The Dedicated Server Handbook ™

Apache Con North America 2011

:: About IPv6

Issac Goldstand
margol@beamartyr.net

Background

- Replacement for IPv4
- Proposed in 1999
- IPv4 address space was assigned by IANA Feb 3rd 2011
- Still not significantly used

The Dedicated Server Handbook ™

ApacheCon North America 2011

IPv4 vs. IPv6

- 32bit addressing VS 128bit addressing
- 0.0.0.0 VS :: (or 0::0)
- 127.0.0.1 VS ::1
- BIG subnet space (64bits)
- Auto-discovery
- Link-local + Site-local

The Dedicated Server Handbook ™

ApacheCon North America 2011

fe80 BLAH

- Link-local prefix – similar to 10./192.168./etc in IPv4 (but NOT the same)
- (Actually is the same idea as 169.254/16 defined by RFC3330, as used by Microsoft)
- Shared by all machines sharing a LAN segment (network link)
- Commonly used in IPv6 Autodiscovery

20::

- **Public allocated address space is 20::/8**
- **The majority of the IPv6 address space is reserved by the IANA “for a rainy day”**

The Dedicated Server Handbook ™

ApacheCon North America 2011

IPv6 Subnetting

- It's there. It's supported…
- But it's not "supposed" to be used
- ISPs get a /32 subnet
- "End user sites" get a /48 subnet
- Smallest "allocation" is typically a /64 subnet
- Although subnets *could* be more or less than 64-bits, the IETF recommends always subnetting exactly 64 bits (even for a point-to-point link between only 2 devices)

6 to 4 Tunnels

- Any IPv4 address can be tunneled into the IPv6 network
- Hurricane Electric is probably the most popular tunnel broker
- Anyone with an IPv4 user can set up a tunnel to fully access IPv6

IPv4 and IPv6 Co-Existence

- Most modern OS-es allow for “dual stack”
- IPv6 is preferred, and IPv4 used as fallback
- Servers and clients both follow the same rules

The Dedicated Server Handbook ™

ApacheCon North America 2011

Security Considerations

- NAT blocks your internal network from the public Internet
- IPv6 addressing is (hypothetically) publicly routable
- NAT hides your internal network structure
- IPv6 address could theoretically contain machine-specific identification

Security Considerations

- At the end of the day a firewall will block the traffic
- … And clever address assignment and subnetting will deal with the rest

The Dedicated Server Handbook ™

ApacheCon North America 2011

That's All Interesting, But…

The Dedicated Server Handbook ™

ApacheCon North America 2011

Popular ASF Projects

- **Apache Portable Runtime (APR)**
- **Apache HTTP Server**
- **Apache Tomcat**
- **Apache Traffic Server**

The Dedicated Server Handbook ™

ApacheCon North America 2011

Apache HTTP Server

- Supports IPv6 since 2001 (and documented since 2002)
- 1.3 Supported IPv6 too via an unofficial patch
- Supports dual-stacking in VirtualHost directive
- Don’t forget to Listen and NameVirtualHost too
- That’s all there is to it ☺

The Dedicated Server Handbook ™

ApacheCon North America 2011

Example Configuration: httpd

```
NameVirtualHost 85.195.98.140
NameVirtualHost
[2a01:7a0:3:200::2:2]
<VirtualHost 85.195.98.140
[2a01:7a0:3:200::2:2]>
ServerName
www.thededicatedserverhandbook.c
om
…
</VirtualHost>
<IfModule mod_ssl.c>
<VirtualHost 85.195.98.140:443
[2a01:7a0:3:200::2:2]:443>
SSLEngine on
…
</VirtualHost>
</IfModule>
```

The Dedicated Server Handbook ™

ApacheCon North America 2011

Apache Tomact

- IP binding is handled by the underlying JRE or by APR (if the tcnative library is used)
- Usually aggressively binding to IPv6 (unless `-Djava.net.preferIPv4Stack` passed)
- If <Connector> only specifies a port, then addresses 0.0.0.0 AND :: are assumed
- Otherwise, specify address parameter:
  - IPv4 as “x.x.x.x”
  - IPv6 as “[x:x::x]”

Example Configuration: Tomcat

```
File: server.xml
<Connector port="8080"
 address="85.195.98.140"
protocol="HTTP/1.1"
…
/>
<Connector port="8080"
address="[2a01:7a0:3:200::2:2]"
protocol="HTTP/1.1"
…
/>
```

The Dedicated Server Handbook ™

ApacheCon North America 2011

Apache Traffic Server

- IPv6 is ready in development – developer release imminent, but full support only in 3.2 (due Q1 2012)
- Can proxy HTTP NAT64, 6to4 and native 6 to 6
- Binds to :: by default. Not able to bind to individual addresses (yet)
- Was used by Yahoo! For the World IPv6 Day

Example Configuration: ATS

File: records.config

```
CONFIG proxy.config.http.server_other_ports STRING 8080:X6
```

File: remap.config

```
map          http://85.195.98.140/      http://[2a01:7a0:3:200::2:2]/
reverse_map  http://[2a01:7a0:3:200::2:2]/  http://85.195.98.140/
```

OR

```
map          http://[2a01:7a0:3:200::2:2]/      http://85.195.98.140/
reverse_map  http://85.195.98.140/  http://[2a01:7a0:3:200::2:2]/
```

The Dedicated Server Handbook ™

ApacheCon North America 2011

Summary

- IPv6 might not be used, but it's ready
- Most OS-es and software are already IPv6-ready
- Most end-user ISPs don't provide IPv6 addresses to consumers
- Many co-location facilities DO offer IPv6 blocks
- But it still hasn't been adopted

The Dedicated Server Handbook ™

ApacheCon North America 2011

Before We Wrap Up…

- **“It’s my eleventy-first Birthday” - J.R.R. Tolkien**

The Dedicated Server Handbook ™

ApacheCon North America 2011

For More Information

- **IPv6 “first steps” recorded presentation and tunnel setup – http://www.TheDedicatedServerHandbook.com/tut/ipv6.php**
- **Hurricane Electric – http://www.tunnelbroker.com**
- **IPv6 Readiness Test - http://test-ipv6.com/**

The Dedicated Server Handbook ™

Apache Con North America 2011

The Dedicated Server Handbook ™

Apache Con North America 2011

Thank You!

Issac Goldstand **margol@beamartyr.net**

http://www.TheDedicatedServerHandbook.com