

Samba and Vista with IPv6

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Quick Poll

- ⌘ Who is using IPv6?
- ⌘ Who is using IPv6 in a production environment?
- ⌘ Who wants to use IPv6 in Windows networks?

Quick Comparison IPv4 vs IPv6

	IPv4	IPv6
Address space	Scarce	Huge <input checked="" type="checkbox"/>
End to end connectivity	No (NAT)	Yes <input checked="" type="checkbox"/>
Stateless auto-configuration	No	Yes <input checked="" type="checkbox"/>
IPSec standard	No	Yes <input checked="" type="checkbox"/>
IP mobility	Impractical	Yes <input checked="" type="checkbox"/>
Network renumbering	Difficult	Easy <input checked="" type="checkbox"/>
Peer to peer applications	Difficult	Easy <input checked="" type="checkbox"/>

Motivations to Implement IPv6

⌘ Political

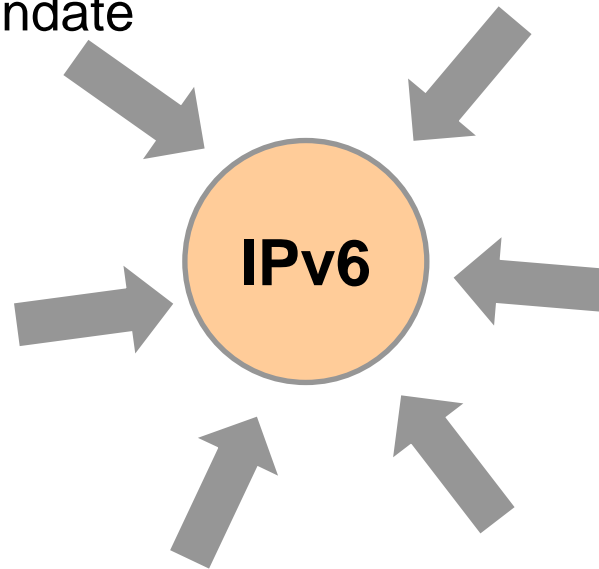
- ☒ Government mandate

⌘ Geographical

- ☒ Address allocation
- ☒ Internet growth

⌘ Services

- ☒ IP mobility
- ☒ Peer to peer
- ☒ VoIP



⌘ Technical

- ☒ Peer to peer
- ☒ Mobility
- ☒ Security
- ☒ QoS

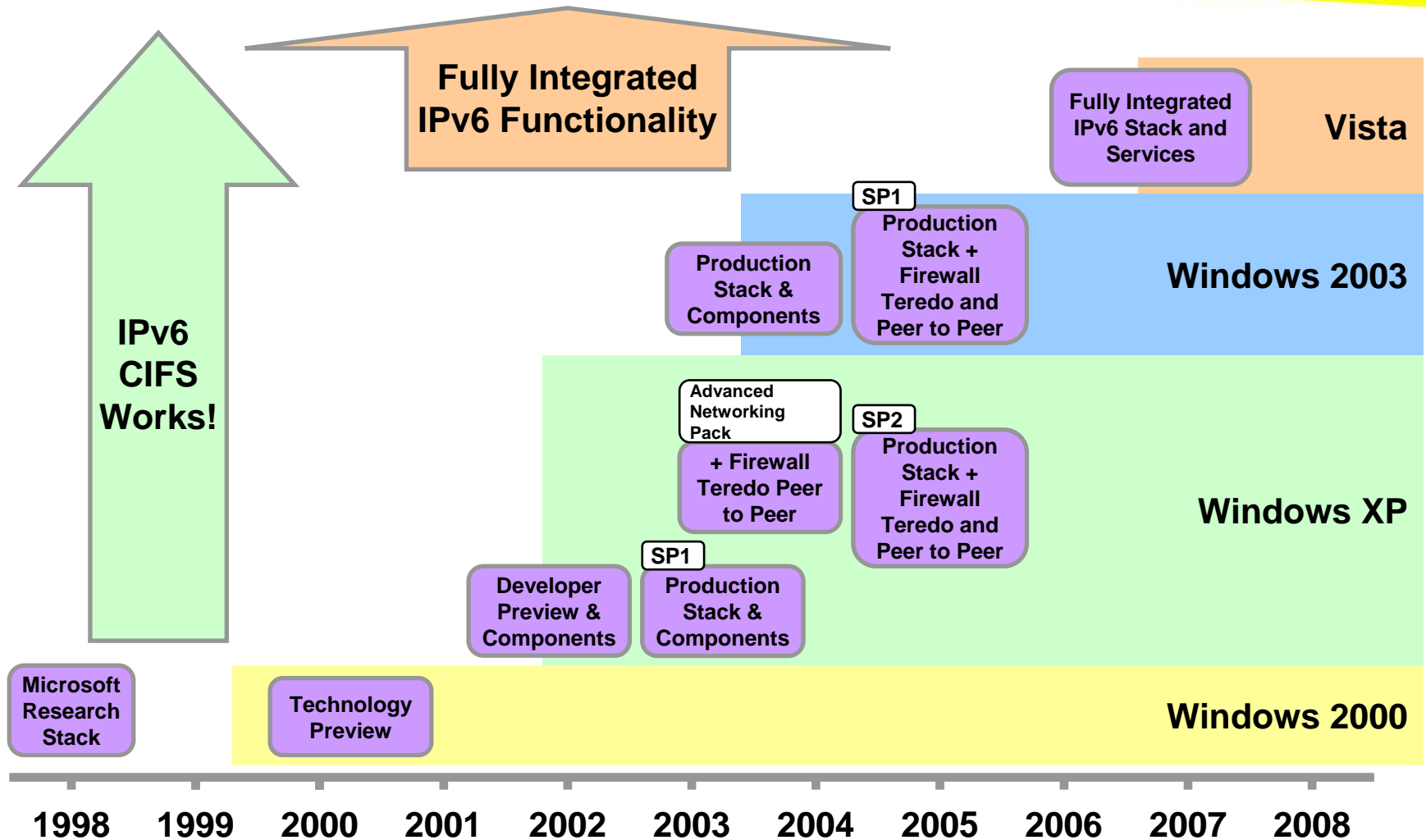
⌘ Organisational

- ☒ DoD
- ☒ Federal Government
- ☒ Microsoft

⌘ Business Case

- ☒ Market opportunities
- ☒ Cost reduction

History of Windows and IPv6



IPv6 and Vista and Longhorn

⌘ Vista & Longhorn will introduce IPv6 into many networks

⌘ IPv6 by stealth

- ☒ Organisation implements Longhorn and/or Vista and uses IPv6 by default
- ☒ Transition mechanisms enable IPv6 on IPv4 only networks

