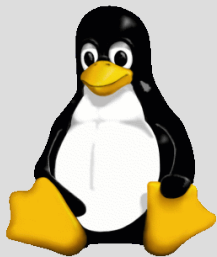


IPv6 & Linux

by Dr. Peter Bieringer



1st Global IPv6 Summit 2004 in Brazil
São Paulo

August 17-20, 2004

<http://www.ipv6summit.com.br/>



Contents

- About me & my IPv6 related work
- IPv6 support in Linux
- IPv6 firewalling in Linux
- IPv6 in DNS (server and resolver)
- How to enable IPv6 in Linux
- IPv6 on some daemons/clients
- Future outlook

About me (or who I am)



- Living in Munich (Germany)
- Employee of *AERAsc Network Services and Security GmbH* (since 2000)
 - focussing on IT security and network consulting
 - trainer for IPv6, TCP/IP and others
- Co-founder and core member of *Deep Space 6*
- Member of the German IPv6 Task Force



My IPv6-related time line

- 1993: First contact with the Internet
- 1996: Got a request designing a course on IPv6
- 1997: *IPv6 & Linux - HowTo, initscripts-ipv6*
- 1999: *IPv6 & Linux - Current Status*
- 2001: *Linux IPv6 HOWTO, ipv6calc*
- 2002: Co-founded *Deep Space 6*

History of my IPv6 related documents

- *IPv6 & Linux - HowTo*

- 1997: first release
- Format: HTML only
- Focus: how to enable IPv6 in Linux and some daemons
- 2001: migration of important content into *Linux IPv6 HOWTO*
- **Status: going obsolete after end of migration**


URL:

<http://www.bieringer.de/linux/IPv6/IPv6-HOWTO/IPv6-HOWTO.html>


History of my IPv6 related documents


- *Linux IPv6 HOWTO*

- 2001: first release
- Format: HTML, PS, PDF generated from SGML source
- Focus: extensive information about IPv6 on Linux
- Currently available in the following languages:

 English (since beginning)

 German (since February 2003)

 French (since May 2003)

 Italian (since March 2004)

 Greek (work in progress)

- **Status: maintained**

URLs:

<http://www.tldp.org/HOWTO/Linux+IPv6-HOWTO/> (English only)

<http://mirrors.bieringer.de/> (all available languages)

History of my IPv6 related documents

- *IPv6 & Linux - Current Status*

- 1999: first release
- Format: HTML only
- Focus: status of IPv6 in kernel, applications and distributions
- 2003: migration of application status to *DeepSpace6*
- **Status: still partially maintained**
- Planned for Q4/2004: migration of kernel status to *Deep Space 6*

URL:

<http://www.bieringer.de/linux/IPv6/status/IPv6+Linux-status.html>

History of my IPv6 related documents

- *Current Status of IPv6 Support for Networking Applications*
 - 2003: first release
 - Format: HMLT generated from XML
 - Migration of content from *IPv6 & Linux - Current Status*
 - Focus: status of IPv6 in networking applications
 - **Status: extended and maintained by *Deep Space 6* team**
 - Statistics (July 2, 2004):
 - Native support: 171
 - IPv6 patch available: 38

URL:

http://www.deepspace6.net/docs/ipv6_status_page_apps.html

Screenshot of Application Status
















Current Status of IPv6 Support for Networking Applications - Mozilla

File Edit View Go Bookmarks Tools Window Help

Current Status of IPv6 Support for ...

