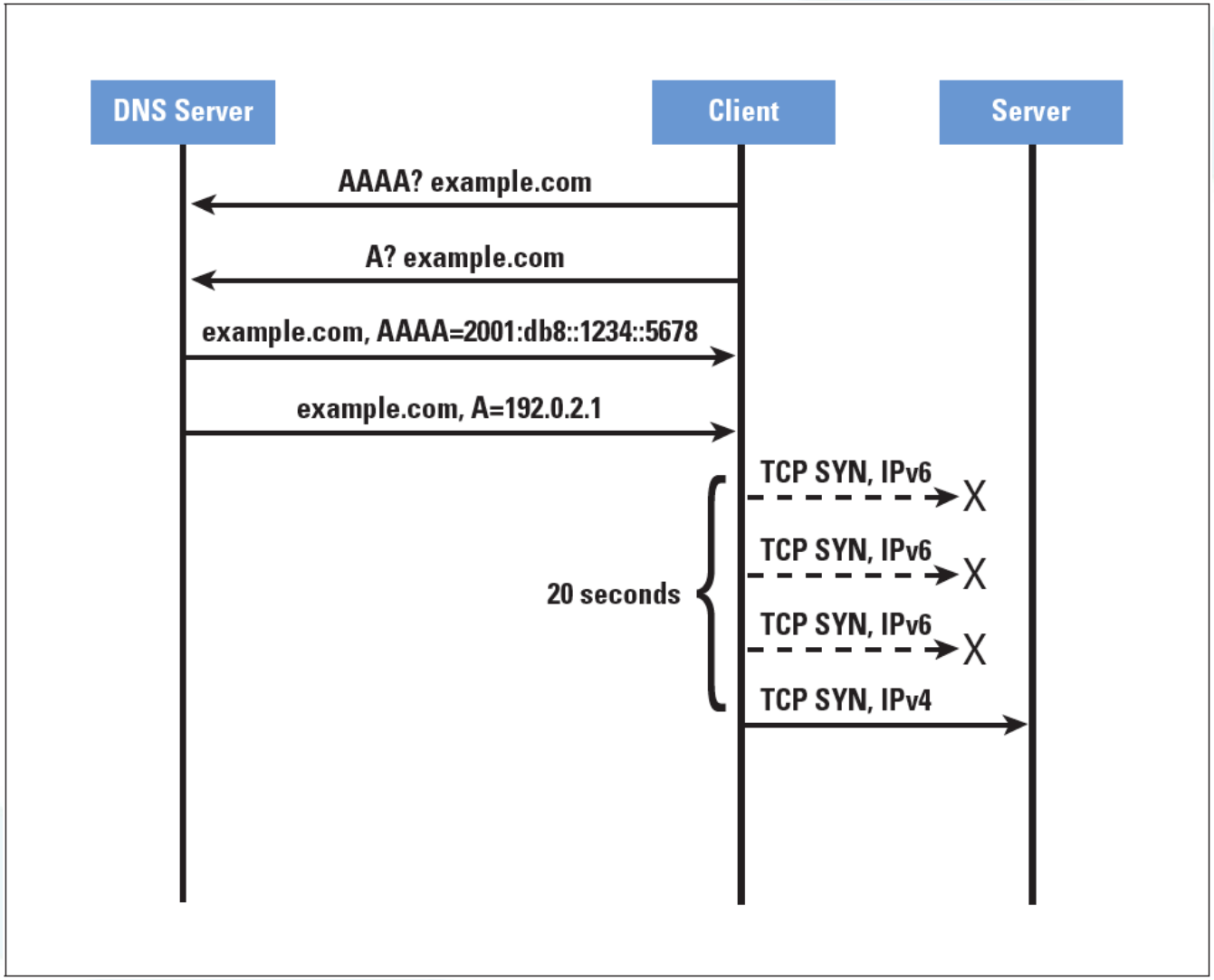
1. Mese az HTTP(S) tranzakciókról és a boldog szembogárról/szempárról
2. Mese a IPv6 szabványokról és a literal címekről

MESE AZ HTTP(S) TRANZAKCIÓKRÓL ÉS A BOLDOG SZEMBOGÁRRÓL/SZEMPÁRRÓL

Boldogtalan szempár – “unhappy eyeballs” – ismétlés NWS 2012-ről

- Néha a IPv6 nem működik
  - Szűrések
  - MTU feketelyukak
  - Hibás IPv6 hálózat
  - stb …
- Szimptóma: “Webböngészőben nem jelenik meg a weboldal” – csak 20-30 mp múlva
- Feladat: a hiba elhárítása
- Addig is a felhasználó elégedetlen - boldogtalan szempár – “unhappy eyeballs”

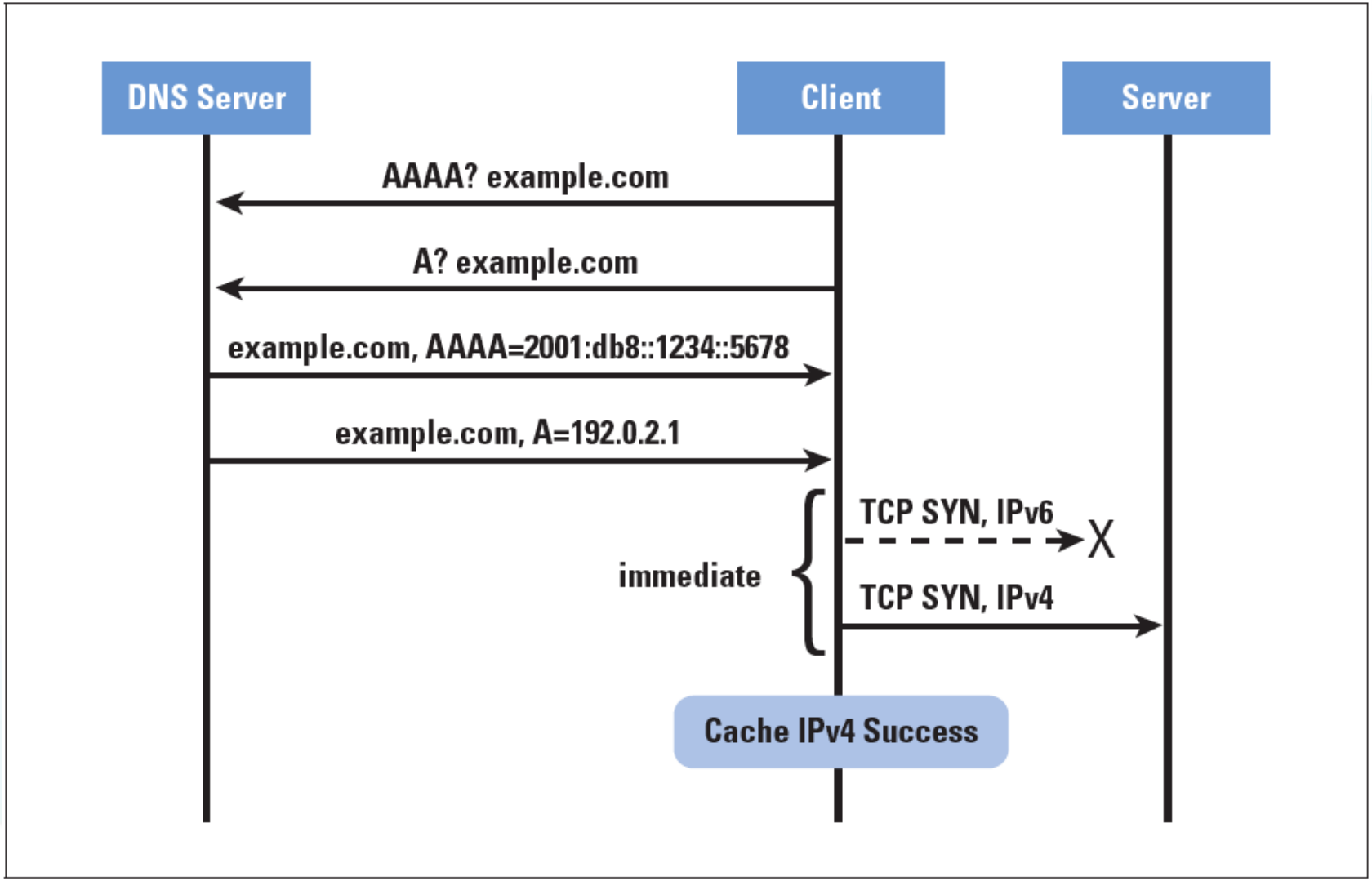
Boldogtalan szempár – “unhappy eyeballs”