⌘ IPv6 by design

- ☒ Organisation implements Longhorn and/or Vista as a part of strategic plan to move to IPv6

Configuring IPv6 on Vista

Local Area Connection Status

Network Connection Details

Network Connection Details:

Property	Value
Connection-specific DN...	
Description	VMware Accelerated AMD PCNet Adapte
Physical Address	00-0C-29-A5-70-20
DHCP Enabled	No
IPv4 IP Address	192.168.108.3
IPv4 Subnet Mask	255.255.255.0
IPv4 Default Gateway	
IPv4 DNS Server	192.168.108.132
IPv4 WINS Server	
NetBIOS over Tcpi... En...	Yes
IPv6 IP Address	3000:0:20:0:85cc:a568:4656:fb20
Temporary IPv6 Address	3000:0:20:0:f84e:405b:1039:3f02
Link-local IPv6 Address	fe80::85cc:a568:4656:fb20%8
IPv6 Default Gateway	fe80::20c:29ff:fea3:8bb1%8
IPv6 DNS Server	3000:0:20:0:20c:29ff:fef1:925b

Close

- ⌘ Enabled by default
- ⌘ Preferred protocol
- ⌘ Configured automatically
- ⌘ Attempts to work even in IPv4 only networks
 - Teredo
 - ISATAP
- ⌘ Fully integrated into GUI

IPv6 Addresses and Vista

- ⌘ Interfaces have **many** IPv6 Addresses
- ⌘ Be aware of this when working with Samba

Globally routable prefix

Interface addresses

- ☑ Not EUI-64 by default
- ☑ Randomly generated

IPv4 WINS Server	
NetBIOS over Tcpip Enabled	Yes
IPv6 IP Address	3000:0:20:0:85cc:a568:4656:fb20
Temporary IPv6 Address	3000:0:20:0:f84e:405b:1039:3f02
Link-local IPv6 Address	fe80::85cc:a568:4656:fb20%8
IPv6 Default Gateway	fe80::20c:29ff:fea3:8bb1%8
IPv6 DNS Server	3000:0:20:0:20c:29ff:fe11:925b