8. Domain Name System

8.1. Domain Name System (53:domain)

Application	Package	Version	Worked By	URLs	Comment	Status
DNS Servers						
bind 8	bind	8.4.4	Maintainers		<i>BIND (Berkeley Internet Name Domain) is the most deployed implementation of the Domain Name System (DNS) protocols in the Internet. BIND provides an openly redistributable reference implementation of the major components of the Domain Name System, including: a Domain Name System server, a Domain Name System resolver library and tools for verifying the proper operation of the DNS server. Starting from release 8.4.1, bind 8 supports also IPv6 transport for named, named-xfer and ndc.</i>	
bind 9	bind	9.2.3	Maintainers		<i>BIND version 9 is a major rewrite of nearly all aspects of the underlying BIND architecture. Some of the important features of BIND 9 are DNS Security, IPv6, DNS Protocol Enhancements, Views, Multiprocessor Support and Improved Portability Architecture.</i>	
djbdns	djbdns	1.05	Felix Von Leitner	 	<i>djbdns is a collection of Domain Name System tools. It includes software for all the fundamental DNS operations: DNS cache, DNS server and DNS client. djbdns also includes several DNS debugging tools, notably dnstrace, which administrators use to diagnose misconfigured remote servers.</i>	
newbie	newbie	0.22	Maintainers		<i>Newbie is the software of Dynamic DNS and surrounding environment. This project is unmaintained.</i>	
maradns	maradns	1.0.18	Maintainers		<i>MaraDNS is a package that implements the Domain Name Service (DNS), an essential internet service. MaraDNS is intended for environments where a DNS server must be secure and where the server must use the absolute minimum number of resources possible. MaraDNS doesn't support IPv6 yet, but the developers plan to make the next 1.2 release of MaraDNS IPv6 enabled.</i>	
DNS Proxies						
totd	totd	1.4	Maintainers		<i>Totd is a small DNS proxy nameserver that supports IPv6 only hosts/networks that communicate with the IPv4 world using some translation mechanism. Examples of such translation mechanisms currently in use are IPv6/IPv4 Network Address and Packet Translation (NAT-PT) and Application level translators (like KAME's faithd).</i>	
Other DNS Related Tools						
dbind	dbind	0.1	Maintainers		<i>Dbind is an automatic tool to update bind9 tables. Dbind can be used to implement dynamic DNS or as a tool to create and update IPv4 and IPv6 DNS tables just by using a single command. Since there is no need to input or edit addresses, it is very difficult to create inconsistent tables.</i>	

9. Information

9.1. Whois (43:whois)

History of my IPv6 related projects

- *initscripts-ipv6*
 - 1997: start of development
 - Focus: integration of handling of permanent IPv6 setup into IPv4 *initscripts* (Fedora/Red Hat Linux and clones)
 - Status:
 - Maintained
 - Sometimes development of new features (see CVS for more)
 - Migration into official *initscripts* (with help of Pekka Savola)

URLs:

<http://www.deepspace6.net/projects/initscripts-ipv6.html>

<http://cvs.deepspace6.net/view/initscripts-ipv6/>

<http://fedora.redhat.com/projects/additional-projects/initscripts/>

History of my IPv6 related projects

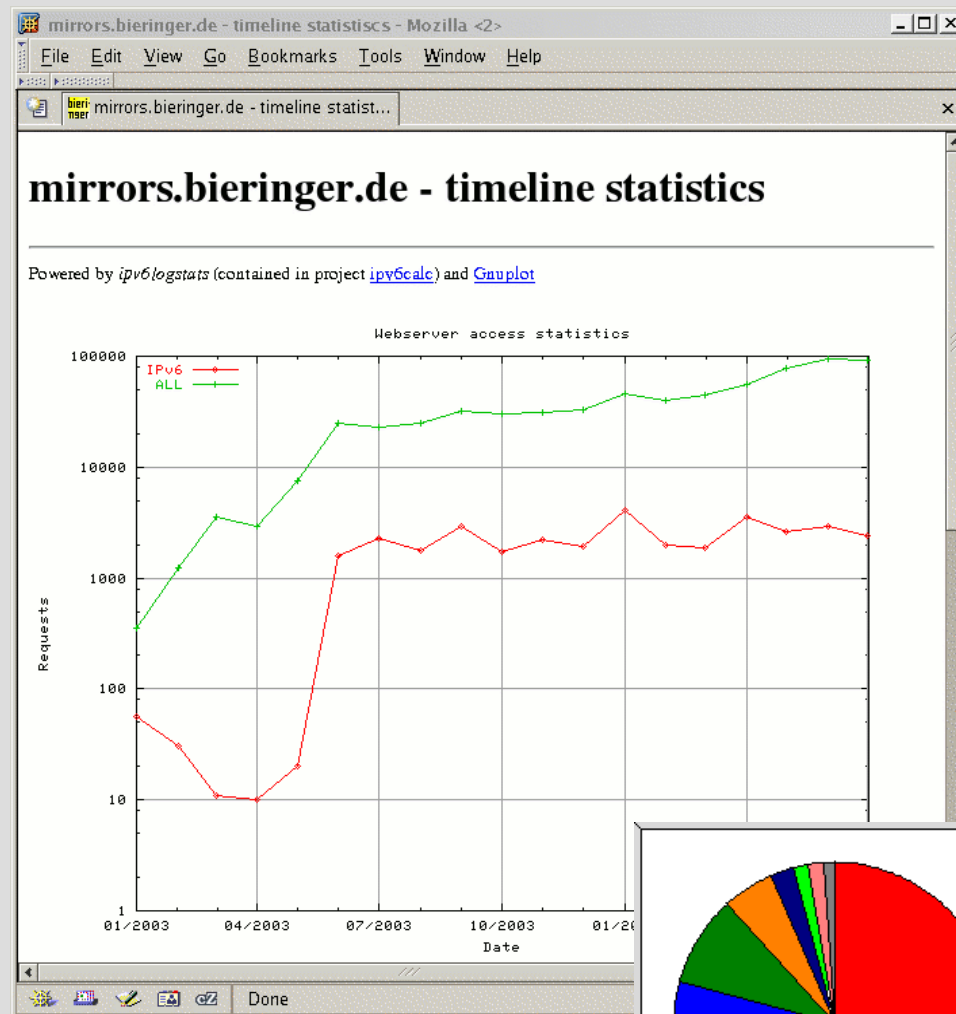
- *ipv6calc*
 - 2001: start development
 - Reason: no tools exist for manipulation of IPv6 addresses
 - Conversion tool for various IPv6 related address formats
 - Status:
 - Maintained
 - Sometimes development of new features

URL:

<http://www.deepspace6.net/projects/ipv6calc.html>

<http://cvs.deepspace6.net/view/ipv6calc/>

Examples powered by ipv6calc



Welcome to [ip6.aerasesc.de](#)

IPv4/IPv6 Address Information Page

Your client

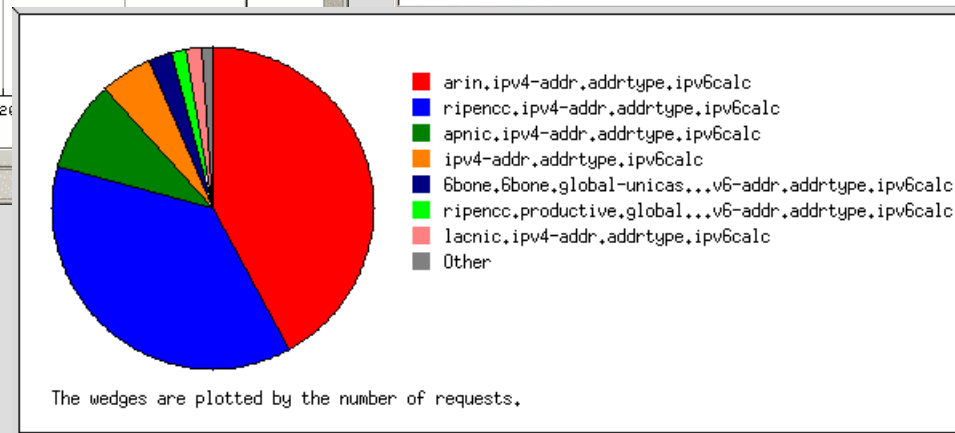
EUI48	EUI-48 identifier (MAC address)	00:04:76:01:23:45
EUI48_SCOPE	EUI-48 scope	global
EUI48_TYPE	EUI-48 address type	unicast
IID	Interface identifier	0204:76ff:fe01:2345
IPV6	IPv6 address	2001:0DB8:0001:0001:0204:76ff:fe01:2345
IPV6_REGISTRY	Registry of IPv6 address	RIPENCC
OUI	Vendor identification of network interface card	"3 Com Corporation"
SLA	Site Level Aggregator (subnet)	0001
TYPE	Address type	unicast,global-unicast,productive
USERAGENT	User agent identification	Mozilla/5.0 (X11; U; Linux i686; en-US; rv:1.6)