Probléma “megoldása”

- Próbáljuk gyorsabban a következő IP címet
- Preferáljuk az IPv6-ot azért ha nincsen ellenkező igénye az alkalmazásnak
- “Kvázi” párhuzamos kapcsolat kiépítés

Boldog szempár – “ happy eyeballs”



“Happy Eyeballs” – RFC6555

1. A host cím preferencia policy (RFC 3484 source address selection) alkalmazása
2. Ha IPv6 nem működik, akkor IPv4

   Ha sikeres akkor egy cacheben tárolva, hogy az adott címre melyik internet family-t kell használni (syn spam elkerülése)
3. A cachelt értékek törlődnek ha új hálózathoz csatlakozik a host
4. A nyeretlen kapcsolatok lezárásra kerülnek (erőforrással takarékoskodás)

“Happy Eyeballs” – implementációk

	Firefox	Firefox fast-fail	Chrome	Opera	Safari	Explorer
MAC OS X 10.7.2 8.0.1	8.0.1	16.9.912.41 b	11.52	5.1.1	-	-
	75s	0ms	300ms	75s	270ms	-
	IPv6	x	IPv6	IPv6	x	-
Windows 7	8.0.1	8.0.1	15.0.874.121 m	11.52	5.1.1	9.0.8112.16421
	21s	0ms	300ms	21s	21s	21s
	IPv6	x	IPv6	IPv6	IPv6	IPv6
Windows XP	8.0.1	8.0.1	15.0.874.121 m	11.52	5.1.1	9.0.8112.16421
	21s	0ms	300ms	21s	21s	21s
	IPv6	x	IPv6	IPv6	IPv6	IPv6
Linux 2.6.40.3-0.tc15	8.0.1	8.0.1	16.9.912.41 b	11.60 b	-	-
	96s	0ms	300ms	189s		-
	IPv6	x	IPv6	IPv6		-
iOS 5.0.1	-	-	-	-	?	-
					720ms	
					x	

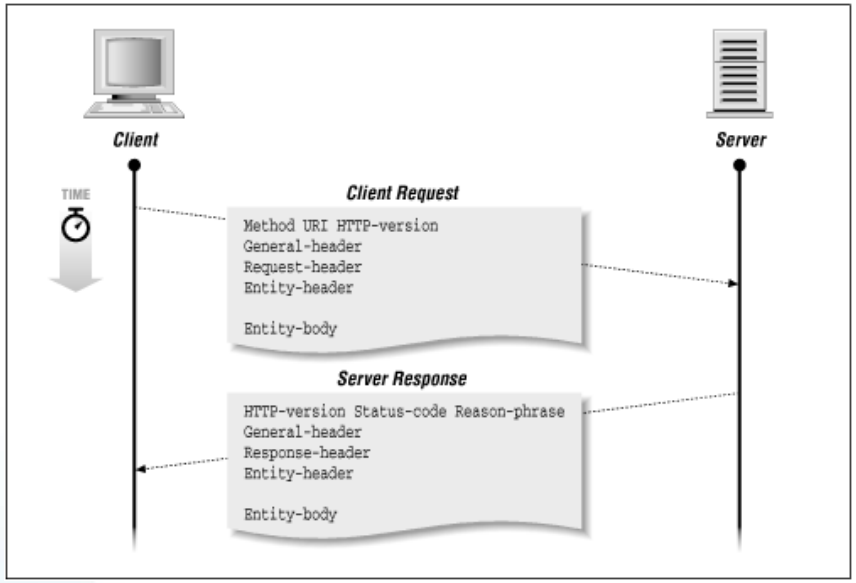
- Forrás: https://labs.ripe.net/Members/gih/dual-stack-esotropia

RFC6555 - összefoglalás

- Csak kapcsolat orientált protokollokra működik (TCP, SCTP)
- A DNS round-robin alapú terhelés elosztás - nem lesz terhelés elosztás
- Modern böngészők implementálják
- Csak tüneti kezelés – a probléma okát kell kezelni

?

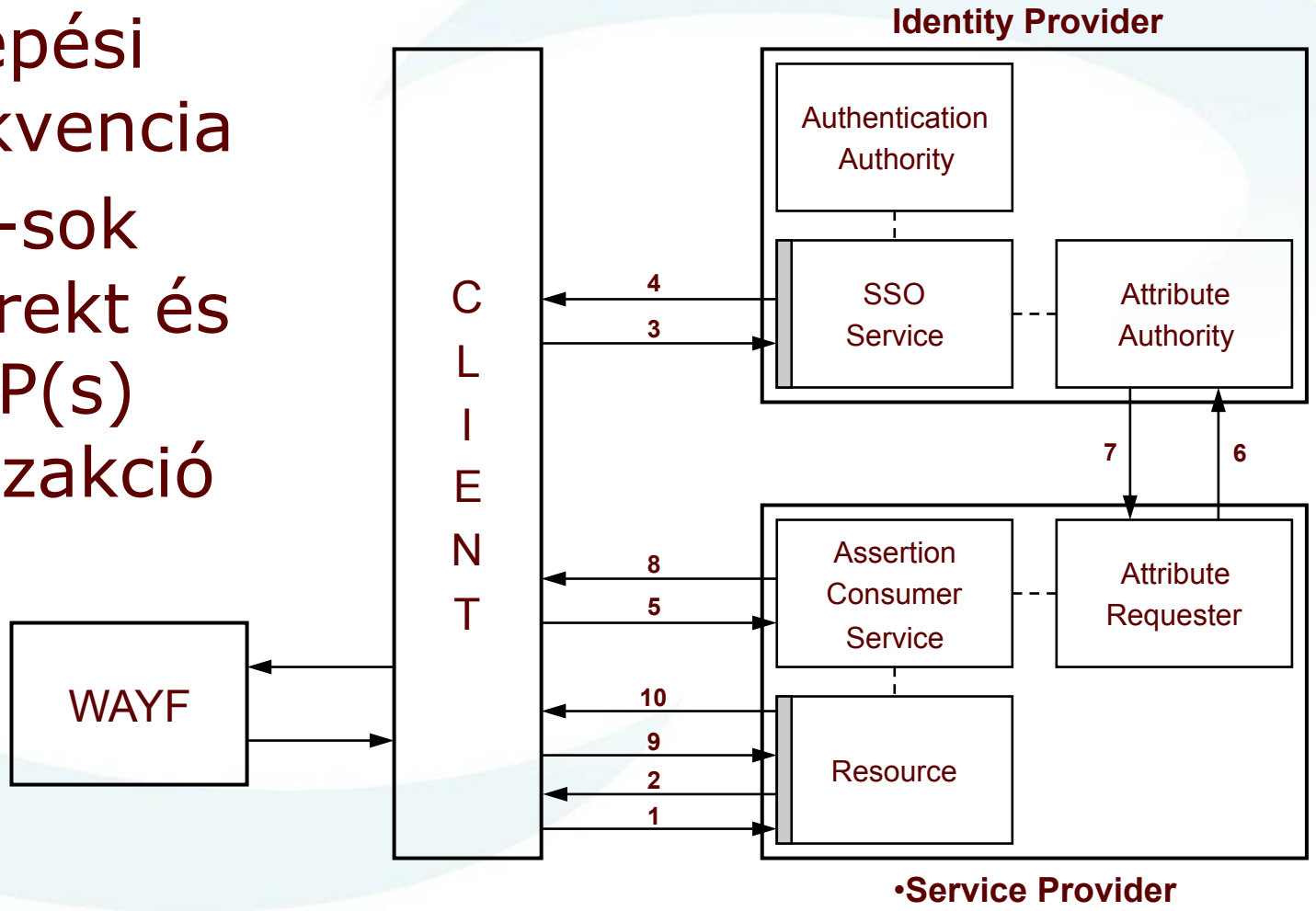
HTTP(S) tranzakciók - ismétlés



- "Minden" HTTP kérés külön TCP kapcsolat -> külön érvényes rá a "happy eyeballs" működési mód
- Hogyan tartozik össze két tranzakció?
  - cookie?