Randomly generated client interface address

Link-local

NetBIOS NBT and IPv6

⌘ NetBIOS does not work over IPv6

⌘ Raw SMB over IPv6 works

Port	Protocol	Description
137	UDP	NBT Name Service
137	TCP	NBT Name Service
138	UDP	Datagram service
138	TCP	Unused
139	UDP	Unused
139	TCP	Session Service
445	TCP	Raw SMB over TCP/IP

Will never work with IPv6

Will work with IPv6



Name Resolution for IPv6 CIFS

⌘ NetBIOS name resolution is IPv4 only

IPv4 Only

⌘ Link-local Multicast Name Resolution
(LLMNR)

IPv4 and IPv6

⌘ DNS

IPv4 and IPv6

Link-local Multicast Name Resolution (LLMNR)

- ⌘ Performs name resolution without DNS
- ⌘ Essentially DNS over multicast
- ⌘ Works for IPv4 *and* IPv6 hosts
- ⌘ Uses multicast addresses

⌘ IPv6 FF02::1:3

⌘ IPv4 224.0.0.252

```
TCP [::]:49155 [::]:0 LISTENING
TCP [::]:49156 [::]:0 LISTENING
TCP [::]:49157 [::]:0 LISTENING
TCP [fe80::85cc:a568:4656:fb20%8]:49167 [fe80::6463:a7a0:d182:adc0%8]:445 ESTABLISHED
```

```
C:\Users\dauid>
```

Linux/Unix and IPv6

- ⌘ Current versions of Linux, BSD and Unix support IPv6
- ⌘ Usually enabled by default
- ⌘ Majority of applications support IPv6

```
root@fedora6:~  
File Edit View Terminal Tabs Help  
[root@fedora6 ~]# ifconfig eth0  
eth0      Link encap:Ethernet  HWaddr 00:0C:29:A3:8B:B1  
          inet addr:192.168.108.131  Bcast:192.168.108.255  Mask:255.255.255  
          inet6 addr: 3000:0:20:0:20c:29ff:fea3:8bb1/64 Scope:Global  
          inet6 addr: fe80::20c:29ff:fea3:8bb1/64 Scope:Link  
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1  
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0  
          TX packets:90 errors:0 dropped:0 overruns:0 carrier:0  
          collisions:0 txqueuelen:1000  
          RX bytes:0 (0.0 b)  TX bytes:17835 (17.4 KiB)  
          Interrupt:185 Base address:0x1400
```

Samba 3 and IPv6

⌘ **nmbd**

- ☒ NetBIOS name resolution IPv4 only
- ☒ WINS IPv4 only
- ☒ NetBIOS also IPv4 only

⌘ **smbd**

- ☒ SMB protocol is network layer independent
- ☒ Requires name resolution
 - ☒ Can be provided by any IPv6 aware mechanism (DNS)
- ☒ Problem – stock **smbd** not IPv6 enabled

smbd over IPv6 using xinetd

1. Run `smbd` from IPv6 enabled internet service daemon
2. Create `/etc/xinetd.d/smb`

```
# Samba smb service
service microsoft-ds
{
    flags                = REUSE IPV6
    socket_type          = stream
    wait                 = no
    user                  = root
    server                = /usr/sbin/smbd
    log_on_failure       += USERID
    disable              = no
}
```

port 445 in
`/etc/services`

Enables IPv6

3. Start `xinetd`

Samba 3 SMB over IPv6 (1)

