IPv6 HandsOn #1
Tuneles, DNS y Web
Dual-Stack

LACNIC - Abril 2012
sofia@lacnic.net -- carlos@lacnic.net

Objetivos y Suposiciones

- Al final del procedimiento que vamos a seguir tendremos una pagina web en Internet accesible por IPv6
- Asumimos conocimiento basico de IPv6 (direccionamiento) y de redes (routing, tuneles)

Entorno

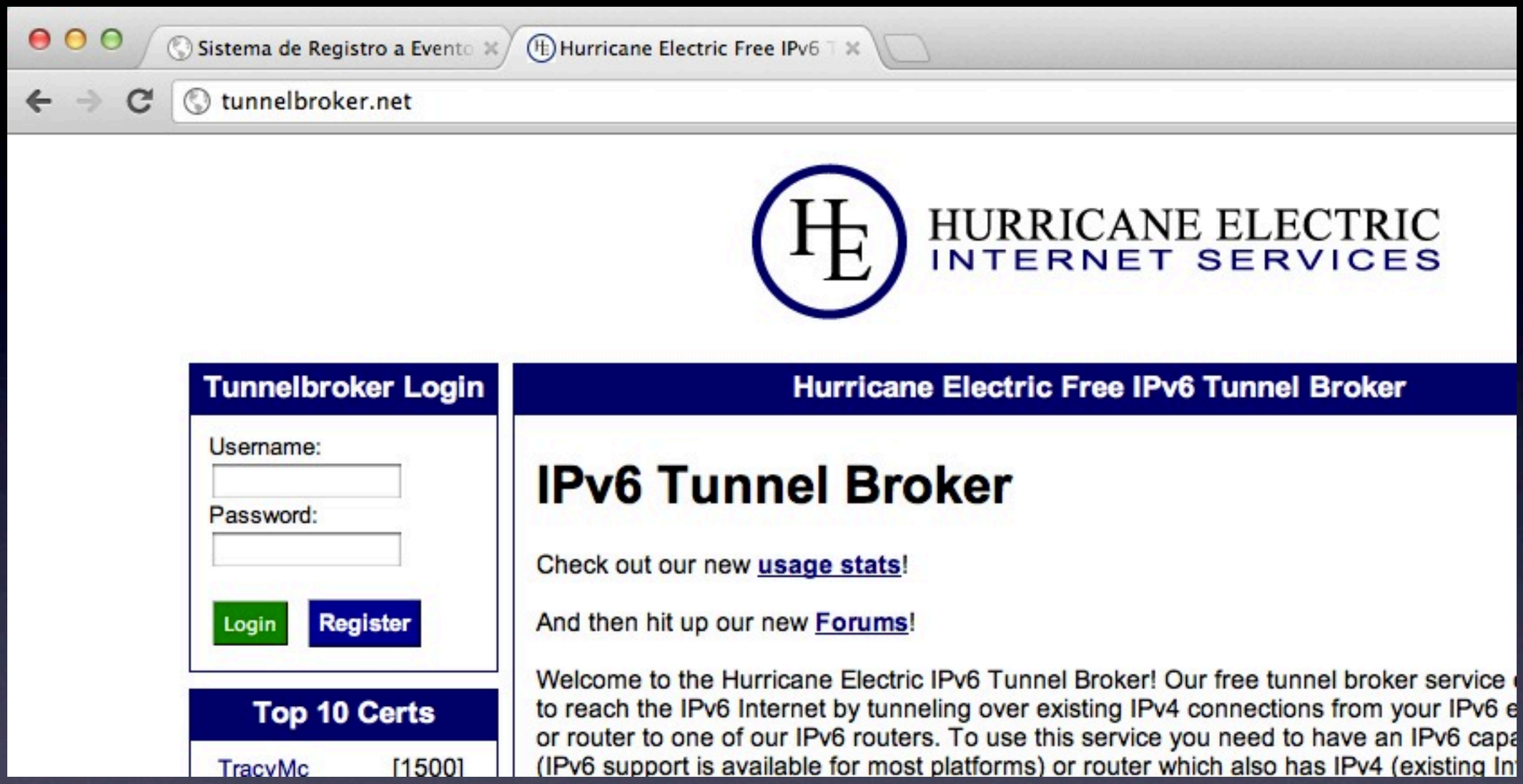
- Vamos a seguir los pasos en una maquina virtual con Debian 6 ‘blank’, recién instalada
- Asumimos que la VM tiene conectividad ‘directa’ a Internet (sin NAT)
  - Es posible hacerlo con NAT también pero hay otras complejidades