Shibboleth működés – HTTP(S) tranzakciók sorozata

- Belépési szekvencia
- Sok-sok redirekt és HTTP(s) tranzakció



Asserting Identity

- Kezdetben a felhasználó nem ismert a szolgáltatás számára
- Az anyaintézménynél történő bejelentkezés után már ismeri a felhasználót és tudja kivel beszél mohacsi@niif.hu
- The eduPersonPrincipalName, an identity attribute asserted by the user's home institution

Hibajelenség

- “Shibboleth-es oldal eszméletlen rövid ideig tart belépve” – 1-2 perc
- “elvileg klaszterezési gond nem lehet” – egyedi szervereken is probléma
- “8 óra session lifetime után mindenképp lejár, de ha ezen belül 3 órán keresztül inaktív vagy, akkor is újra az IdP-hez fordul”
- “pár perc inaktivitás után megszünteti a sessionömet,, szépen látszik logokban, csak épp az okokat nem ismerem még”
- “ Nem mindig jön elő a hiba”
- “Általában MAC gépeket érinti a probléma”
- “Ha nincsen IPv6 akkor nem jön elő a hiba”

Okok

- A shibboleth session IP címhez kötődik
- A MAC OS X úgy van meg hackelve az Apple által, hogy happy-eye-ball-t alkalmaz a network framework: egyszerre indít a szerver irányába IPv4 és IPv6 TCP SYN csomagokat és amelyik előbb válaszol azt kezdi használni
- Később is valamilyen módon ellenőrzi ezt – minden HTTP GET újra inditja a mechanizmust?
- Tipikus működés: egyszer az IPv6 nyer, egyszer IPv4 nyer es folyamatosan megy a flip-flop.
- Eredménye: nem megy az authentikáció - page reload megy az authentikáció stb.

Megoldások?

1. Shibboleth session nem IP címhez rendelése
2. Shibboleth session együttes IPv4 és IPv6 címhez rendelése - ez valószínüleg lehetetlen a béna HTTP protokol miatt – SAML2 kiterjeszthető?
3. A szerver determinisztikus módon IPv4-en 10-20ms-al később válaszol
4. A mac happy-eyeball-jának tuningolása

Hogyan tovább?

Megoldások

- Shibboleth:

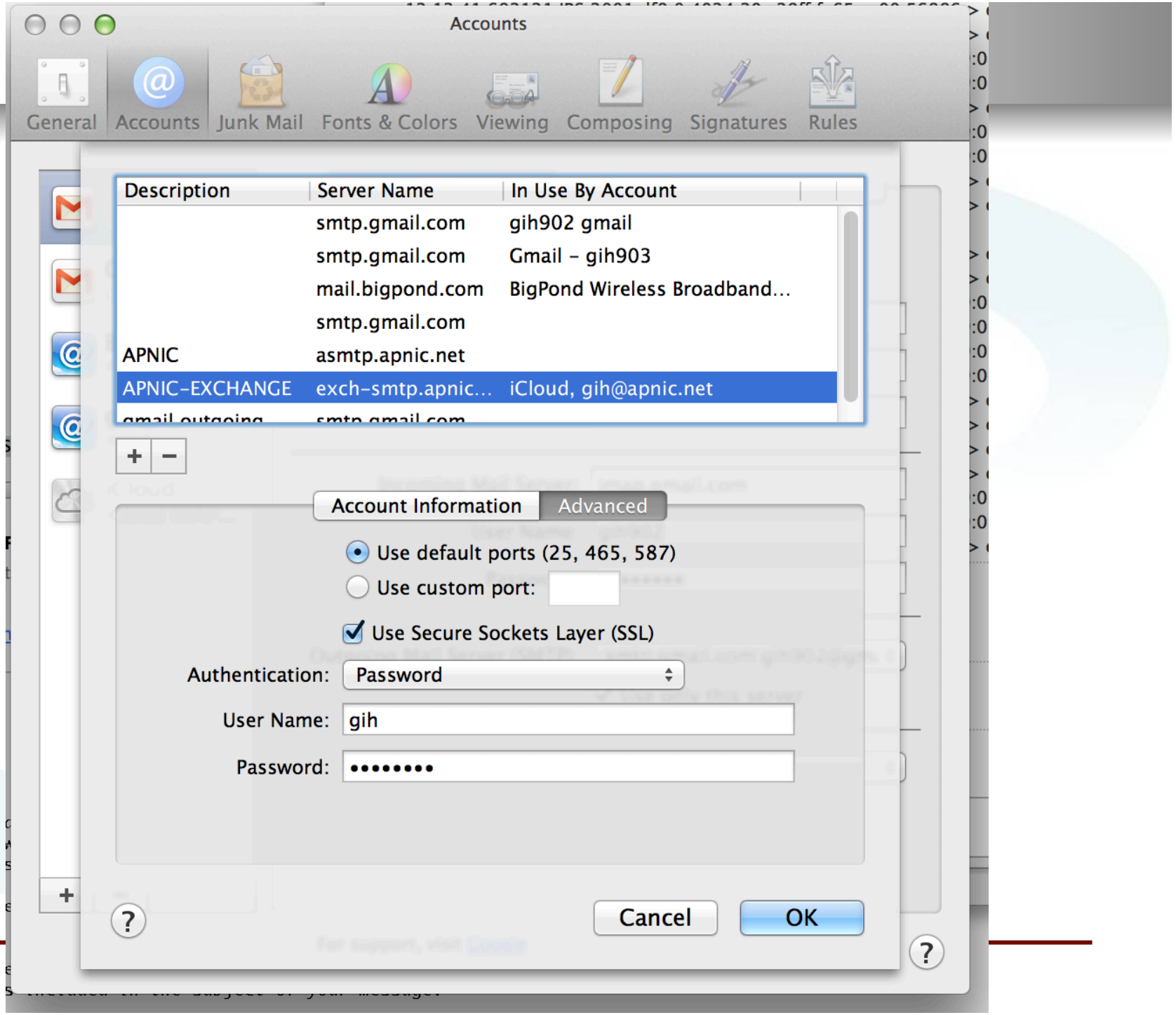
  consistentAddress opció letiltása
- Szükséges a HTTPS! alkalmazása session lopás elkerülésére!

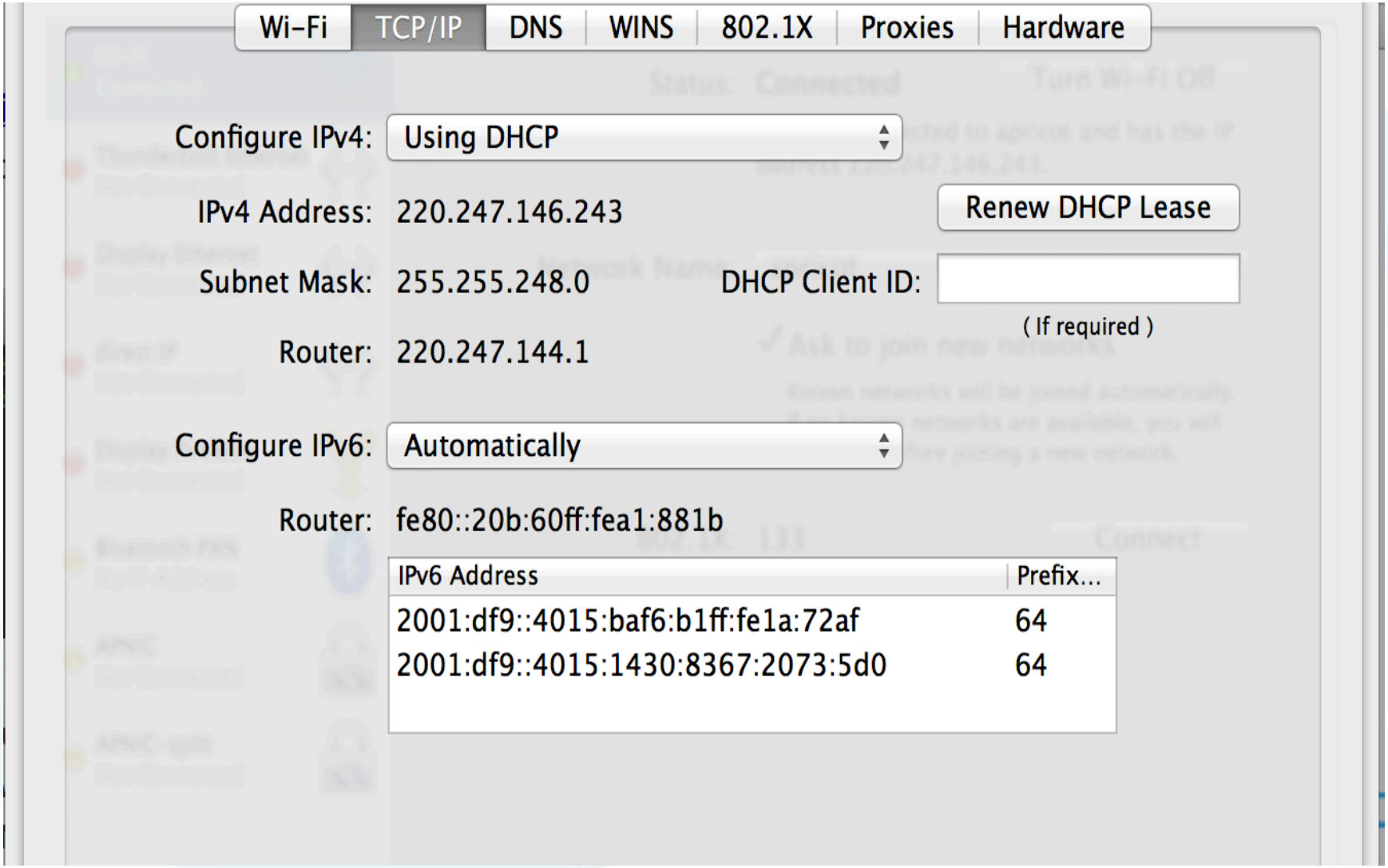
Dual stack?

