HURRICANE ELECTRIC
INTERNET SERVICES

Leading the way to the future of the Internet via IPv6

SuperHappyDevHouse 30 – 01/31/2009

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Company Snapshot

One of the largest and most reliable Internet Backbone, Colocation , and hosting companies in the world. And the #1 provider of IPv6 connectivity.

1. Colocation

2. Dedicated Servers

3. Web Hosting

4. IP Transit

Web Hosting

NETCRAFT

Speed with Reliability

Hurricane Electric is the Most Reliable Hosting Company in August 2008

Ranking by Failed Requests and Connection time,
August 1st – 31st 2008

Rank	Company site	OS	Outage hh:mm:ss	Failed Req%	DNS	Connect	First byte	Total
1	www.he.net	Linux	0:00:00	0.00	0.001	0.053	0.111	0.164
2	DataPipe	unknown	0:00:00	0.01	0.002	0.014	0.029	0.045
3	www.godaddy.com	Windows Server 2003	0:00:00	0.01	0.054	0.041	0.264	0.264
4	INetU	unknown	0:00:00	0.01	0.038	0.044	0.237	0.383
5	New York Internet	FreeBSD	0:00:00	0.01	0.002	0.047	0.096	0.245
6	www.swishmail.com	unknown	0:00:00	0.01	0.001	0.061	0.123	0.340
7	www.web.com	Windows 2000	0:00:00	0.01	0.110	0.074	0.185	0.621
8	Hosting 4 Less	Linux	0:00:00	0.01	0.067	0.080	0.164	0.365
9	www.datasync.com	Linux	0:00:00	0.02	0.001	0.050	0.116	0.167
10	Verio	Linux	0:00:00	0.02	0.067	0.076	0.152	0.152

Current IPv4

Core Problem:

The eventual exhaustion of the IPv4 address space

The current version of IP, IP version 4 (IPv4), defines a 32-bit address which means that there are only 2^32 (4,294,967,296) IPv4 addresses available.

Although this seems like a large number of addresses, the finite number of IP addresses is already reaching its limit and will be exhausted by the year 2011.

Current IPv4

As a result, public IPv4 addresses have become relatively scarce, forcing many users and some organizations to use a NAT to map a single public IPv4 address to multiple private IPv4 addresses.

Although NATs promote reuse of the private address space, they violate the fundamental design principle of the original Internet that all nodes have a unique, globally reachable address, preventing true end-to-end connectivity for all types of networking applications.

Additionally, the rising prominence of Internet-connected devices and appliances ensures that the public IPv4 address space will eventually be depleted.

Understanding IPv6

To address these and other concerns, the Internet Engineering Task Force (IETF) has developed a suite of protocols and standards known as IP version 6 (IPv6).

IPv6 has a number of improvements and simplifications when compared to IPv4. The primary difference is that IPv6 uses 128 bit addresses as compared to the 32 bit addresses used with IPv4.

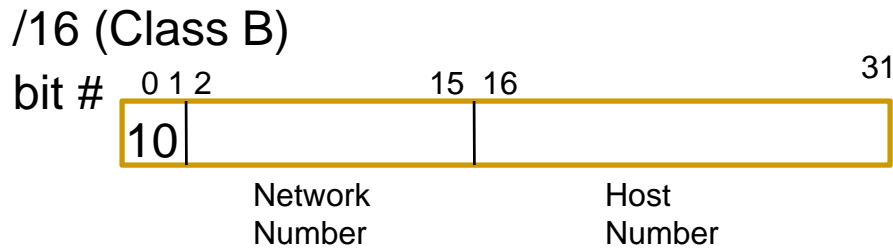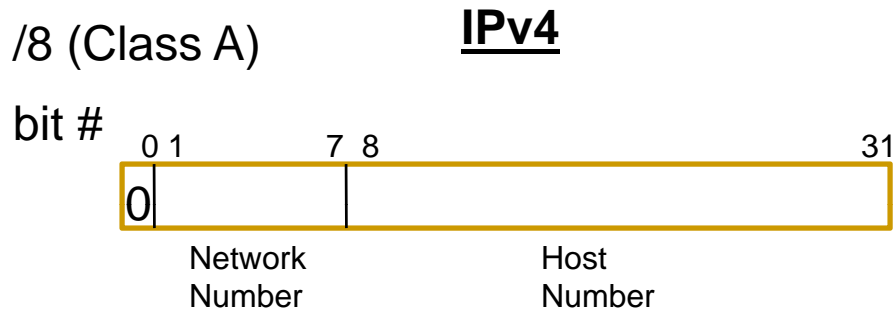This means that there are more available IP addresses using IPv6 than are available with IPv4 alone.