Pasos a seguir

- Registrarse en tunnelbroker.net (Hurricane Electric)
- Crear el tunel en tunnelbroker.net
- Configurar el tunel del lado del cliente
- Configurar registros DNS
- Configurar servidor Apache
- Testing

Configuración del Tunnel Broker

http://tunnelbroker.net



HURRICANE ELECTRIC
INTERNET SERVICES

Tunnelbroker Login

Username:

Password:

Login Register

Top 10 Certs

mwm	[1500]
voloshin	[1500]
module0x90	[1500]
kneissel	[1500]
phagras	[1500]
aantigua	[1500]
xorl86	[1500]
baka6	[1500]
pasquik	[1500]
scavara	[1500]

Latest 10 Certs

gmindru	[Sage]
moullas	[Sage]
nepalanu...	[Newb]
jtabu	[Newb]
briantum	[Expl]
aitsaidm	[Newb]
luismendoza	[Newb]
opeokesola	[Newb]
lujomebe	[Newb]

HE.net IPv6 Tunnel Broker Registration

After successfully completing registration, an email will be sent to the listed email address with your account password.

* = Required Information

* Account Name: sofiasilva
* Email: sofia@lacnic.net
* First Name: Sofia
* Last Name: Silva
Company Name: LACNIC
* Country: Uruguay
* Address: pública de México 6125/27
* City: Montevideo
* State/Region: Montevideo
* ZIP/Postal Code: 11400
* Phone: +59826042222

☑ I have read and agreed to the Terms and Services

Register

Quick Links

- Certification
- Tunnelbroker
- Free DNS
- Code
- BGP Toolkit
- Forums
- FAQ
- Video Presentations
- IPv6 Blog Posts
- Usage Statistics
- Tunnel Server Status
- Network Map
- Looking Glass (v4/v6)
- Route Server (telnet)
- Global IPv6 Report
- IPv6 BGP View

Services

- Transit
- Colocation
- Dedicated Servers

v4 Exhaustion

IPv4 & IPv6 Statistics

RIR v4 IPs Left

AfriNIC	59,067,495
APNIC	18,768,187
ARIN	117,573,803
LACNIC	53,451,140
RIPE	35,954,066

v6 ASNs

HURRICANE ELECTRIC
INTERNET SERVICES

Tunnelbroker Login

Username:

Password:

Login Register

Top 10 Certs

bylbo	[1500]
comptech	[1500]
adriangr...	[1500]
UltraZero	[1500]
gawul00	[1500]

Hurricane Electric Free IPv6 Tunnel Broker

You have successfully registered for Hurricane Electric's free IPv6 tunnelbroker service.
Your account information should be arriving in your email (sofia@lacnic.net) shortly.

If you have not received your account information within the next few hours, please contact us at ipv6@he.net and include your username in the email.