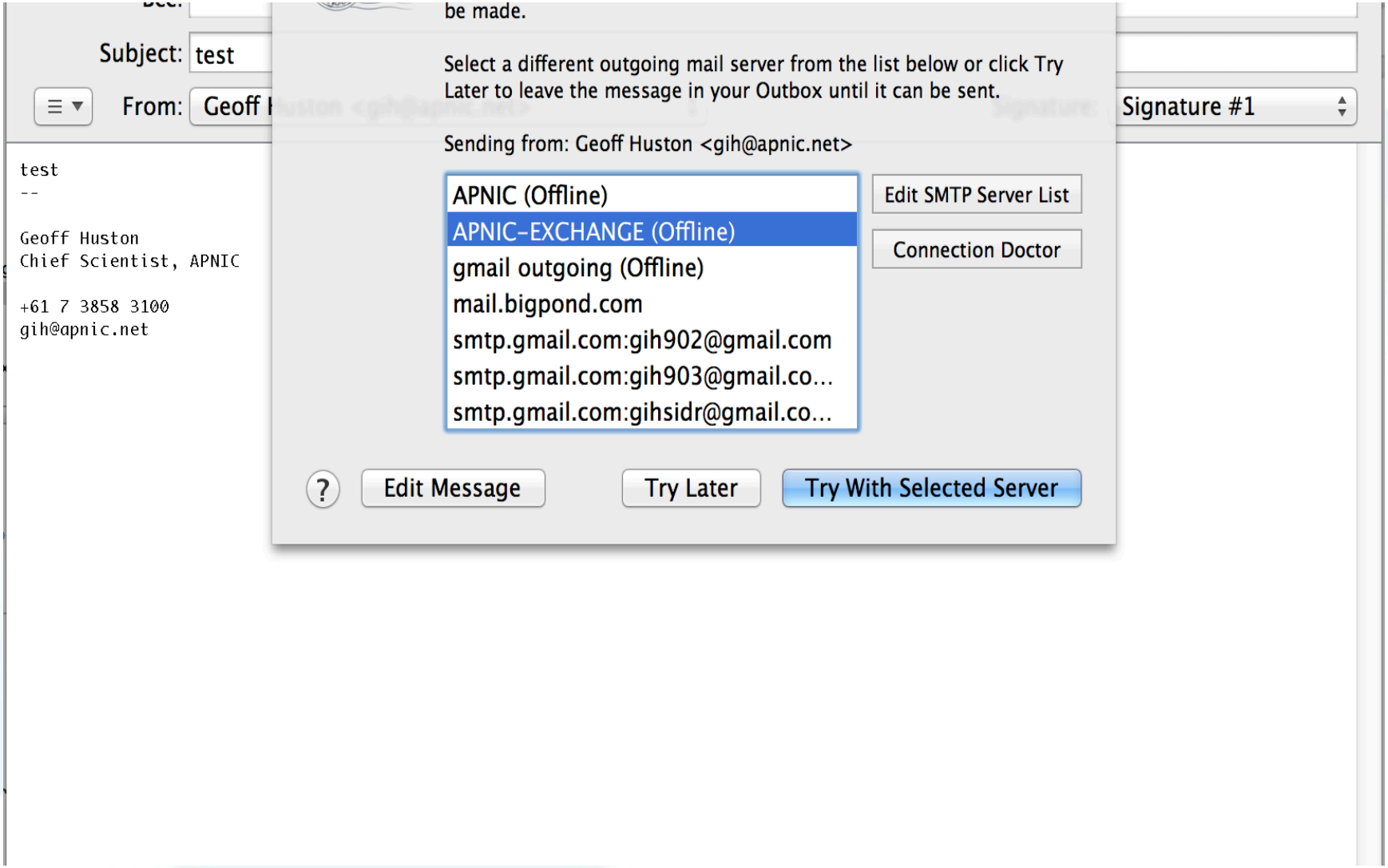
- Kerberos közösség szintén nem használ már IP címhez kötött ticketet..
- Mi van a privacy címekkel, amelyek gyakran változnak?
  - Szerencsére a szabvány ~ naponkénti váltást javasol