IPv4: 4,294,967,296 IP addresses.
IPv6: 18,446,744,073,709,551,616 IP addresses in a single /64 allocation.

Understanding IPv6

IPv4

/8 (Class A)

bit #

0 1	7 8	31
0		

Network Number   Host Number

IPv6

/16 (Class B)

bit #

0 1 2	15 16	31
10		

Network Number   Host Number

64 bits	64 bits

Network Part

(Router Broadcasts)

Host Part

(MAC Address)

/24 (Class C)

bit #

0 1 2 3	23 24	31
110		

Network Number   Host Number
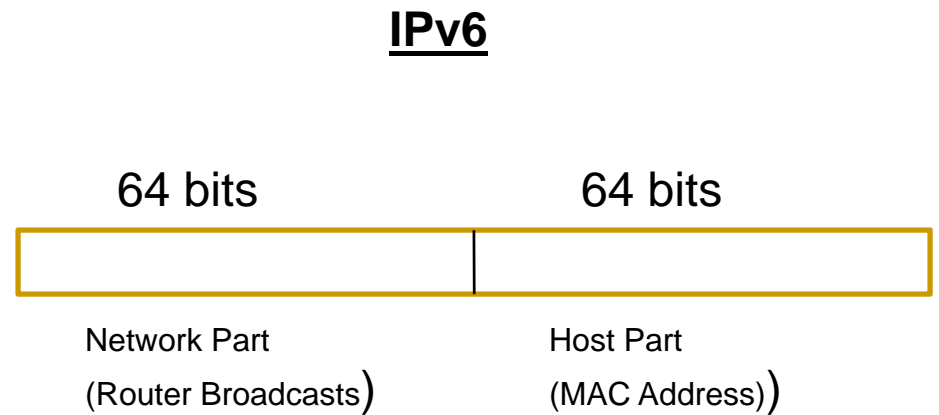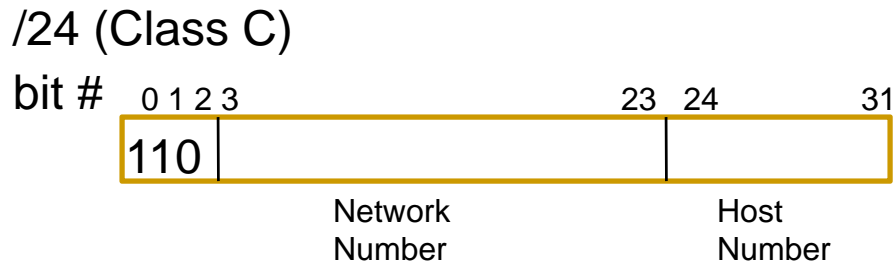
(Not using manual configuration or DHCPv6)

Understanding IPv6

A significant difference in IPv6:

IPv4: 4 blocks of 8 bits separated by a '.' (Ex: 216.218.186.2)

IPv6: 8 blocks of 16 bits separated by a ':' (Ex: 2001:470:0:76::2)

or

(2001:0470:0000:0076:0000:0000:0000:0002)

(Notice that leading zeros are removed and that '::' can be used only once to represent consecutive zero's)