Quick Links

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- Free DNS
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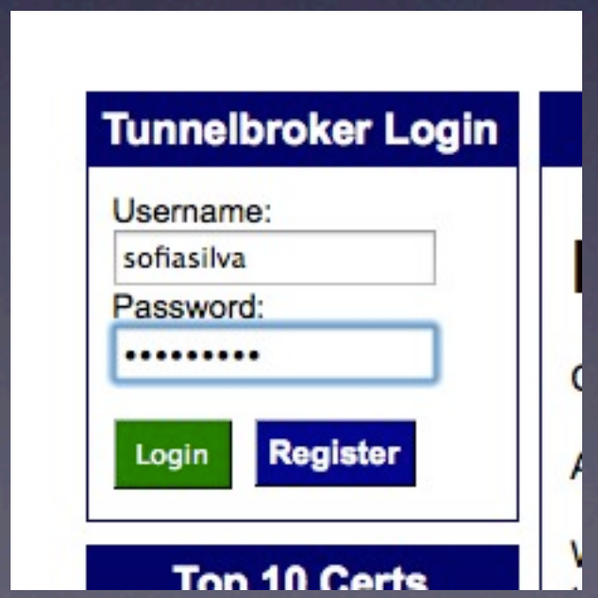

HURRICANE ELECTRIC
INTERNET SERVICES

Account Menu

Main Page
Account Info
Logout

User Functions

Combine Tunnels
Create Regular Tunnel
Create BGP Tunnel
IPv6 Portscan

Hurricane Electric Free IPv6 Tunnel Broker

Name: Sofia Silva
User ID: tb4f8c5542a670d2.76522670

Tunnel Broker News:

Update - 18 January 2012
[January 18, 2012]

Update - 13 January 2012
[January 13, 2012]

UPDATE - 16 October 2011
[October 16, 2011]

UPDATE - Sept. 27th, 2010
[September 27, 2011]

Dyn-compliant Endpoint Updates
[September 16, 2011]

HE.NET
IPv6
Certified
No Cert Yet
sofiasilva

Quick Links

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HURRICANE ELECTRIC
INTERNET SERVICES

Create New Tunnel

You currently have 0 of 5 tunnels configured.

- If you are trying to reclaim a tunnel simply use your last IPv4 address here. If you have any issues please email ipv6@he.net.
- If you have a public ASN and wish to setup a full BGP feed, please use **this form** instead.

IPv4 Endpoint (Your side): 200.7.85.155

You are viewing from: 200.7.85.155

We recommend you use: Miami, FL, US [209.51.161.58]

Available Tunnel Servers:

Asia

Hong Kong, HK	216.218.221.6
Singapore, SG	216.218.221.42
Tokyo, JP	74.82.46.6

Europe

Amsterdam, NL	216.66.84.46
Berlin, DE	216.66.86.114
Frankfurt, DE	216.66.80.30
London, UK	Not Available (Full)
Paris, FR	216.66.84.42
Prague, CZ	216.66.86.122
Stockholm, SE	216.66.80.90
Warsaw, PL	216.66.80.162
Zurich, CH	216.66.80.98

North America

Ashburn, VA, US	216.66.22.2
Chicago, IL, US	209.51.181.2
Dallas, TX, US	216.218.224.42
Fremont, CA, US	72.52.104.74
Fremont, CA, US	64.62.134.130
Los Angeles, CA, US	66.220.18.42
Miami, FL, US	209.51.161.58
New York, NY, US	Not Available (Full)
Seattle, WA, US	216.218.226.238
Toronto, ON, CA	216.66.38.58

Create Tunnel

Tunnel Details

IPv6 Tunnel | Example Configurations | Advanced

Tunnel ID: 156477 — Delete Tunnel

Creation Date: Apr 16, 2012

Description: Tunnel Webinario IPv6 LACNIC

IPv6 Tunnel Endpoints

Server IPv4 Address: 209.51.161.58

Server IPv6 Address: 2001:470:**4**:a59::1/64

Client IPv4 Address: **200.7.85.155**

Client IPv6 Address: 2001:470:**4**:a59::2/64

Available DNS Resolvers

Anycasted IPv6 Caching Nameserver: 2001:470:20::2

Anycasted IPv4 Caching Nameserver: 74.82.42.42

Routed IPv6 Prefixes

Routed /64: 2001:470:**5**:a59::/64

Routed /48: **Assign /48**

rDNS Delegations — **Edit**

rDNS Delegated NS1:

rDNS Delegated NS2:

rDNS Delegated NS3:

rDNS Delegated NS4:

rDNS Delegated NS5:

Tunnel Details

IPv6 Tunnel | **Example Configurations** | Advanced

Linux-route2

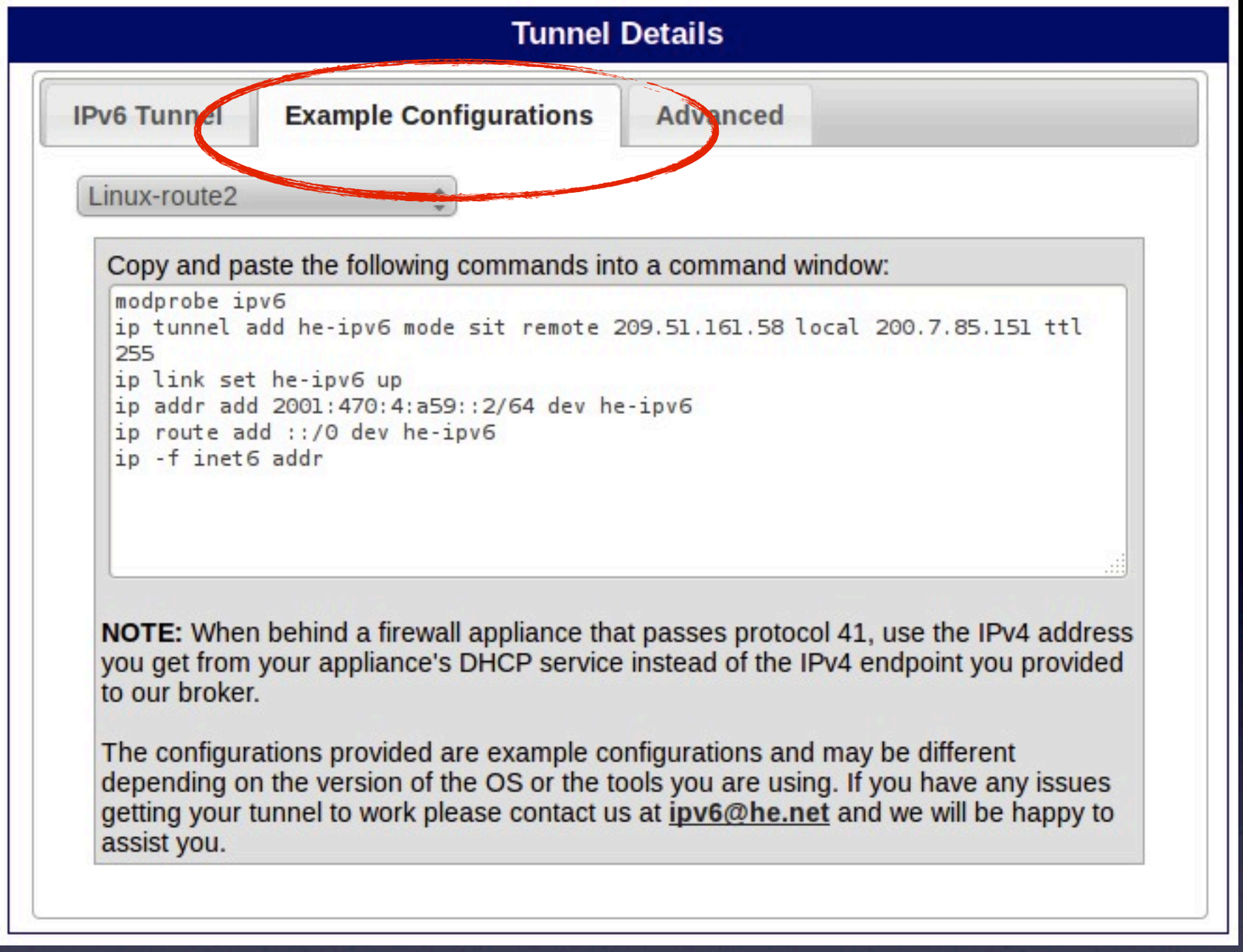
Copy and paste the following commands into a command window:

```
modprobe ipv6
ip tunnel add he-ipv6 mode sit remote 209.51.161.58 local 200.7.85.151 ttl
255
ip link set he-ipv6 up
ip addr add 2001:470:4:a59::2/64 dev he-ipv6
ip route add ::/0 dev he-ipv6
ip -f inet6 addr
```

NOTE: When behind a firewall appliance that passes protocol 41, use the IPv4 address you get from your appliance's DHCP service instead of the IPv4 endpoint you provided to our broker.