This server

EUI64_SCOPE	EUI-64 scope	local
IID	Interface identifier	0000:0000:0148:0001
IPV6	IPv6 address	2001:07b0:1101:0002:0000:0000:0148:0001
IPV6_REGISTRY	Registry of IPv6 address	RIPENCC
NAME	Reverse DNS resolution	ip6.aerasesc.de
SLA	Site Level Aggregator (subnet)	0002
TYPE	Address type	unicast,global-unicast,productive

Generated by ip6calcweb.cgi 0.46, (P) & (C) 2002-2003 by Peter Bieringer
Powered by [ip6calc](#) 0.47, (P) & (C) 2001-2003 by Peter Bieringer

IPv6 ready



IPv6 support in Linux

IPv6 support in Linux

- Several components need IPv6 support in Linux:
 - Kernel
 - Networking
 - Firewalling
 - C-Libraries
 - resolver functions
 - RPC (portmapper)
 - Client applications
 - understanding IPv6 addresses in input
 - understanding AAAA records during DNS resolving
 - using IPv6 socket, if AAAA record is in DNS available
 - Server applications
 - understanding of IPv6 addresses in configurations
 - using IPv6 server socket (either by configuration or by default)
 - proper logging of IPv6 addresses

History of IPv6 in Linux - Kernel

- History of IPv6 implementation in Linux kernel
 - First rudimentary in version 2.1.8 (1996)
 - 2.2.19+ worked relatively stable, but less features
 - 2.4.x works relatively stable, some more features
 - In October 2000 the USAGI team was founded with focus of implementing all required features into the kernel
 - URL: <http://www.linux-ipv6.org/>
 - USAGI team submitted patches for 2.5.x series
 - Still ongoing process for 2.6.x
 - e.g. fixing problems reported by TAHI Conformance Test Report
 - completing IPsec support
 - further fixes
 - Awarded with *IPv6 Ready Logo™* (Phase 1)
 - USAGI snapshot 20040119
 - For router and host role



Status of IPv6 in Linux - Kernel

- According to the TAHI Conformance Test Report
 - Vanilla linux-2.6.1
 - USAGI 20040119 Snapshot linux26



	<u>Vanilla</u>	<u>USAGI</u>
• IPv6 Specification	100%	100%
• ICMPv6 for IPv6 Specification	100%	100%
• Neighbor Discovery	65%	91%
• Stateless Address Autoconfiguration	98%	98%
• Path MTU Discovery	0%	100%
• IPSec AH and ESP	77%	72%
• IPv6 over IPv4 Tunnel	100%	100%
• Robustness	100%	100%

Status of IPv6 in Linux - Kernel

- IPv6 IPsec

- USAGI and Netdev team ported code of *BSD KAME project to Linux
 - Replaces KLIPS code of FreeS/WAN
 - Features IPv4 and IPv6 support
- IKE daemons *raccoon* and *pluto*
 - Both are IPv6 capable
 - *raccoon* was also taken from KAME project, intention was replacing *pluto* (from the FreeS/WAN project) because of its complex code base
 - But *pluto* is still alive, already supporting native IPsec of 2.6.x kernels
 - now maintained by
 - *Openswan* (URL: <http://www.openswan.org/>)
 - *strongSwan* (URL: <http://www.strongswan.org/>)



Firewalling in IPv6 is very important...
...there is no implicit „protection“ anymore!