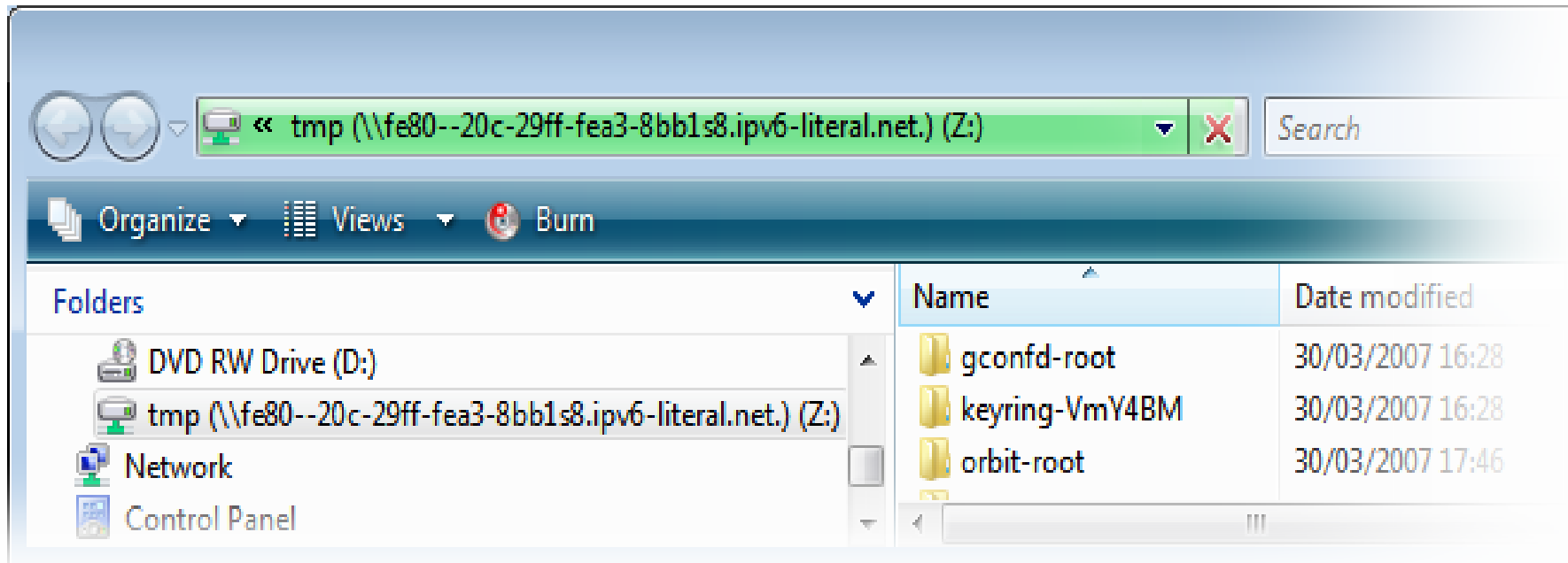
⌘ On Samba box check for IPv6 SMB listener

```
# netstat -inet6 -an | grep 445  
tcp 0 0 :::445 :::* LISTEN
```

⌘ Works! 

Samba 3 SMB over IPv6 (2)

⌘ Connect from Vista using link local address and no DNS



⊠ Literal DNS name converts to IPv6 addresses

⊠ Hyphens replace colons in domain name

⌘ Works! 

Vista net use over IPv6

⌘ Works from the command line too

```
Command Prompt
C:\Users\david>net use z: \\fe80--20c-29ff-fea3-8bb1s8.ipv6-literal.net.\tmp
C:\Users\david>net use
New connections will be remembered.

Status          Local          Remote          Network
-----
OK              Z:             \\fe80--20c-29ff-fea3-8bb1s8.ipv6-literal.net.\tmp
                                                Microsoft Windows Network
                                                VMware Shared Folders
\\.\host
The command completed successfully.
```

IPv6 and `xinetd` Gotcha

You might be tempted to:

- ⌘ Enable IPV6 in `xinetd`

```
/etc/xinetd.conf
```

```
v6only = yes
```

- ⌘ And remove IPv6 in the `smb` configuration

```
/etc/xinetd.d/smb
```

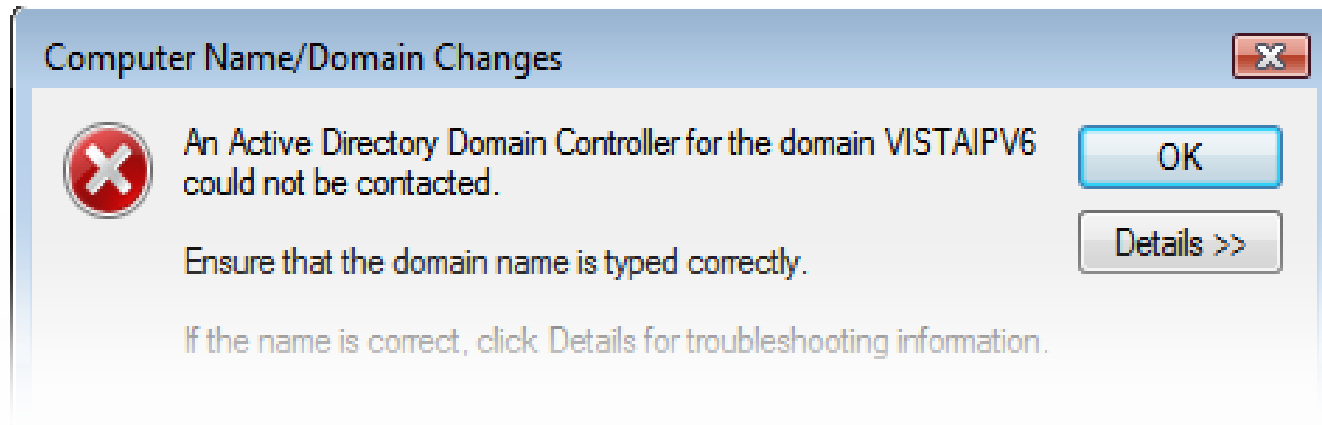
```
flags = REUSE IPV6
```

- ⌘ This will configure SMB over *IPv4!*

- Dual stack uses IPv4-mapped IPv6 addresses

Samba 3 as IPv6 PDC

- ⌘ Samba 3 cannot be Active Directory domain controller
- ⌘ Vista **only** contacts Active Directory DC using IPv6



- ⌘ Vista cannot join or login to a Samba 3 domain over IPv6



- ⌘ Share SMB/CIFS user authentication **does** work

Samba 3 IPv6 Client Side

⌘ Support not complete in Samba 3 client code

☒ Quite a bit of work to do

C:\WINDOWS\system32\cmd.exe

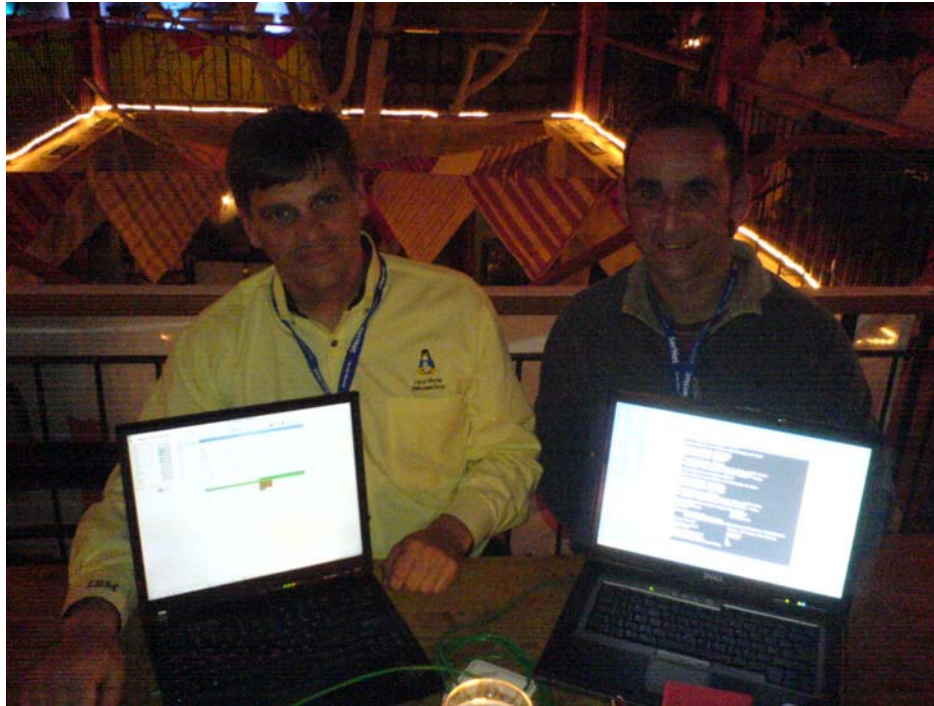
```
# c:\IPv6Kit\bin\checkv4.exe *.c
client.c(82) : in_addr : use in6_addr in addition for IPv6 support
client.c(3397) : in_addr : use in6_addr in addition for IPv6 support
mount.cifs.c(750) : in_addr : use in6_addr in addition for IPv6 support
mount.cifs.c(800) : gethostbyname : use getaddrinfo instead
mount.cifs.c(818) : inet_ntoa : use WSAAddressToString or getnameinfo with NI_NUMERICHOST instead
smbctool.c(79) : in_addr : use in6_addr in addition for IPv6 support
smbctool.c(3476) : in_addr : use in6_addr in addition for IPv6 support
smbmount.c(39) : in_addr : use in6_addr in addition for IPv6 support
smbmount.c(124) : in_addr : use in6_addr in addition for IPv6 support
```

Linux CIFS IPv6 Client

⌘ “*Linux CIFS Client Guide*” by Steve French

“IPv6 Support is planned for the future and is almost complete”

⌘ Now working as of SambaXP 2007 Party!