The configurations provided are example configurations and may be different depending on the version of the OS or the tools you are using. If you have any issues getting your tunnel to work please contact us at **ipv6@he.net** and we will be happy to assist you.

1. Tomar la configuración de ejemplo



Tunnel Details

IPv6 Tunnel | Example Configurations | Advanced

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NOTE: When behind a firewall appliance that passes protocol 41, use the IPv4 address you get from your appliance's DHCP service instead of the IPv4 endpoint you provided to our broker.

The configurations provided are example configurations and may be different depending on the version of the OS or the tools you are using. If you have any issues getting your tunnel to work please contact us at ipv6@he.net and we will be happy to assist

1. Tomar la configuración de ejemplo

marcelo — sa@ipv6-handson-1: ~ — ssh — 83×26

```
#!/bin/bash
modprobe ipv6
ip tunnel add he-ipv6 mode sit remote 209.51.161.58 local 200.7.84.178 ttl 255
ip link set he-ipv6 up
ip addr add 2001:470:4:a6d::2/64 dev he-ipv6
ip route add ::/0 dev he-ipv6
ip -f inet6 addr

~
~
~
```

2. Crear un script ‘set-tunnel.sh’

1. Tomar la configuración de ejemplo

Tunnel Details

IPv6 Tunnel | Example Configurations | Advanced

Linux-route2

Copy and paste the following commands into a command window:

```
modprobe ipv6
ip tunnel add he-ipv6 mode sit remote 209.51.161.58 local 200.7.85.151 ttl
255
ip link set he-ipv6 up
ip addr add 2001:470:4:a59::2/64 dev he-ipv6
ip route add ::/0 dev he-ipv6
ip -f inet6 addr
```

NOTE: When behind a firewall appliance that passes protocol 41, use the IPv4 address you get from your appliance's DHCP service instead of the IPv4 endpoint you provided to our broker.

The configurations provided are example configurations and may be different depending on the version of the OS or the tools you are using. If you have any issues getting your tunnel to work please contact us at ipv6@he.net and we will be happy to assist

marcelo — sa@ipv6-handson-1: ~ — ssh — 83×26

```
#!/bin/bash
modprobe ipv6
ip tunnel add he-ipv6 mode sit remote 209.51.161.58 local 200.7.84.178 ttl 255
ip link set he-ipv6 up
ip addr add 2001:470:4:a6d::2/64 dev he-ipv6
ip route add ::/0 dev he-ipv6
ip -f inet6 addr
~
~
~
```

2. Crear un script ‘set-tunnel.sh’

¡Ejecutar y probar!

- Comandos útiles:
  - `ip -6 link show`
  - `ip -6 addr show`
  - `ip -6 route show`

¡Ejecutar y probar! (ii)

marcelo — sa@ipv6-handson-1: ~ — ssh — 83×26

```
root@ipv6-handson-1:~# ping6 2001:470:4:a6d::1
PING 2001:470:4:a6d::1(2001:470:4:a6d::1) 56 data bytes
64 bytes from 2001:470:4:a6d::1: icmp_seq=1 ttl=64 time=168 ms
64 bytes from 2001:470:4:a6d::1: icmp_seq=2 ttl=64 time=169 ms
64 bytes from 2001:470:4:a6d::1: icmp_seq=3 ttl=64 time=198 ms
^C
--- 2001:470:4:a6d::1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2006ms
rtt min/avg/max/mdev = 168.227/178.829/198.659/14.033 ms
root@ipv6-handson-1:~#
```