Understanding IPv6

IPv6 availability depends on your Service Provider, either at home or for work. In a dual-stack environment, IPv4 and IPv6 co-exist along the same connection and don't require any special kind of connection. If dual-stack is not available, you might find yourself using an IP tunneling product or service to bring IPv6 connectivity to you.
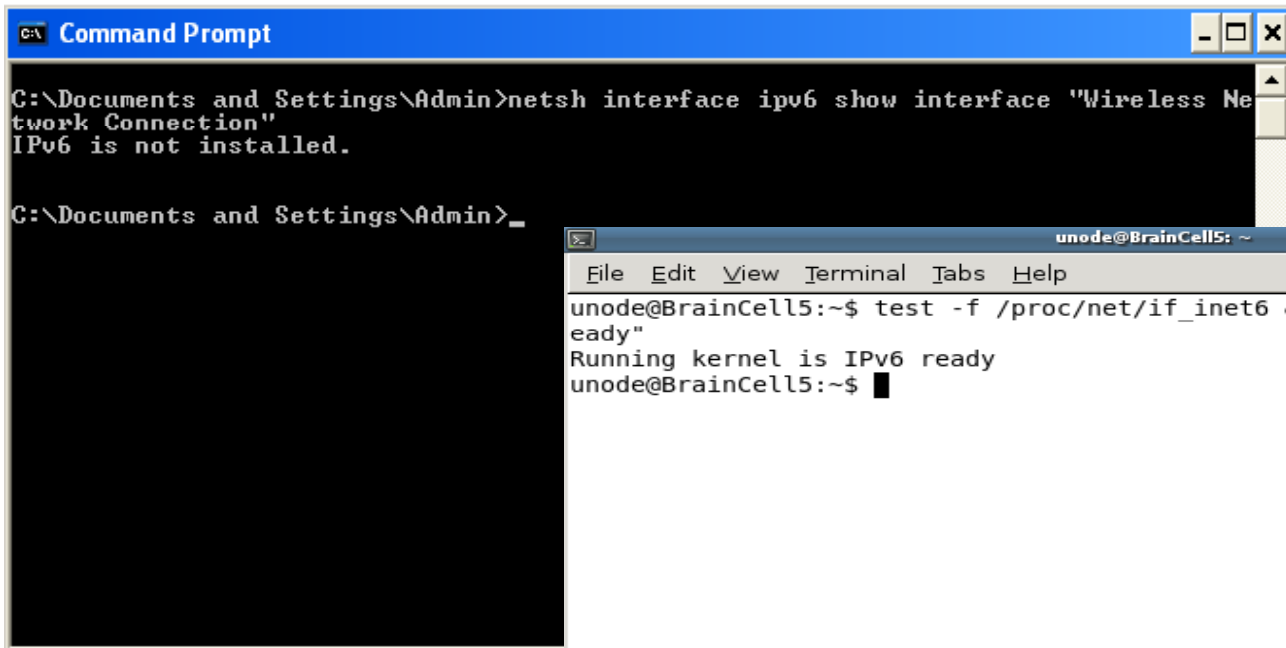
Many Operating System platforms have native IPv6 support:

- Linux, BSD (Free, Open, Net) & MacOSX have had IPv6 support enabled for years

- Windows 2000/2003/XP – had to have it installed optionally

- Vista and Windows 2008 – have native IPv6 support enabled by default

Checking for IPv6 support
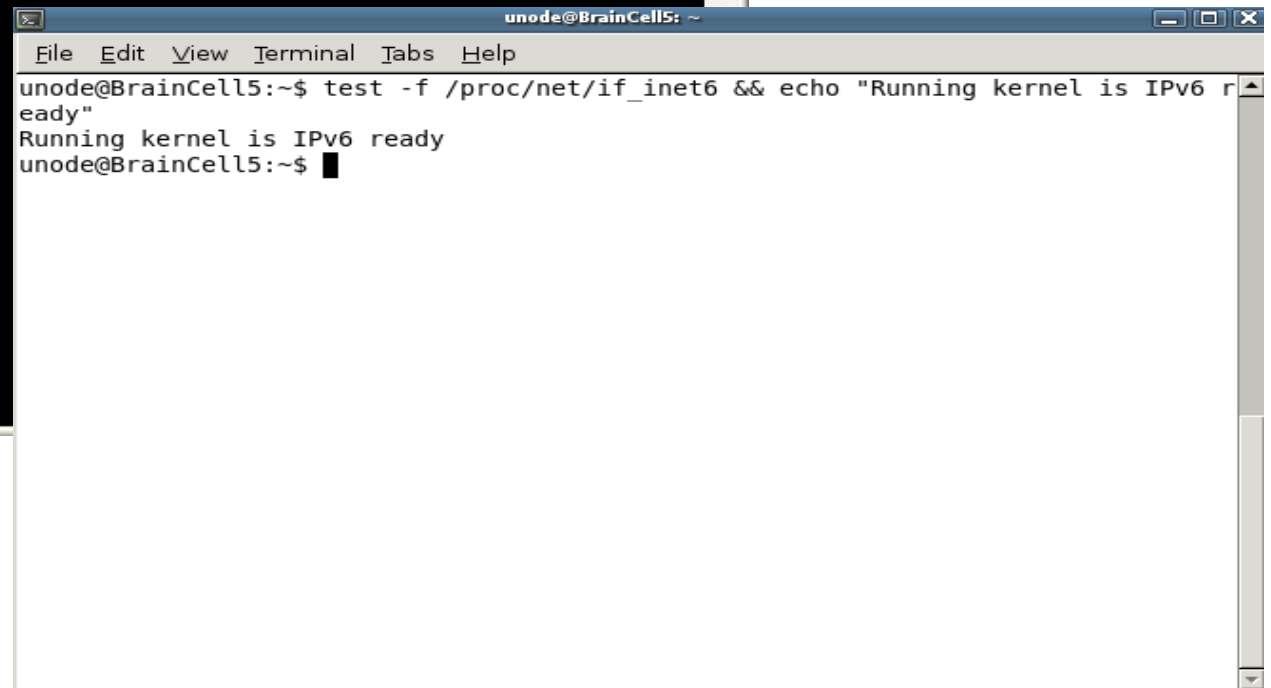
Windows XP (SP3)

```
Command Prompt                                          _ □ ×

C:\Documents and Settings\Admin>netsh interface ipv6 show interface "Wireless Ne
twork Connection"
IPv6 is not installed.

C:\Documents and Settings\Admin>_
```

Linux (Ubuntu 8.10)

```
                          unode@BrainCell5: ~                    _ □ ×

File  Edit  View  Terminal  Tabs  Help
unode@BrainCell5:~$ test -f /proc/net/if_inet6 && echo "Running kernel is IPv6 r
eady"
Running kernel is IPv6 ready
unode@BrainCell5:~$ █
```

(Must use Windows XP SP3 for most recent IPv6 tools such as 'netsh')

Installing IPv6 (Windows XP Example)

Hurricane Electric's IPv6 Certification

- Prove that you have basic IPv6 knowledge

- Prove that you have IPv6 connectivity and a IPv6 web server

- Prove that you have a working IPv6 email address

- Prove that you have working reverse IPv6 DNS

- Prove that you have name servers with IPv6 addresses that can respond to queries via IPv6

http://ipv6.he.net/certification/

Newbie

Enthusiast

Administrator

Professional

Guru

Hurricane Electric's IPv6 Certification

Enthusiast

Congratulations you NeWb! Lets get you on to being an Enthusiast as quick as possible. Lets certify that you have the basics of IPv6 setup. To complete this test you will need:

- An IPv6 capable desktop
- An IPv6 capable website/webserver
- The Domain you provide below will be used in future DNS tests.

[Reset Test]

Help	Step	Description	Data
ℹ	[1]	Generate a User Code	sn2bgcwgxf
ℹ	[2]	Tell us what your IPv6 website is, FQDN please	http://hahmed.corp.he.net
ℹ	[3]	We will test grabbing the file:	http://hahmed.corp.he.net/sn2bgcwgxf.txt
ℹ	[4]	Schedule the test:	Test It!