Reasons for IPv6 Firewalling

- Firewalling in IPv6 is very important, because
 - Client gets a global IPv6 address by design
 - in case if a global prefix is available
 - quickly happen by autoconfiguration after receiving a router advertisement
 - Unlike in IPv4, no hiding NAT on border routers possible
 - in IPv6, NAT was left out from design (see also RFC 2993)
 - but hiding NAT in IPv4 does not solve all security problems...think about tunneling via HTTPS (HTTP CONNECT), DNS or ICMP payload
 - Without protection, any listening service can be accessed from remote

**Like in very modern IPv4 world
firewalling on
border AND host
is also required for IPv6**

Reasons for IPv6 Firewalling

- Need careful design because
 - Tools are already available
 - Latest versions of *nmap* are already IPv6 capable
 - IPv6 networking is not as well reviewed and tested as IPv4 code
 - the developers hopefully learnt from the bugs found in IPv4 code
- One „advantage“...address range scanning isn't easy anymore
 - Per subnet 2^{64} addresses are possible
 - This can consume much time...
 - But reduction to 2^{24} per a chosen common used NIC vendor ID
 - But clients normally respond to IPv6 ping to all-node link-local multicast address
 - Example: `ping6 -I eth0 ff02::1`
 - Currently only a problem in link-local range

Status of IPv6 firewalling in Linux

- Modern Linux kernel contains *netfilter* firewalling
 - *ipchains* was replaced 2001 in 2.3.x series
 - User-space tool for IPv6: *ip6tables*
- Development
 - Mostly USAGI team is working on kernel side
 - Netfilter team is working on user-space tools
- Current status
 - Vanilla kernel supports stateless IPv6 packet filtering
 - Very useful and also important for client security
 - Stateful IPv6 packet filtering is already available
 - currently USAGI extension, but waiting to be included in vanilla kernel
 - But still no GUI tools (e.g. fwbuilder) are IPv6 enabled – scripts have to be used instead
- More hints



URL: <http://www.tldp.org/HOWTO/Linux+IPv6-HOWTO/chapter-firewalling-security.html>

Example of IPv6 firewalling in Linux

- Chain INPUT (policy DROP)

```
target  prot opt  source      destination
# Destination Unreachable (1) Packet Too Big (2) Time Exceeded (3) Parameter Problem (4)
ACCEPT  icmpv6  ::/0       ::/0        ipv6-icmp type 1
ACCEPT  icmpv6  ::/0       ::/0        ipv6-icmp type 2
ACCEPT  icmpv6  ::/0       ::/0        ipv6-icmp type 3
ACCEPT  icmpv6  ::/0       ::/0        ipv6-icmp type 4
# Router Advertisement (134) Neighbor Solicitation (135) Neighbor Advertisement (136)
ACCEPT  icmpv6  fe80::/10  ff02::/16   ipv6-icmp type 134
ACCEPT  icmpv6  fe80::/10  ::/0        ipv6-icmp type 135
ACCEPT  icmpv6  ::/0       ff02::/16   ipv6-icmp type 135
ACCEPT  icmpv6  ::/0       ::/0        ipv6-icmp type 136
# Incoming Secure Shell (tcp/22)
ACCEPT  tcp          ::/0          ::/0          tcp spts:1024:65535 dpt:22
```

- Chain OUTPUT (policy DROP)

```
target  prot opt  source      destination
ACCEPT  icmpv6  ::/0       ::/0        ipv6-icmp type 1
ACCEPT  icmpv6  ::/0       ::/0        ipv6-icmp type 2
ACCEPT  icmpv6  ::/0       ::/0        ipv6-icmp type 3
ACCEPT  icmpv6  ::/0       ::/0        ipv6-icmp type 4
ACCEPT  icmpv6  ::/0       ff02::/16   ipv6-icmp type 135
ACCEPT  icmpv6  ::/0       ::/0        ipv6-icmp type 136
# Outgoing Secure Shell response (tcp/22 without only SYN flag set)
ACCEPT  tcp          ::/0          ::/0          tcp spt:22 dpts:1024:65535
flags:!0x16/0x02
```

IPv6 in DNS (server and resolver)...