Steve French and David Holder – The first ever CIFS client connection over IPv6

Samba 4 and IPv6

⌘ Samba 4 code is not yet completely IPv6 clean

```
C:\WINDOWS\system32\cmd.exe
# c:\IPv6Kit\bin\checkv4.exe socket_ipv6.c
socket_ipv6.c(188) : sockaddr_in : use sockaddr_storage instead, or
socket_ipv6.c(285) : gethostbyaddr : use getnameinfo instead
socket_ipv6.c(371) : gethostbyaddr : use getnameinfo instead
```

⌘ Server side now IPv6 clean as of this week, **but**

⏏ IPv4 is hard-code in some places

```
status = stream_setup_socket(event_context, model_ops,
                             &ldap_stream_ops,
                             "ipv4", address, &port,
                             ldap_service);
```

⌘ You can hack Samba 4 server to work over IPv6

 socket_ipv4.c	22089	1 file cset	2 weeks	tridge	check the return value of interpret_addr2()
 socket_ipv6.c	22488	2 file cset	20 hours	jelmer	Hopefully fix ipv6.
			11		Remove unused 'flags' argument from

Samba 4 and IPv6

⌘ Cannot run Samba 4 from Internet Super Daemon

☒ Samba4 `smbd` listens on multiple ports

☒ Internet super daemons one port per daemon

	Protocol	Local Address	Local Port	State	Foreign Address	Foreign Port
	tcp	0.0.0.0	1024	*	0.0.0.0	*
	tcp	0.0.0.0	3268	*	0.0.0.0	*
SWAT	tcp	0.0.0.0	901	*	0.0.0.0	*
LDAP	tcp	0.0.0.0	389	*	0.0.0.0	*
	tcp	0.0.0.0	135	*	0.0.0.0	*
NetBIOS	tcp	0.0.0.0	139	*	0.0.0.0	*
Kerberos	tcp	192.168.108.132	464	*	0.0.0.0	*
Kerberos	tcp	192.168.108.132	88	*	0.0.0.0	*
LDAPS	tcp	0.0.0.0	636	*	0.0.0.0	*
SMB	tcp	0.0.0.0	445	*	0.0.0.0	*
LDAP	udp	0.0.0.0	389	*	0.0.0.0	*
WINS	udp	192.168.108.132	137	*	0.0.0.0	*
WINS	udp	192.168.108.255	137	*	0.0.0.0	*
WINS	udp	0.0.0.0	137	*	0.0.0.0	*
NetBIOS	udp	192.168.108.132	138	*	0.0.0.0	*
NetBIOS	udp	192.168.108.255	138	*	0.0.0.0	*
NetBIOS	udp	0.0.0.0	138	*	0.0.0.0	*
Kerberos	udp	192.168.108.132	464	*	0.0.0.0	*
Kerberos	udp	192.168.108.132	88	*	0.0.0.0	*

Samba 4 and IPv6

⌘ Use IPv6 hack or port forwarder for Samba 4 over IPv6



```
root@fedora6s4:~  
File Edit View Terminal Tabs Help  
tcp 0 0 :::3268 :::* LISTEN  
tcp 0 0 :::389 :::* LISTEN  
tcp 0 0 :::135 :::* LISTEN  
tcp 0 0 :::464 :::* LISTEN  
tcp 0 0 :::88 :::* LISTEN  
tcp 0 0 :::636 :::* LISTEN  
tcp 0 0 :::445 :::* LISTEN  
udp 0 0 :::389 :::*  
udp 0 0 :::464 :::*  
udp 0 0 :::88 :::*
```

⊞ Hacked version also listens on IPv4 (dual stack)