marcelo — sa@ipv6-handson-1: ~ — ssh — 83×26

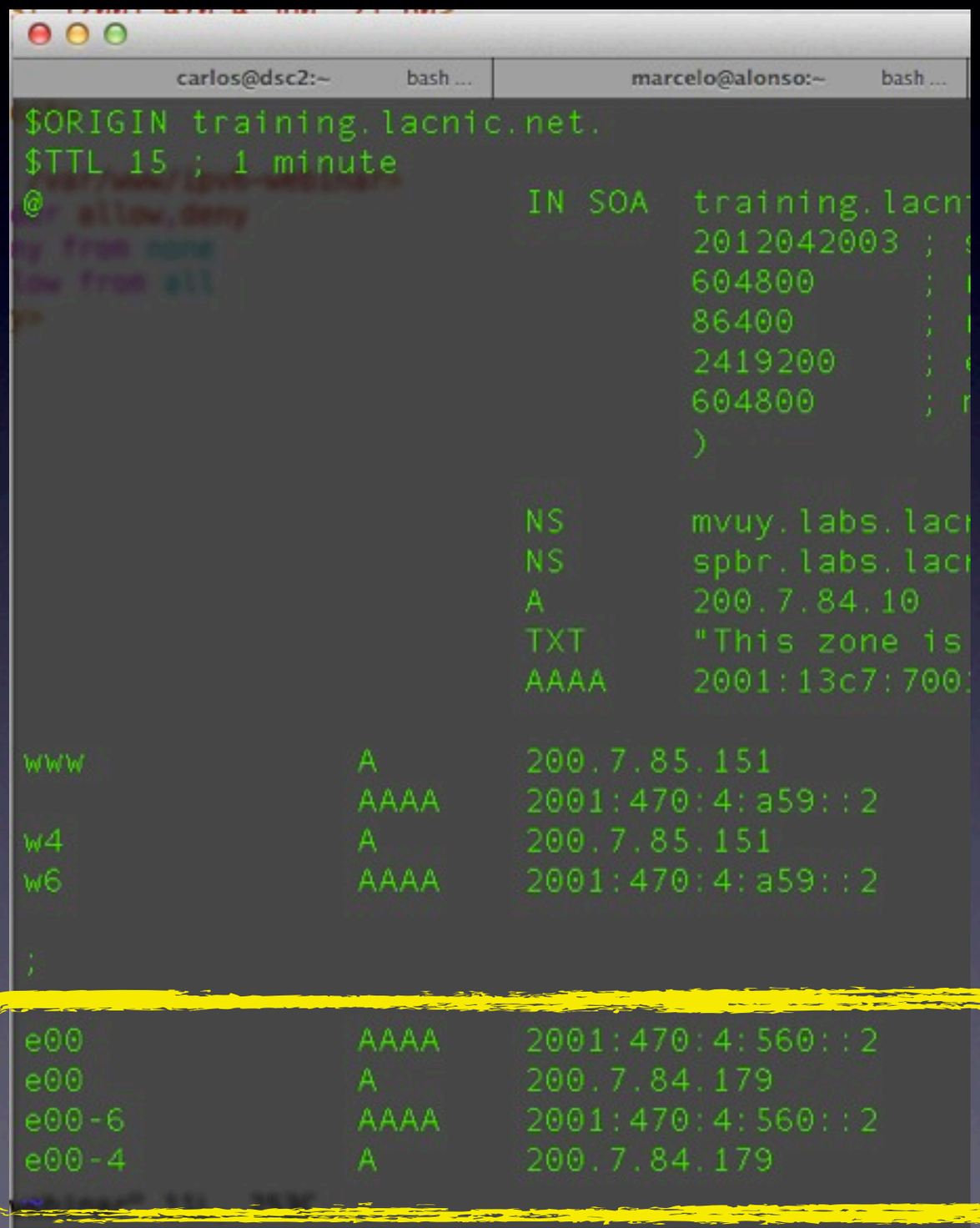
```
root@ipv6-handson-1:~# ping6 -c3 ipv6.google.com
PING ipv6.google.com(mia04s03-in-x12.1e100.net) 56 data bytes
64 bytes from mia04s03-in-x12.1e100.net: icmp_seq=1 ttl=57 time=209 ms
64 bytes from mia04s03-in-x12.1e100.net: icmp_seq=2 ttl=57 time=222 ms
64 bytes from mia04s03-in-x12.1e100.net: icmp_seq=3 ttl=57 time=209 ms

--- ipv6.google.com ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2008ms
rtt min/avg/max/mdev = 209.667/213.951/222.233/5.857 ms
root@ipv6-handson-1:~#
```