...required to avoid typing these long addresses

e.g. `2001:0DB8:0123:4567:89AB:CDEF:0123:4567`

DNS IPv6 status - server

- Support of „AAAA“ record
 - BIND since version 4.9.5
- Native IPv6 transport of queries
 - BIND8 since version 8.4.0
 - BIND9
 - djbdns (with patch from Felix Leitner – experimental)
- Note:
 - No changes are required for the reverse lookup (PTR), each nibble of the expanded IPv6 address is separated by a dot, same mechanism as on IPv4 is used

DNS IPv6 status - resolver

- IPv6 address query support
 - GNU C-Library since version 2.1
 - dietlibc
- Resolver able to use IPv6 transport for queries
 - GNU C-Library since version 2.2
 - dietlibc since version 0.10
- RPC bind (portmapper)
 - GNU C-Library: status currently unknown
 - dietlibc: not planned

Configuring IPv6 on a Linux box...

...some scenarios

Enable IPv6 on Linux client

- Prerequisites:
 - native IPv6 connectivity is available on the link
 - router already sends advertisements (RA)
- Manual setup
 - Activate IPv6 by loading the kernel module „ipv6“
 - Manual

```
# modprobe ipv6
```
 - After next reboot (current Debian already contain this by default)
 - Kernel 2.4.x

```
# echo "alias net-pf-10 ipv6" >>/etc/modules.conf
```

```
# depmod -a
```
 - Kernel 2.6.x

```
# echo "alias net-pf-10 ipv6" >>/etc/modprobe.conf
```

```
# depmod -a
```
 - Autoconfiguration does the rest for you:
 - adds IPv6 address using the prefix received by the RA
 - setup default route to the address of the router which is received also by the RA

Enable IPv6 on Linux client

- Prerequisites:
 - native IPv6 connectivity is available on the link
 - no router sends advertisements
- Manual setup
 - Activate IPv6 by loading the kernel module „ipv6“

```
# modprobe ipv6
```
 - Add an IPv6 address to the interface

```
# ip -6 addr add 2001:0DB8::2/64 dev eth0
```

```
# ip link set dev eth0 up
```
 - Add static route to a router

```
# ip -6 route add 2000::/3 via 2001:0DB8::1
```

 - Note that support of manual setup of default route in IPv6 was recently enabled in latest kernels (::/0)

IPv6 on Linux client - 6to4 tunneling

- Prerequisites:
 - Global routable IPv4 address on one interface (eth?, ppp?)
- Manual setup
 - Generate 6to4 prefix

```
# ipv6calc -q --action conv6to4 192.0.2.1
2002:c000:201::
```
 - Create a tunnel interface


```
# ip tunnel add tun6to4 mode sit ttl 64 remote any
local 192.0.2.1
# ip link set dev tun6to4 up
```
 - Add 6to4 IPv6 address to the interface (example suffix ::1)

```
# ip -6 addr add 2002:c000:201:::1/16 dev tun6to4
```
 - Add static route through device to IPv4 anycast address of 6to4 relays

```
# ip -6 route add 2000::1/3 via ::192.88.99.1 dev
tun6to4 metric 1
```

URL: <http://staff.csc.fi/~psavola/residential.html> (how 6to4 works)

IPv6 on Linux client - static tunneling

- Prerequisites:
 - Global routable IPv4 address on one interface (eth?, ppp?)
 - static IPv4 address in normal cases
 - dynamic IPv4 address can be used using heartbeat protocols
 - e.g. by SixXS Tunnel Broker, URL: <http://www.sixxs.net/> 
 - IPv4 address of remote tunnel server
 - sometimes (but not needed for unnumbered tunnels) IPv6 address
- Manual setup
 - Create a tunnel interface

```
# ip tunnel add sit1 mode sit ttl 64 remote
192.0.2.254 local 192.0.2.1
# ip link set dev sit1 up
```
 - Add static route through device

```
# ip -6 route add 2000::/3 dev sit1 metric 1
```

IPv6 on Linux router

- IPv6 enabled router
 - Can supply native IPv6 connectivity for local network
 - Using Router Advertisement Daemon *radvd* for autoconfiguration of clients
 - Can provide upstream connectivity via tunneling
 - Should have IPv6 firewalling
 - Remember: no NAT is available in IPv6 for „auto-protection“ on layer 3!
- Manual setup
 - IPv6 configuration of at least 2 devices (e.g. LAN and tunnel interface)
 - IPv6 forwarding needs to be enabled

```
# sysctl -w net.ipv6.conf.all.forwarding=1
```