MESE A IPV6 SZABVÁNYOKRÓL ÉS A LITERAL CÍMEKRŐL

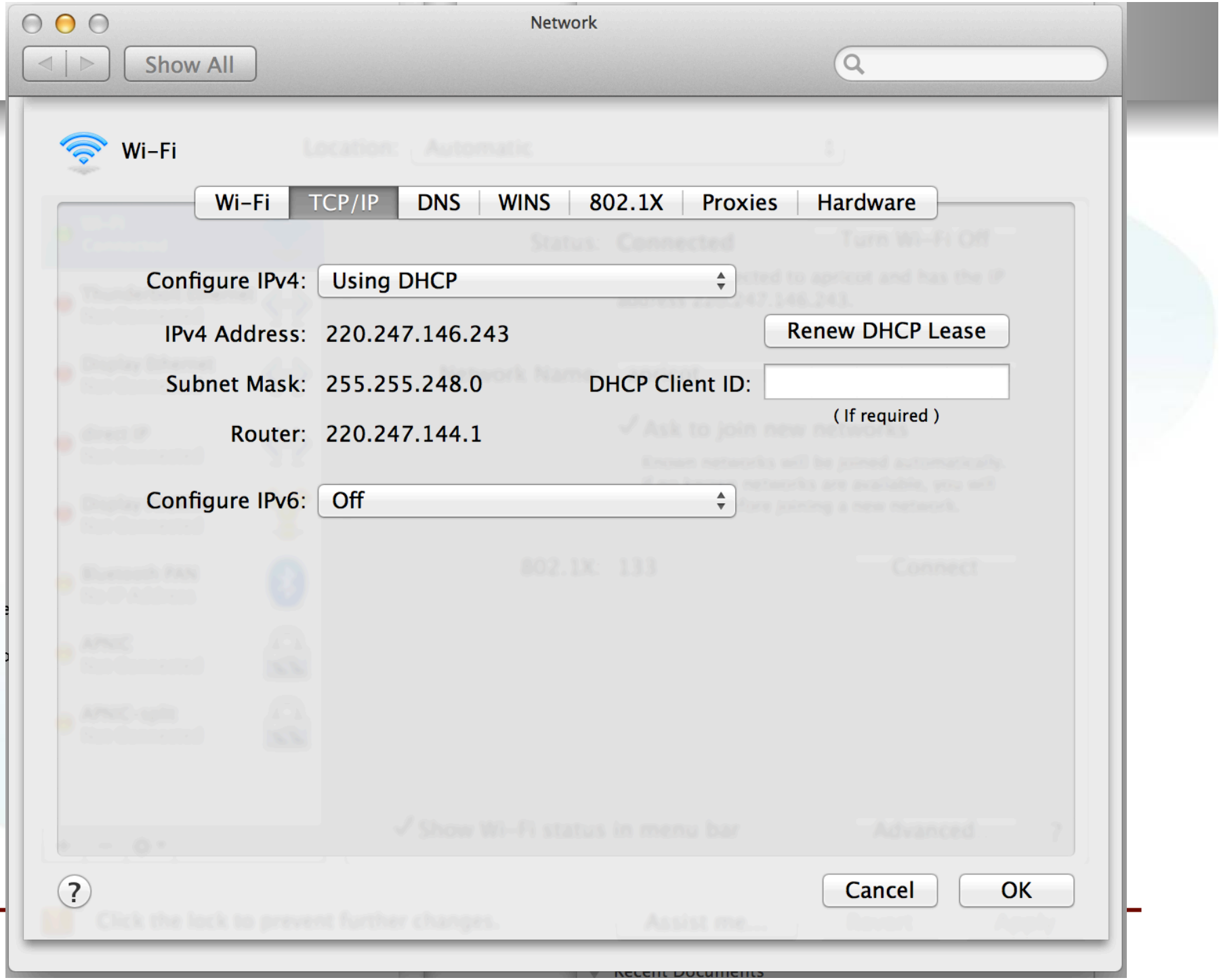
Geoff Huston


Accounts
General
Accounts
Junk Mail
Fonts & Colors
Viewing
Composing
Signatures
Rules
Description
Server Name
In Use By Account
smtp.gmail.com
gih902 gmail
smtp.gmail.com
Gmail - gih903
mail.bigpond.com
BigPond Wireless Broadband...
smtp.gmail.com
APNIC
asmtp.apnic.net
APNIC-EXCHANGE
exch-smtp.apnic...
iCloud, gih@apnic.net
Account Information
Advanced
Use default ports (25, 465, 587)
Use custom port:
Use Secure Sockets Layer (SSL)
Authentication:
Password
User Name:
gih
Password:
Cancel
OK


Wi-Fi
TCP/IP
DNS
WINS
802.1X
Proxies
Hardware
Configure IPv4:
Using DHCP
IPv4 Address:
220.247.146.243
Renew DHCP Lease
Subnet Mask:
255.255.248.0
DHCP Client ID:
(If required)
Router:
220.247.144.1
Configure IPv6:
Automatically
Router:
fe80::20b:60ff:fea1:881b
IPv6 Address
Prefix...
2001:df9::4015:baf6:b1ff:fe1a:72af
64
2001:df9::4015:1430:8367:2073:5d0
64


be made.
Select a different outgoing mail server from the list below or click Try Later to leave the message in your Outbox until it can be sent.
Sending from: Geoff Huston <gih@apnic.net>
APNIC (Offline)
APNIC-EXCHANGE (Offline)
gmail outgoing (Offline)
mail.bigpond.com
smtp.gmail.com:gih902@gmail.com
smtp.gmail.com:gih903@gmail.co...
smtp.gmail.com:gihsidr@gmail.co...
Edit SMTP Server List
Connection Doctor
Edit Message
Try Later
Try With Selected Server
Subject: test
From: Geoff
Signature #1
test
--
Geoff Huston
Chief Scientist, APNIC
+61 7 3858 3100
gih@apnic.net

Status	Account Name	Account Type	Details
🟢	APNIC	SMTP	Connection and login to server succeeded.
🔴	APNIC-EXCHANGE	SMTP	Could not connect to this SMTP server. Check your network connection and that you entered the correct information in the Account preferences. Also verify that the server supports SSL. If it does not, deselect the “Use SSL” checkbox in the Advanced tab of Account preferences.
🟢	BigPond Wireless…	POP	Connection and login to server succeeded.
🟢	gih@apnic.net	IMAP	Connection and login to server succeeded.
🟢	gih902 gmail	Google IMAP	Connection and login to server succeeded.
🟢	Gmail - gih903	Google IMAP	Connection and login to server succeeded.