Hurricane Electric's IPv6 Certification

Congratulations, your an IPv6 Enthusiast! As we all know the next step after geting your website online is to make it so you can recieve email via IPv6. What you will need is:

- An IPv6 enabled mail system
- If you have "Greylisting" enabled: either whitelist ipv6@he.net or you will have to send, wait for your greylist timer to expire and then reset and send again. We are working on a better solution to this issue.

[Reset Test]

Step	Description	Data	
1	Generate a New User Code		Generate It!
2	Tell us what your IPv6 capable email address is (Including the Domain):		
3	Schedule a test, we will email you your new User Code		Send It!
4	Tell us what the code was:		→

Certificate of Completion

gopher

hereby awarded the rank of

Administrator

Hurricane Electric
IPv6 Certification

Hurricane Electric's IPv6 Certification

Professional

Congratulations, your an IPv6 Administrator! As we all know the next step after geting your IPv6 Email working is to setup Reverse DNS for the mail servers IP. What you will need is:

- An IPv6 enabled mail system, with working RDNS.

Step	Description	Data	
1	Check if your mail server has working rdns		->

TunnelBroker – Tunneling of IPv6 packets through an IPv4 Network

IPv6 Network

IPv6 Host

IPv4 + IPv6 Router

IPv4 Network

IPv6 Network

IPv6 Host

IPv4 + IPv6 Router

Add IPv4 Header

IPv4 Router

IPv4 Router

Remove IPv4 Header
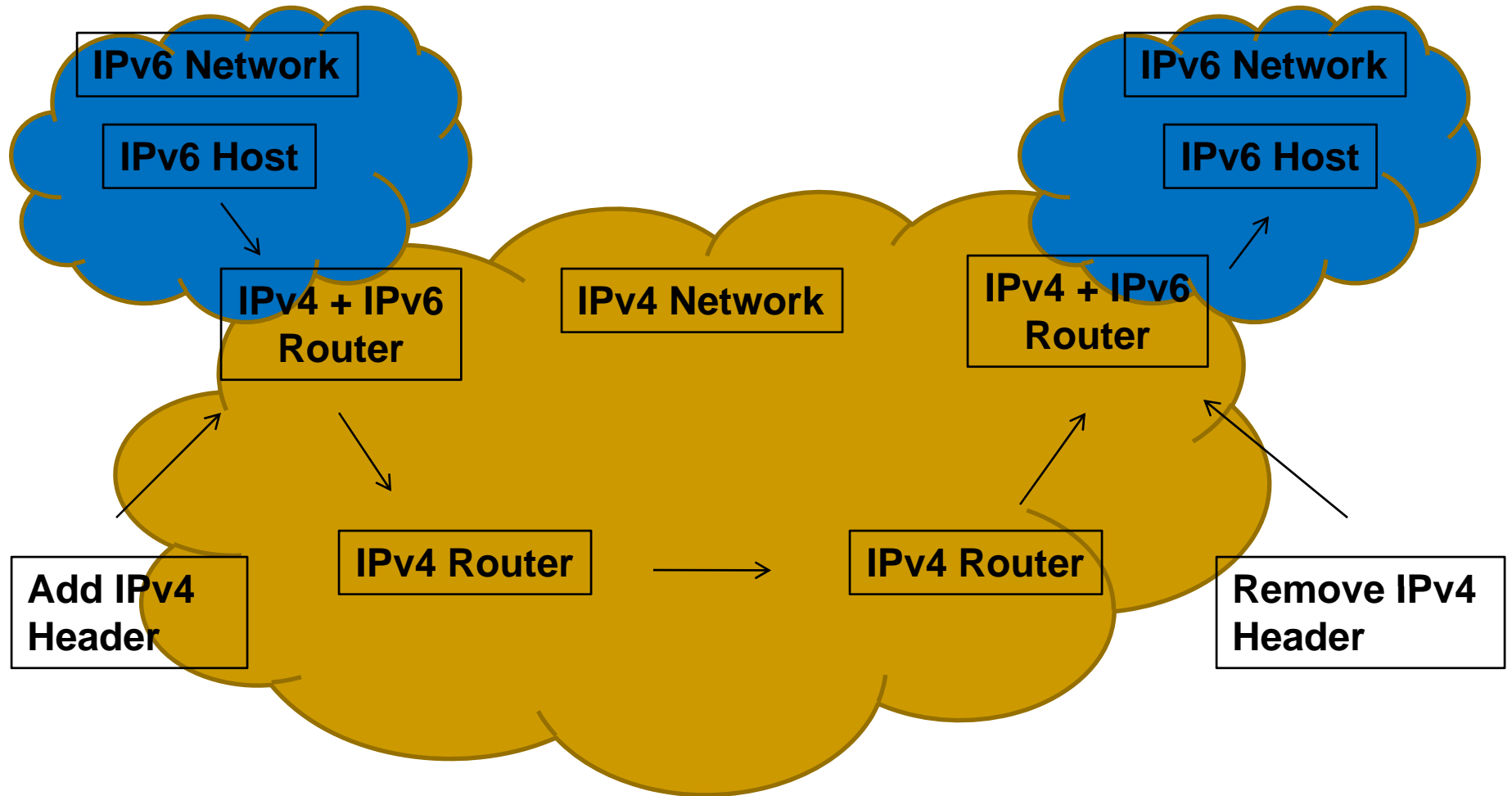
Hurricane Electric's IPv6 Tunnel Broker