Permanent IPv6 setup in Linux

- Permanent IPv6 setup depends on support of Linux distributions
 - Fedora/Red Hat Linux and clones
 - Setup options are described in
 - File: `/usr/share/doc/initscripts-<version>/sysconfig.txt`
 - `initscripts-ipv6` homepage
URL: <http://www.deepspace6.net/projects/initscripts-ipv6.html>
 - Debian
 - Setup options are described in
 - Craig Small's web page
URL: <http://people.debian.org/~csmall/ipv6/setup.html>
 - SuSE
 - Setup options are described in
 - File: `/usr/share/doc/packages/sysconfig/README`
 - Major problem: IPv6 support is not equal
 - some distributions (e.g. Debian, SuSE) use different configuration file and rc-script structures
 - `initscripts-ipv6` extension cannot be used here :-)

IPv6 is now configured on the Linux box...

now let's look for support in applications

Some IPv6-ready daemons/clients

- DNS: BIND + glibc resolver
- SSH: OpenSSH
- HTTP: Apache2, Mozilla
- FTP: ProFTPD, vsftpd
- SMTP: postfix
- POP3/IMAP4: courier-imap

IPv6-enabling of DNS

- DNS

- BIND server „named“ (<http://www.isc.org/products/BIND/>)

- Configuration file, usually */etc/named.conf*

- Adjust listening option

```
options {  
    ...  
    listen-on-v6 { any; };  
    ...  
};
```

- glibc resolver (<http://www.gnu.org/software/libc/libc.html>)

- Configuration file */etc/resolv.conf*

- Specify IPv6 address before IPv4 address of a DNS server (support since version 2.2)

```
# ns.ripe.net  
nameserver 2001:610:240:0:53::193  
nameserver 193.0.0.193
```

- Configuration file */etc/nsswitch.conf*

- Force to enable AAAA queries on host-to-address resolution (only required on some Linux distributions)

```
hosts:          files dns6
```

IPv6-enabling of SSH

- SSH

- OpenSSH server „sshd“ (<http://www.openssh.org/>)

- Configuration file, usually */etc/ssh/sshd_config*

- Adjust listen option

- ...
 - Listen ::
 - ...

- OpenSSH client „ssh“

- Use command line option to force IPv6 connect

- # ssh -6 ::1



IPv6-enabling of HTTP

- HTTP

- Apache2 webserver (<http://httpd.apache.org/>)



- Configuration file, usually `/etc/httpd/conf/httpd.conf`
 - Adjust listen option

```
...  
Listen 192.0.2.1:80  
Listen [2001:0DB8::1]:80  
...
```

- Adjust virtual hosting option, if required

```
<VirtualHost [2001:0DB8::1]:80 192.0.2.1:80>  
</VirtualHost>
```

- Mozilla web client (<http://www.mozilla.org/>)



- Most proxies don't support IPv6 to client at the moment, so specify not to use any proxy
 - Screenshot is shown on next slide
 - Note that precompiled/distributed versions for MS Windows don't support IPv6 at the moment

IPv6-enabling of HTTP

AERAsc - IPv4/IPv6 Address Information Page - Mozilla <2>


File Edit View Go Bookmarks Tools Window Help

Back Forward Reload Stop <http://ipv6.aerasesc.de/index2.html.en> Print

Bookmarks Red Hat Network Training Support Software Hardware Developers Embedded Search

AERAsc - IPv4/IPv6 Address Info...

Welcome to ipv6.aerasesc.de




IPv4/IPv6 Address Information Page

In case of native IPv6 access you will see an animated logo on the top of the page.