Network
Show All
Wi-Fi
Wi-Fi
TCP/IP
DNS
WINS
802.1X
Proxies
Hardware
Configure IPv4:
Using DHCP
IPv4 Address:
220.247.146.243
Renew DHCP Lease
Subnet Mask:
255.255.248.0
DHCP Client ID:
(If required)
Router:
220.247.144.1
Configure IPv6:
Off
Cancel
OK

```
•1362012788.007246 IP6 2001:dd8:9:2::101:16.587 > 2001:df9::4015:1430:8367:2073:5d0.57100: Flags [P.], seq 1:97, ack 1, win 4320, options [nop,nop,TS val 508156037 ecr 8898059
•         0x0000:  b8f6 b11a 72af 000b 60a1 881b 86dd 6000  ....r...`.....`.
•         0x0010:  0000 0080 0632 2001 0dd8 0009 0002 0000  .....2..........
•         0x0020:  0000 0101 0016 2001 0df9 0000 4015 1430  ............@..0
•         0x0030:  8367 2073 05d0 024b df0c 6af0 c68b 23fc  .g.s...K..j...#.
•         0x0040:  7ec3 8018 10e0 799a 0000 0101 080a 1e49  ~.....y........I
•         0x0050:  d885 3509 5c7c 3232 3020 4941 4d44 4132  ..5.\|220.IAMDA2
•         0x0060:  2e6f 7267 2e61 706e 6963 2e6e 6574 204d  .org.apnic.net.M
•         0x0070:  6963 726f 736f 6674 2045 534d 5450 204d  icrosoft.ESMTP.M
•         0x0080:  4149 4c20 5365 7276 6963 6520 7265 6164  AIL.Service.read
•         0x0090:  7920 6174 2054 6875 2c20 3238 2046 6562  y.at.Thu,.28.Feb
•         0x00a0:  2032 3031 3320 3130 3a35 333a 3039 202b  .2013.10:53:09.+
•         0x00b0:  3130 3030 0d0a                           1000..
•1362012788.007437 IP6 2001:df9::4015:1430:8367:2073:5d0.57100 > 2001:dd8:9:2::101:16.587: Flags [.], ack 97, win 8205, options [nop,nop,TS val 889806133 ecr 508156037], lengt
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•         0x0010:  0000 0020 0640 2001 0df9 0000 4015 1430  .....@......@..0
•         0x0020:  8367 2073 05d0 2001 0dd8 0009 0002 0000  .g.s............
•         0x0030:  0000 0101 0016 df0c 024b 23fc 7ec3 6af0  .........K#.~.j.
•         0x0040:  c6eb 8010 200d bcca 0000 0101 080a 3509  ..............5.
•         0x0050:  5d35 1e49 d885                           ]5.I..
•1362012788.019769 IP6 2001:df9::4015:1430:8367:2073:5d0.57100 > 2001:dd8:9:2::101:16.587: Flags [P.], seq 1:48, ack 97, win 8205, options [nop,nop,TS val 889806145 ecr 508156
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•         0x0010:  0000 004f 0640 2001 0df9 0000 4015 1430  ...O.@......@..0
•         0x0020:  8367 2073 05d0 2001 0dd8 0009 0002 0000  .g.s............
•         0x0030:  0000 0101 0016 df0c 024b 23fc 7ec3 6af0  .........K#.~.j.
•         0x0040:  c6eb 8018 200d fa4d 0000 0101 080a 3509  .......M......5.
•         0x0050:  5d41 1e49 d885 4548 4c4f 205b 4950 7636  ]A.I..EHLO.[IPv6
•         0x0060:  3a32 3030 313a 6466 393a 3a34 3031 353a  :2001:df9::4015:
•         0x0070:  3134 3330 3a38 3336 373a 3230 3733 3a35  1430:8367:2073:5
•         0x0080:  6430 5d0d 0a                             d0]..
•1362012788.203943 IP6 2001:dd8:9:2::101:16.587 > 2001:df9::4015:1430:8367:2073:5d0.57100: Flags [.], ack 48, win 4367, options [nop,nop,TS val 508156234 ecr 889806145], lengt
•         0x0000:  b8f6 b11a 72af 000b 60a1 881b 86dd 6000  ....r...`.....`.
•         0x0010:  0000 0020 0632 2001 0dd8 0009 0002 0000  .....2..........
•         0x0020:  0000 0101 0016 2001 0df9 0000 4015 1430  ............@..0
•         0x0030:  8367 2073 05d0 024b df0c 6af0 c6eb 23fc  .g.s...K..j...#.
•         0x0040:  7ef2 8010 110f cac8 0000 0101 080a 1e49  ~..............I
•         0x0050:  d94a 3509 5d41                           .J5.]A
•1362012788.204423 IP6 2001:dd8:9:2::101:16.587 > 2001:df9::4015:1430:8367:2073:5d0.57100: Flags [P.], seq 97:128, ack 48, win 4367, options [nop,nop,TS val 508156235 ecr 8898
•         0x0000:  b8f6 b11a 72af 000b 60a1 881b 86dd 6000  ....r...`.....`.
•         0x0010:  0000 003f 0632 2001 0dd8 0009 0002 0000  ...?.2..........
•         0x0020:  0000 0101 0016 2001 0df9 0000 4015 1430  ............@..0
•         0x0030:  8367 2073 05d0 024b df0c 6af0 c6eb 23fc  .g.s...K..j...#.
•         0x0040:  7ef2 8018 110f 0952 0000 0101 080a 1e49  ~......R.......I
•         0x0050:  d94b 3509 5d41 3530 3120 352e 352e 3420  .K5.]A501.5.5.4.
•         0x0060:  496e 7661 6c69 6420 646f 6d61 696e 206e  Invalid.domain.n
•         0x0070:  616d 650d 0a                             ame..
•1362012788.204652 IP6 2001:df9::4015:1430:8367:2073:5d0.57100 > 2001:dd8:9:2::101:16.587: Flags [.], ack 128, win 8203, options [nop,nop,TS val 889806328 ecr 508156235], leng
•         0x0000:  000b 60a1 881b b8f6 b11a 72af 86dd 6000  ..`.......r...`.
```

```
•1362012788.007246 IP6 2001:dd8:9:2::101:16.587 > 2001:df9::4015:1430:8367:2073:5d0.57100: Flags [P.], seq 1:97, ack 1, win 4320, options [nop,nop,TS val 508156037 ecr 8898059
•	0x0000:  b8f6 b11a 72af 000b 60a1 881b 86dd 6000  ....r...`.....`.
•	0x0010:  0000 0080 0632 2001 0dd8 0009 0002 0000  .....2..........
•	0x0020:  0000 0101 0016 2001 0df9 0000 4015 1430  ............@..0
•	0x0030:  8367 2073 05d0 024b df0c 6af0 c68b 23fc  .g.s...K..j...#.
•	0x0040:  7ec3 8018 10e0 799a 0000 0101 080a 1e49  ~.....y........I
•	0x0050:  d885 3509 5c7c 3232 3020 4941 4d44 4132  ..5.\|220.IAMDA2
•	0x0060:  2e6f 7267 2e61 706e 6963 2e6e 6574 204d  .org.apnic.net.M
•	0x0070:  6963 726f 736f 6674 2045 534d 5450 204d  icrosoft.ESMTP.M
•	0x0080:  4149 4c20 5365 7276 6963 6520 7265 6164  AIL.Service.read
•	0x0090:  7920 6174 2054 6875 2c20 3238 2046 6562  y.at.Thu,.28.Feb
•	0x00a0:  2032 3031 3320 3130 3a35 333a 3039 202b  .2013.10:53:09.+
•	0x00b0:  3130 3030 0d0a                           1000..
•1362012788.007437 IP6 2001:df9::4015:1430:8367:2073:5d0.57100 > 2001:dd8:9:2::101:16.587: Flags [.], ack 97, win 8205, options [nop,nop,TS val 889806133 ecr 508156037], lengt
•	0x0000:  000b 60a1 881b b8f6 b11a 72af 86dd 6000  ..`.......r...`.
•	0x0010:  0000 0020 0640 2001 0df9 0000 4015 1430  .....@......@..0
•	0x0020:  8367 2073 05d0 2001 0dd8 0009 0002 0000  .g.s............
•	0x0030:  0000 0101 0016 df0c 024b 23fc 7ec3 6af0  .........K#.~.j.
•	0x0040:  c6eb 8010 200d bcca 0000 0101 080a 3509  ..............5.
•	0x0050:  5d35 1e49 d885                           ]5.I..
•1362012788.019769 IP6 2001:df9::4015:1430:8367:2073:5d0.57100 > 2001:dd8:9:2::101:16.587: Flags [P.], seq 1:48, ack 97, win 8205, options [nop,nop,TS val 889806145 ecr 508156
•	0x0000:  000b 60a1 881b b8f6 b11a 72af 86dd 6000  ..`.......r...`.
•	0x0010:  0000 004f 0640 2001 0df9 0000 4015 1430  ...O.@......@..0
•	0x0020:  8367 2073 05d0 2001 0dd8 0009 0002 0000  .g.s............
•	0x0030:  0000 0101 0016 df0c 024b 23fc 7ec3 6af0  .........K#.~.j.
•	0x0040:  c6eb 8018 200d fa4d 0000 0101 080a 3509  .......M......5.
•	0x0050:  5d41 1e49 d885 4548 4c4f 205b 4950 7636  ]A.I..EHLO.[IPv6
•	0x0060:  3a32 3030 313a 6466 393a 3a34 3031 353a  :2001:df9::4015:
•	0x0070:  3134 3330 3a38 3336 373a 3230 3733 3a35  1430:8367:2073:5
•	0x0080:  6430 5d0d 0a                             d0]..
•1362012788.203943 IP6 2001:dd8:9:2::101:16.587 > 2001:df9::4015:1430:8367:2073:5d0.57100: Flags [.], ack 48, win 4367, options [nop,nop,TS val 508156234 ecr 889806145], lengt
•	0x0000:  b8f6 b11a 72af 000b 60a1 881b 86dd 6000  ....r...`.....`.
•	0x0010:  0000 0020 0632 2001 0dd8 0009 0002 0000  .....2..........
•	0x0020:  0000 0101 0016 2001 0df9 0000 4015 1430  ............@..0
•	0x0030:  8367 2073 05d0 024b df0c 6af0 c6eb 23fc  .g.s...K..j...#.
•	0x0040:  7ef2 8010 110f cac8 0000 0101 080a 1e49  ~..............I
•	0x0050:  d94a 3509 5d41                           .J5.]A
•1362012788.204423 IP6 2001:dd8:9:2::101:16.587 > 2001:df9::4015:1430:8367:2073:5d0.57100: Flags [P.], seq 97:128, ack 48, win 4367, options [nop,nop,TS val 508156235 ecr 8898
•	0x0000:  b8f6 b11a 72af 000b 60a1 881b 86dd 6000  ....r...`.....`.
•	0x0010:  0000 003f 0632 2001 0dd8 0009 0002 0000  ...?.2..........
•	0x0020:  0000 0101 0016 2001 0df9 0000 4015 1430  ............@..0
•	0x0030:  8367 2073 05d0 024b df0c 6af0 c6eb 23fc  .g.s...K..j...#.
•	0x0040:  7ef2 8018 110f 0952 0000 0101 080a 1e49  ~.....R.......I
•	0x0050:  d94a 3509 5d41 3530 3120 352e 352e 3420  .K5.]A501.5.5.4.
•	0x0060:  496e 7661 6c69 6420 646f 6d61 696e 206e  Invalid.domain.n
•	0x0070:  616d 650d 0a                             ame..
•1362012788.204652 IP6 2001:df9::4015:1430:8367:2073:5d0.57100 > 2001:dd8:9:2::101:16.587: Flags [.], ack 128, win 8203, options [nop,nop,TS val 889806328 ecr 508156235], leng
•	0x0000:  000b 60a1 881b b8f6 b11a 72af 86dd 6000  ..`.......r...`.
```

telnet exch-v6only.rand.apnic.net 587

Trying 2001:dd8:9:2::101:16...

Connected to exch-v6only.rand.apnic.net.