Hurricane Electric's free tunnel broker service enables you to reach the IPv6 Internet by tunneling over existing IPv4 connections from your IPv6 enabled host or router to one of Hurricane Electric's IPv6 routers.

http://tunnelbroker.net

Tunnelbroker Login

Username:

Password:

[Login] [Register]

Hurricane Electric Free IPv6 Tunnel Broker

IPv6 Tunnel Broker

Check out our new **usage stats**!

And then hit up our new **Forums**!

Hurricane Electric's IPv6 Tunnel Broker

Account Menu

Click For Main Page
Update Info
Logout

User Functions

Combine Tunnels
Create Regular Tunnel
Create BGP Tunnel

HE IPv6 Tunnel Broker

Name: Humair Ahmed
UserID: dd98afe2b13e930cb0c8e48891c14b3e

HE.NET
IPv6
Certified
Explorer
gopher

Tunnel [0 / 4]	Routed /64	Routed /48

Tunnel Broker News:

⊞ **UPDATE - Jan. 9th, 2009** - By broquea

⊞ **UPDATE - Dec. 4th, 2008** - By broquea

⊞ **UPDATE - September 19th, 2008** - By broquea

⊞ **IPv6 Certification Program** - By broquea

⊞ **Re: Website Maintenance** - By broquea

Hurricane Electric's IPv6 Tunnel Broker

Account Menu

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User Functions

Combine Tunnels
Create Regular Tunnel
Create BGP Tunnel

Setup Regular IPv6 Tunnel

You currently have 0 of 4 allowed tunnels configured.

- If you are trying to reclaim a tunnel simply enter your last IPv4 address here. If you have any issues please email ipv6@he.net.
- If You have an official ASN and wish to setup a full BGP feed Please use **This** Form instead.

IPv4 endpoint
(your side of the tunnel)
(You are viewing from IP: 75.36.200.156):

Which Server Is Closest to you?:

- ○ Fremont, CA USA [72.52.104.74]
- ○ New York, NY USA [209.51.161.14]
- ○ London, UK [216.66.80.26]
- ○ Dallas, TX USA [216.218.224.42]
- ○ Chicago, IL USA [209.51.181.2]
- ○ Paris, France [216.66.84.42]
- ○ Amsterdam, NL [216.66.84.46]
- ○ Miami,FL USA [209.51.161.58]
- ○ Ashburn, VA USA [216.66.22.2]
- ○ Seattle, WA USA [216.218.226.238]
- ○ Los Angeles, CA USA [66.220.18.42]
- ○ Hong Kong [216.218.221.6]
- ○ Toronto, ON Canada [216.66.38.58]