For more about IPv6 from AERAsc take a look at [IPv6 Services](#) and [IPv6 Workshops/Trainings](#)

[Deutsche Version](#)



Your client		
EUI48	EUI-48 identifier (MAC address)	00:04:76:01:23:45
EUI48_SCOPE	EUI-48 scope	global
EUI48_TYPE	EUI-48 address type	unicast
IID	Interface identifier	0204:76ff:fe01:2345
IPv6	IPv6 address	2001:0DB8:0001:0001:0204:76ff:fe01:2345
IPv6_REGISTRY	Registry of IPv6 address	RIPENCC
OUI	Vendor identification of network interface card	"3 Com Corporation"
SLA	Site Level Aggregator (subnet)	0001
TYPE	Address type	unicast,global-unicast,productive
USERAGENT	User agent identification	Mozilla/5.0 (X11; U; Linux i686; en-US; rv:1.6)
This server		
EUI64_SCOPE	EUI-64 scope	local
IID	Interface identifier	0000:0000:0148:0001
IPv6	IPv6 address	2001:07b0:1101:0002:0000:0000:0148:0001
IPv6_REGISTRY	Registry of IPv6 address	RIPENCC
NAME	Reverse DNS resolution	ipv6.aerasesc.de
SLA	Site Level Aggregator (subnet)	0002
TYPE	Address type	unicast,global-unicast,productive

Generated by [ipv6calcweb.cgi](#) 0.46, (P) & (C) 2002-2003 by Peter Bieringer
Powered by [ipv6calc](#) 0.47, (P) & (C) 2001-2003 by Peter Bieringer

IPv6-enabling of FTP

- FTP

- ProFTPD server (<http://www.proftpd.org/>)

- Configuration file, usually */etc/proftpd.conf*

- Adjust listen option, but take care, not 100% logical in virtual host setup...

```
...  
<VirtualHost 192.0.2.1>  
    ...  
    Bind 2001:0DB8::1  
    ...  
</VirtualHost>
```

- vsftpd server (<http://vsftpd.beasts.org/>)

- Configuration file, usually */etc/vsftpd/vsftpd.conf*

- Adjust listen option

```
...  
listen_ipv6=YES  
...
```



IPv6-enabling of SMTP/POP3/IMAP4

- SMTP

- Postfix server (<http://www.postfix.org/>)

- Patch is still required, URL: <http://www.ipnet6.org/postfix.html>
 - Mainstream IPv6 support is planned for 2.2.x
 - Configuration file, usually */etc/postfix/master.cf*

```
...  
::1:smtp inet n - n - - smtpd -v  
...
```



- POP3/IMAP4

- courier-imap server (<http://www.inter7.com/index.php?page=courierimap>)

- Normally nothing to do except *courier-imap* needs to be compiled with IPv6 support (default, if IPv6 is supported on system)
 - Configuration file, usually */usr/lib/courier-imap/etc/{imapd,pop3d}*

```
...  
ADDRESS=0 (default)  
...
```

Future Outlook

Future Outlook

- Linux kernel
 - Ongoing coding by USAGI/netdev team to reach the 100%
 - Client security using IPv6 firewalling is already possible
- Distribution support
 - Permanent setup capabilities and features depending on implementation
 - except for *initscripts-ipv6* no information is available about an ongoing development
- Application support
 - Around 200 are ported or a patch is available
 - Major missing ones for IPv6-only networking:
 - syslogd, syslog-ng (no forecast)
 - RPC portmapper, NFS (no forecast)
 - Possible replacement: coda (first occurrence of IPv6 support in 6.0.4)
 - squid (no forecast)
 - amanda (no forecast)

Future Outlook

- Major question:
When can we deploy an Linux based IPv6-only network?
- Answer:
Still not 100% at the moment
 - Good: Internet usage
 - Browsing, e-Mail
 - Poor: Intranet support
 - Missing backup, RPC/NFS, central syslogging, caching proxies

Contact Information

pb@bieringer.de

<http://www.bieringer.de/pb/>

<http://www.bieringer.de/linux/IPv6/>



peter@deepspace6.net

<http://www.deepspace6.net/>



pbieringer@aerasec.de

<http://www.aerasec.de/>

<http://www.aerasec.de/services/ipv6.html>

Thank you for listening!

Q&A

Credits to

Robson Oliveira (invitation, suggestions)

Mauro Tortonesi (review, suggestions)

Simone Piunno (review, suggestions)

Martin F. Krafft (review, suggestions)