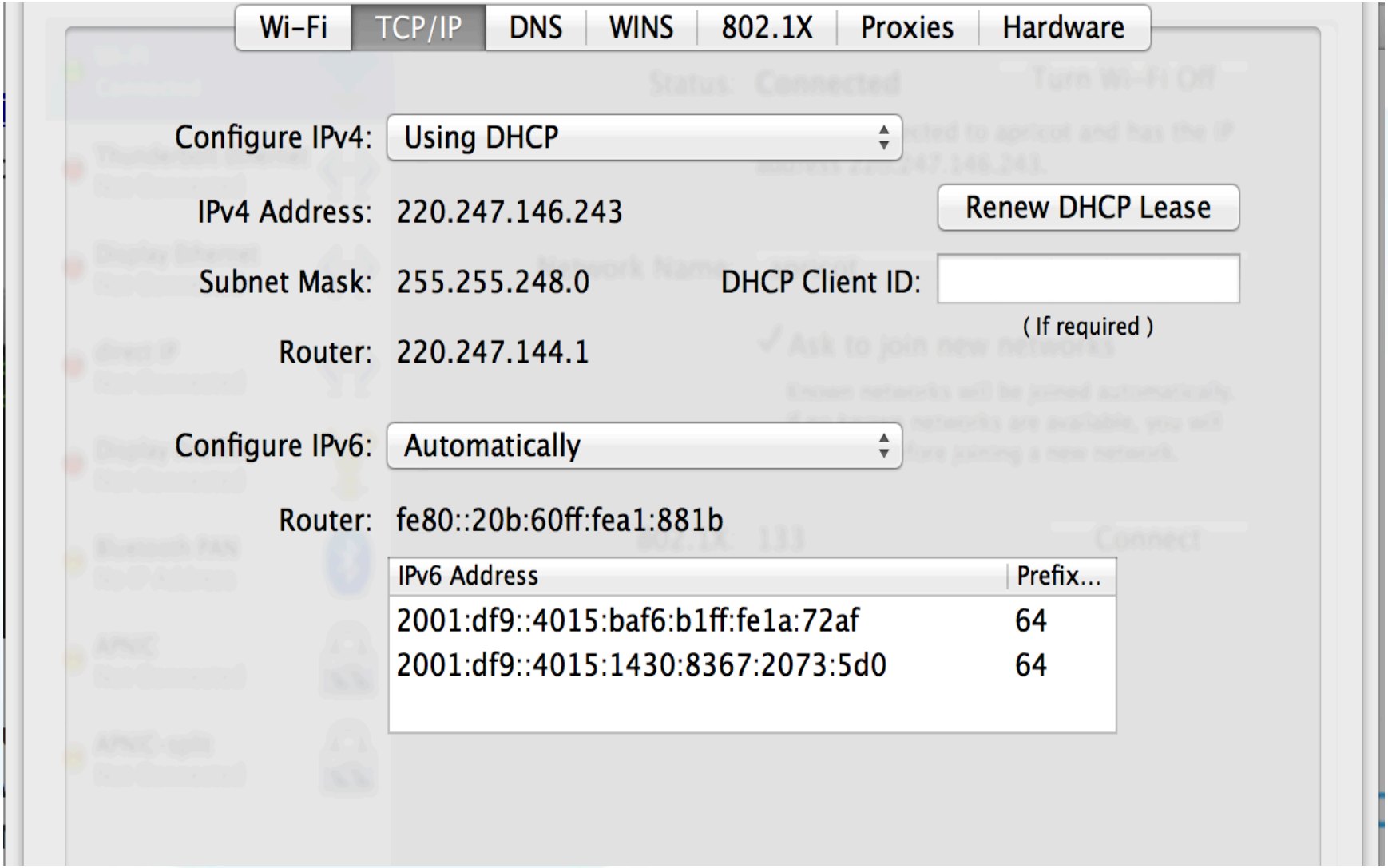
Escape character is '^]'.

220 IAMDA1.org.apnic.net Microsoft ESMTP MAIL Service ready at Thu, 28 Feb 2013 10:55:11 +1000

EHLO [IPv6:2001:df9::4015:1430:8367:2073:5d0]

501 5.5.4 Invalid domain name

IPv6 kikapcs



Symptom

- Microsoft mail exchange server is thinking that 2001:df9::4015:1430:8367:2073:5d0 is a badly formatted IPv6 address.
- Is it badly formatted?
- Let's try the alternate address format on the Exchange mail server where the “::” is expanded to “:0:”.

220 IAMDA1.org.apnic.net Microsoft ESMTP MAIL Service ready at Thu, 28 Feb 2013 17:03:46 +1000

EHLO [IPv6:2001:df9::4015:1430:8367:2073:5d0]

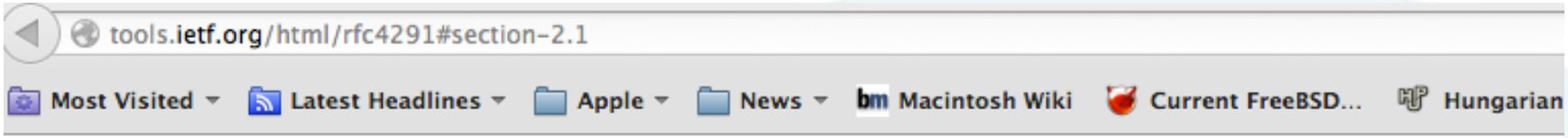
501 5.5.4 Invalid domain name

EHLO [IPv6:2001:df9:0:4015:1430:8367:2073:5d0]

250-IAMDA1.org.apnic.net Hello [2001:dd8:9:2::101:249]

```
telnet exch-v6only.rand.apnic.net 587
Trying 2001:dd8:9:2::101:16...
Connected to exch-v6only.rand.apnic.net.
Escape character is '^]'.
EHLO [IPv6:2001:df9:0:4015:baf6:b1ff:fe1a:72af]
250-IAMDA1.org.apnic.net Hello [2001:dd8:9:2::101:249]
250-SIZE 30965760
250-PIPELINING
250-DSN
250-ENHANCEDSTATUSCODES
250-STARTTLS
250-X-ANONYMOUSTLS
250-AUTH GSSAPI NTLM
250-X-EXPS GSSAPI NTLM
250-8BITMIME
250-BINARYMIME
250-CHUNKING
250-XEXCH50
```

RFC 4291



2.2. Text Representation of Addresses

There are three conventional forms for representing IPv6 addresses as text strings:

1. The preferred form is x:x:x:x:x:x:x:x, where the 'x's are one to four hexadecimal digits of the eight 16-bit pieces of the address. Examples:

   ABCD:EF01:2345:6789:ABCD:EF01:2345:6789

   2001:DB8:0:0:8:800:200C:417A

   Note that it is not necessary to write the leading zeros in an individual field, but there must be at least one numeral in every field (except for the case described in 2.).

2. Due to some methods of allocating certain styles of IPv6 addresses, it will be common for addresses to contain long strings of zero bits. In order to make writing addresses containing zero bits easier, a special syntax is available to compress the zeros. The use of "::" indicates one or more groups of 16 bits of zeros. The "::" can only appear once in an address. The "::" can also be used to compress leading or trailing zeros in an address.

RFC 5952

[Docs] [txt|pdf] [draft-ietf-6man-t...] [Diff1] [Diff2] [Errata]

PROPOSED STANDARD
Errata Exist

Internet Engineering Task Force (IETF) — S. Kawamura
Request for Comments: 5952 — NEC BIGLOBE, Ltd.
Updates: 4291 — M. Kawashima
Category: Standards Track — NEC AccessTechnica, Ltd.
ISSN: 2070-1721 — August 2010

A Recommendation for IPv6 Address Text Representation

Abstract

As IPv6 deployment increases, there will be a dramatic increase in the need to use IPv6 addresses in text. While the IPv6 address architecture in Section 2.2 of RFC 4291 describes a flexible model for text representation of an IPv6 address, this flexibility has been causing problems for operators, system engineers, and users. This document defines a canonical textual representation format. It does not define a format for internal storage, such as within an application or database. It is expected that the canonical format will be followed by humans and systems when representing IPv6 addresses as text, but all implementations must accept and be able to handle any legitimate RFC 4291 format.

4.1. Handling Leading Zeros in a 16-Bit Field

Leading zeros MUST be suppressed. For example, 2001:0db8::0001 is not acceptable and must be represented as 2001:db8::1. A single 16-bit 0000 field MUST be represented as 0.

4.2. "::" Usage

4.2.1. Shorten as Much as Possible

The use of the symbol "::" MUST be used to its maximum capability. For example, 2001:db8:0:0:0:0:2:1 must be shortened to 2001:db8::2:1. Likewise, 2001:db8::0:1 is not acceptable, because the symbol "::" could have been used to produce a shorter representation 2001:db8::1.

4.2.2. Handling One 16-Bit 0 Field

The symbol "::" MUST NOT be used to shorten just one 16-bit 0 field. For example, the representation 2001:db8:0:1:1:1:1:1 is correct, but 2001:db8::1:1:1:1:1 is not correct.