Submit

Hurricane Electric's IPv6 Tunnel Broker

Account Menu

Click For Main Page
Update Info
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User Functions

Combine Tunnels
Create Regular Tunnel
Create BGP Tunnel

Setup Regular IPv6 Tunnel

CREATE
2846|72.52.104.74|75.36.200.156|2001:470:1f04:b1e::1|2001:470:1f04:b1e::2|2001:470:1f05:b1e::|
O.K.: Your tunnel has been allocated

Your tunnel has been allocated and created. The endpoints and tunnel server information can be found under **Tunnel Details**. This page will also have examples to help you get the tunnel up and running on your system.

Hurricane Electric's IPv6 Tunnel Broker

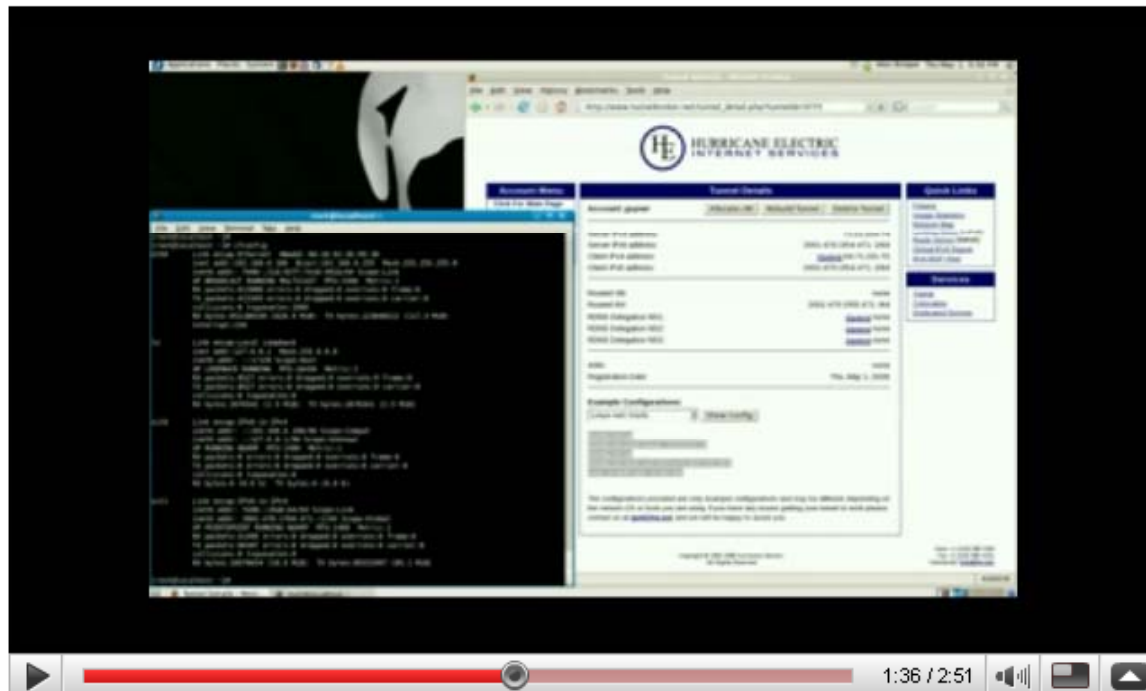# Hurricane Electric's IPv6 Tunnel Broker

Hurricane Electric's IPv6 Tunnel Broker

Alex Broque – Hurricane Electric Network Engineer and co-developer of the
Tunnelbroker provides a tutorial via YouTube video.
(TunnelBroker software has since been updated)

http://www.youtube.com/watch?v=4o7sk97mItM

Q&A

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Copy of slides available at:
http://superhappydevhouse.org/f/SHDH30_Hurricane_Electric_IPv6_Presentation_(Full).pdf

For all questions regarding IPv6 Certification or the HE TunnelBroker contact IPv6@he.net