⌘ Works for mapping network drives and simple tasks

⌘ Vista *fails* to join domain over IPv6

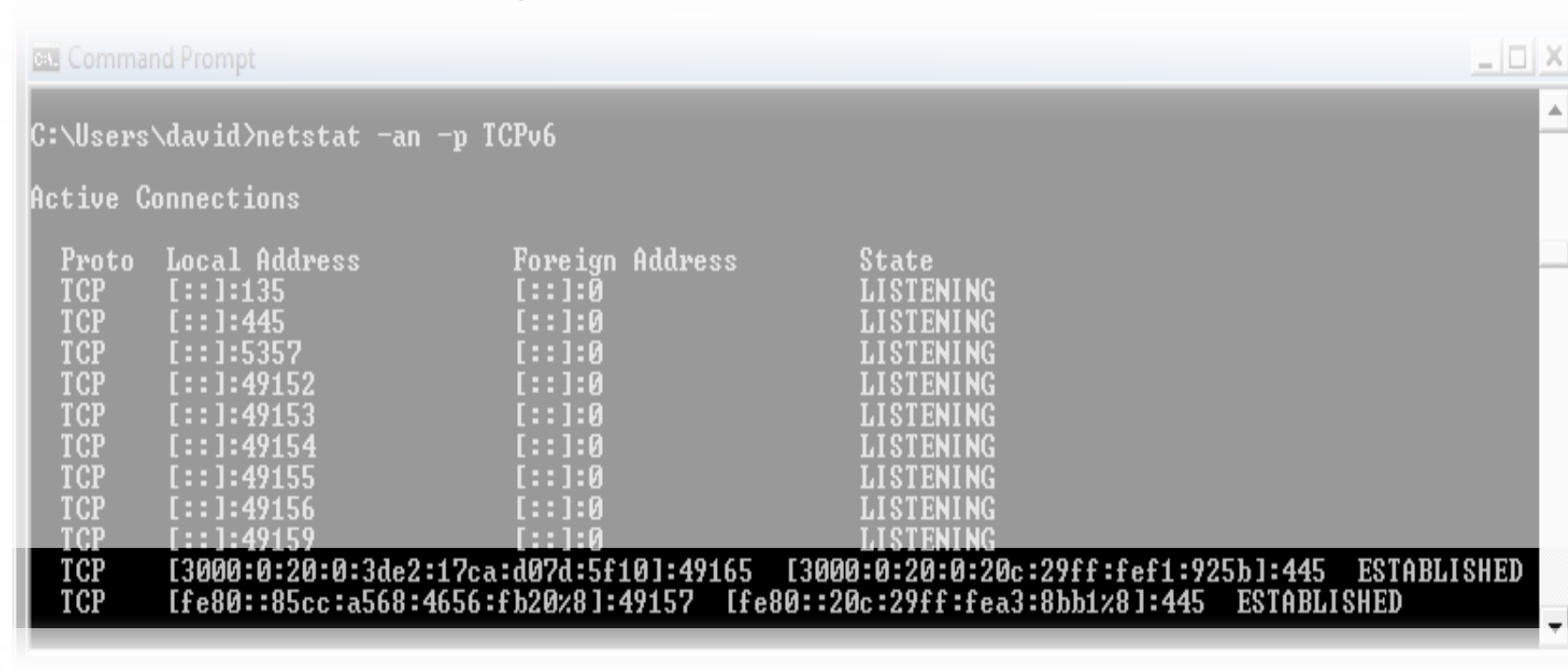
⊞ **No** difference from IPv4

Vista to Samba 4 over IPv6

⌘ SMB over IPv6 works using:

☑ IPv6 hack

☑ Port forwarding



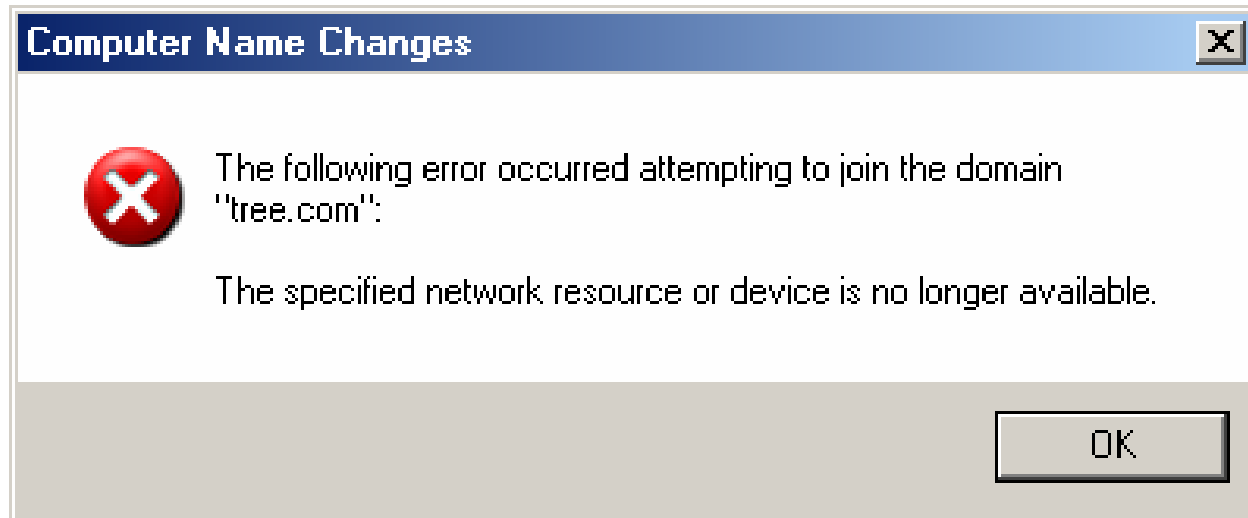
```
Command Prompt
C:\Users\david>netstat -an -p TCPv6

Active Connections

Proto Local Address           Foreign Address         State
TCP   [::]:135                 [::]:0                  LISTENING
TCP   [::]:445                 [::]:0                  LISTENING
TCP   [::]:5357                [::]:0                  LISTENING
TCP   [::]:49152               [::]:0                  LISTENING
TCP   [::]:49153               [::]:0                  LISTENING
TCP   [::]:49154               [::]:0                  LISTENING
TCP   [::]:49155               [::]:0                  LISTENING
TCP   [::]:49156               [::]:0                  LISTENING
TCP   [::]:49159               [::]:0                  LISTENING
TCP   [3000::20:0:3de2:17ca:d07d:5f10]:49165 [3000::20:0:20c:29ff:fe1:925b]:445 ESTABLISHED
TCP   [fe80::85cc:a568:4656:fb20%8]:49157 [fe80::20c:29ff:fea3:8bb1%8]:445 ESTABLISHED
```

Longhorn IPv6 and Samba

⌘ Longhorn fails to join Samba 4 domain



⌘ Longhorn can use SMB shares over IPv6 to Samba 3/4

IPv6 and Samba Summary

Version	Role	Works?	Requirement
Samba3	Raw SMB over IPv6	Yes	None
	NT DC over IPv6	No	No requirement
	CIFS Client	Yes	As of SambaXP 2007
	AD Client over IPv6	No	Required for Longhorn AD domains
Samba4	Raw SMB over IPv6	Yes*	Required. <i>*only with hack</i>
	AD Client over IPv6	No	Required. Can be simulated by port forwarding.
	AD DC over IPv6	Yes*	Required. <i>*only with hack</i> Can be simulated using port forwarding. IPv6 AD clients (Vista/Longhorn) cannot join a Samba4 domain.
	LLMNR	No	Required

Where Next with Samba and IPv6?

- ⌘ Samba with AD is required combination for IPv6
 - ☑ AD DC – Samba 4
- ⌘ Samba 4 can be hacked to support IPv6
 - ☑ Server only
- ⌘ Samba4 server code is close to supporting IPv6
 - ☑ Needs changes to build and test

Deployment of Vista and Longhorn will make Samba over IPv6 critical for some organisations

Questions?

File	Commit Count	Commit Date	Author	Description
netif.c	18708	1 file cset	metze	much nicer fix metze
netif.h	17586	32 file cset	metze	merge lib/netif into lib/socket and use -lr
socket.c	17197	18 file cset	abartlet	This patch moves the encryption of buf
socket.h	17197	18 file cset	abartlet	This patch moves the encryption of b
socket_ipv4.c	22089	1 file cset	tridge	check the return value of interpret.
socket_ipv6.c	22488	2 file cset	jelmer	Hopefully fix ipv6.
socket_unix.c	15356	15 file cset	abartlet	Remove unused 'flags' argumen
unix.c	21656	20 file cset	jelmer	Move tests a bit closer to the

Contact Details

⌘ Erion IPv6 Services:

www.ipv6training.com

www.ipv6consultancy.com

www.erion.co.uk

⌘ Samba and Windows Integration

www.erion.co.uk

⌘ David Holder

`david.holder@erion.co.uk`