4.2.3. Choice in Placement of "::"

When there is an alternative choice in the placement of a "::", the longest run of consecutive 16-bit 0 fields MUST be shortened (i.e., the sequence with three consecutive zero fields is shortened in 2001:0:0:1:0:0:0:1). When the length of the consecutive 16-bit 0 fields are equal (i.e., 2001:db8:0:0:1:0:0:1), the first sequence of zero bits MUST be shortened. For example, 2001:db8::1:0:0:1 is correct representation.

Compliance

RFC5952 says that if there is a "::" instance it should be maximal, so that constructs such as ":0::" or "::0:" are invalid. Does Microsoft's Exchange Mail Server agree?

```
EHLO [IPv6:1:0::0:2]
250-NXMDA1.org.apnic.net Hello [203.119.101.xx]
```

Evidently not.

RFC5952 says that if there are two 'runs' of consecutive 0-valued 16 bit nibbles, the longer run is to be replaced by a "::" symbol. Does Microsoft's Exchange Mail Server agree?

```
EHLO [IPv6:1::4:0:0:0:8]
250-NXMDA1.org.apnic.net Hello [203.119.101.xx]
```

Evidently not.

Compliance /2

The writing in RFC5952 is incredibly sloppy for a Proposed Standard, but one interpretation of the text is that RFC5952 says that if there is a 'run' of 2 or more consecutive 0-valued 16 bit nibbles then it must be replaced by a "::" symbol. Does Microsoft's Exchange Mail Server agree?

```
EHLO [IPv6:0:0:0:0:0:0:0:0]
250-NXMDA1.org.apnic.net Hello [203.119.101.xx]
```

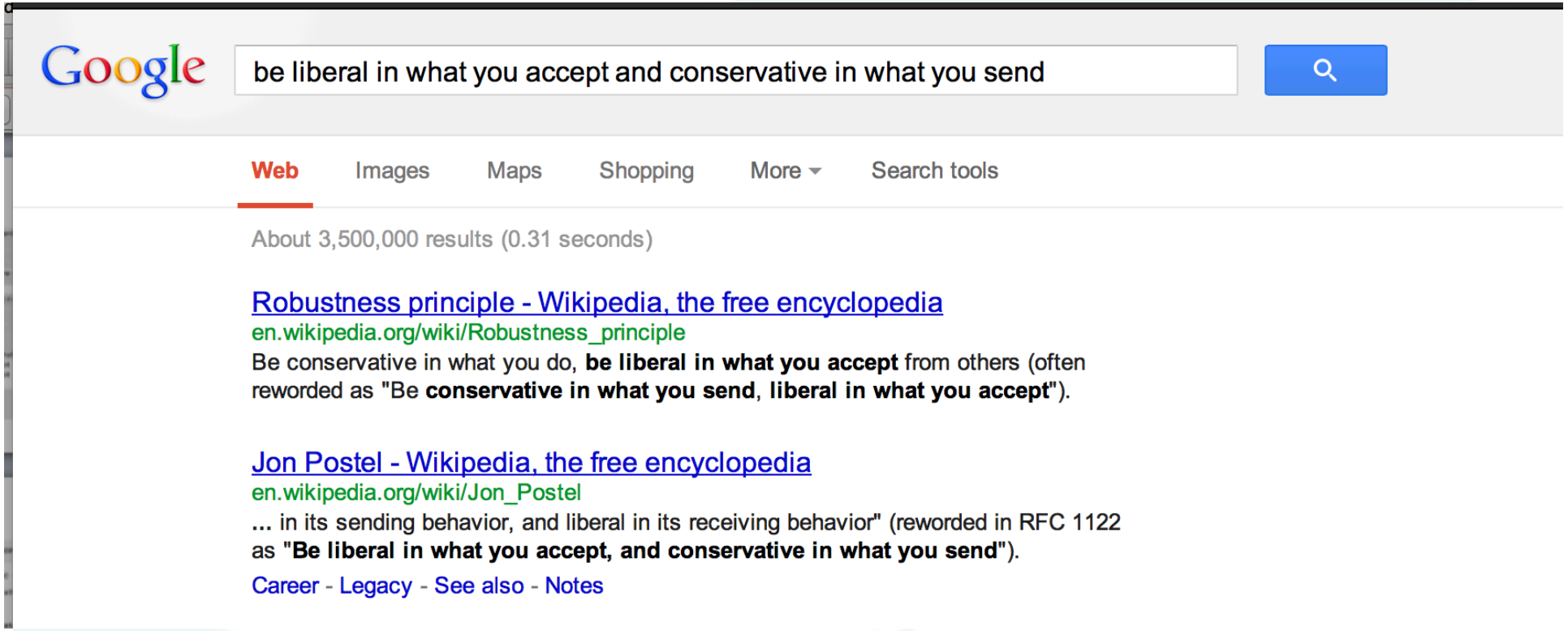
Evidently not.

Maybe Microsoft's Mail Exchange Server is not actually implementing the provisions of RFC5952 at all. Maybe its implementing a simpler set of constraints as specified in RFC2821 which is slightly more constraining than RFC4291 (even though RFC2821 was published earlier), in so far as it contains a formal grammar form of the IPv6 literal:

```
IPv6-comp = [IPv6-hex *5(":" IPv6-hex)] "::" [IPv6-hex *5(":"IPv6-hex)]
      ; The "::" represents at least 2 16-bit groups of zeros
```

So lets test this. Does Microsoft's Exchange Mail Server implement a IPv6 literal parser that implements the syntax of RFC2821?

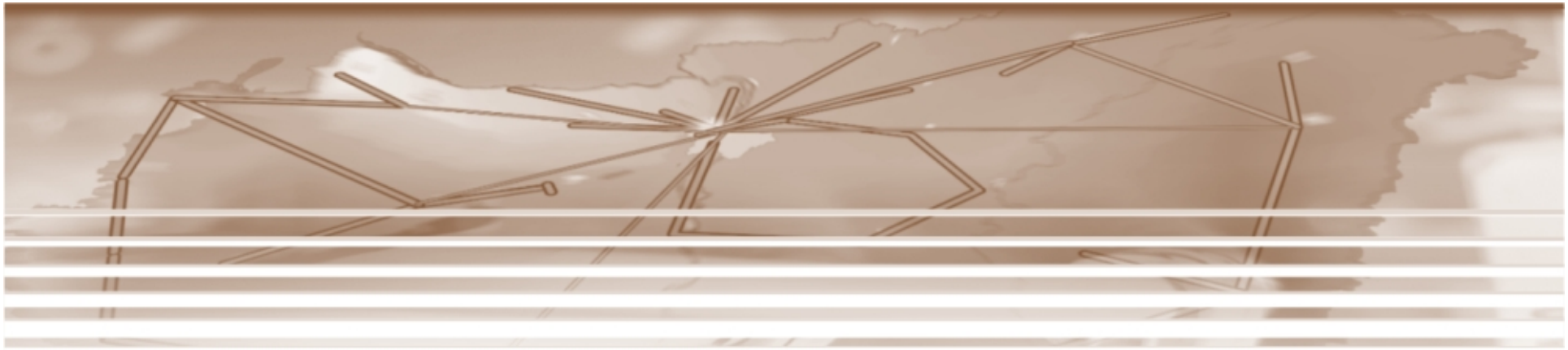
```
EHLO [IPv6:1::2::3]
250-NXMDA1.org.apnic.net Hello [203.119.101.xx]
```


Google
be liberal in what you accept and conservative in what you send
Web
Images
Maps
Shopping
More
Search tools
About 3,500,000 results (0.31 seconds)
Robustness principle - Wikipedia, the free encyclopedia
en.wikipedia.org/wiki/Robustness_principle
Be conservative in what you do, be liberal in what you accept from others (often reworded as "Be conservative in what you send, liberal in what you accept").
Jon Postel - Wikipedia, the free encyclopedia
en.wikipedia.org/wiki/Jon_Postel
... in its sending behavior, and liberal in its receiving behavior" (reworded in RFC 1122 as "Be liberal in what you accept, and conservative in what you send").
Career - Legacy - See also - Notes

Megoldás

- Exchange javitas?
- Kliens javitas?
- Kliens fall-back IPv4-re? – ez nem megy…

Kérdések?



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