Configurar DNS

- Para poder exponer nuestro nuevo servidor a Internet necesitamos crear entradas de DNS
- Para ello necesitamos un dominio
  - *training.lacnic.net* en nuestro ejemplo
- Registros A y AAAA -- Direcciones v4 y v6

Configurar DNS (ii)



- Browser pregunta por A y AAAA a la vez
- Si hay solo A o solo AAAA, entonces el acceso solo es posible por uno de los protocolos
- Si están ambos, el acceso es posible vía ambos protocolos

Deshabilitar SLAAC

- Si SLAAC (stateless autoconfiguration) esta presente en la red, se puede deshabilitar solo para nuestro servidor
- Para ello editamos el archivo /etc/ sysctl.conf y agregamos las líneas:

```
## Disable IPv6 static autoconfig
net.ipv6.conf.default.autoconf = 0
net.ipv6.conf.all.autoconf = 0
net.ipv6.conf.eth0.autoconf = 0
```

- Se aplica con “sudo sysctl -p”

Configuración Apache

marcelo — root@transitionrouter2: /etc/apache2/site

```
#Listen [2001:470:4:560::2]:80
#Listen 200.7.84.179:80

# Escucho en la direccion IPv6
<VirtualHost [2001:470:4:560::2]:80>
        DocumentRoot /var/www/ipv6-webinar
        ServerName e00.training.lacnic.net
</VirtualHost>

# Escucho en la direccion IPv4
<VirtualHost 200.7.84.179:80>
        DocumentRoot /var/www/ipv6-webinar
        ServerName e00.training.lacnic.net
</VirtualHost>

<Directory /var/www/ipv6-webinar>
        Order allow,deny
        Deny from none
        Allow from all
</Directory>


~
```

Esta configuración asocia directamente a direcciones y no a nombres.

Configuración Apache (ii)

marcelo — sa@ipv6-handson-1: ~ — ssh

sa@ipv6-handson-1: ~ | carlos@lab:~ | ssh ...

```
NameVirtualHost 200.7.84.179:80
NameVirtualHost [2001:470:4:a6d::2]:80

<Directory /var/www/ipv6-handson>
        Order allow,deny
        Allow from all
        Deny from none
</Directory>

<VirtualHost 200.7.84.179:80>
        ServerName e00.training.lacnic.net
        ServerAlias e00-4.training.lacnic.net
        DocumentRoot /var/www/ipv6-handson
</VirtualHost>

<VirtualHost [2001:470:4:a6d::2]:80>
        ServerName e00.training.lacnic.net
        ServerAlias e00-6.training.lacnic.net
        DocumentRoot /var/www/ipv6-handson
</VirtualHost>
~
~
~
```

Esta configuración asocia nombres (ServerName y ServerAlias)

```
e00             AAAA    2001:470:4:a6d::2
e00             A       200.7.84.179
e00-6           AAAA    2001:470:4:a6d::2
e00-4           A       200.7.84.179
```

Listo!


Página Web Dual-Stack
Página Web Dual-Stack
w4.training.lacnic.net/webDualStack.php
Google
Ejemplo de una página web Dual-Stack
Usted se está conectando desde la siguiente dirección IPv4: 200.7.85.155


Página Web Dual-Stack
Página Web Dual-Stack
www.training.lacnic.net/webDualStack.php
Google
Ejemplo de una página web Dual-Stack
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¡Muchas Gracias!