Deploying Samba in IPv6 Networks

Samba XP
2011

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Deploying Samba in IPv6 Networks

- Urgent need to deploy IPv6
- Status of Samba support for IPv6
- What is different in IPv6 Windows Networks?
- How to Deploy IPv6
  - Preparing your infrastructure for IPv6
  - Deploying IPv6 with Samba 3
- The Future
Urgent Need to Deploy IPv6

- IPv4 address pool is empty
- Regional registrars will run out of stock in 2011
- IPv4 is a legacy protocol
- Linux, Unix, Windows, etc. all have IPv6 stacks

Please sir can I have some more IPv4 addresses?
Status of Samba IPv6 Support

CIFS Linux Client

Samba 4

Samba 3.2+

No IPv6 support (IPv6 support will not be added)

IPv6 Patch Not Recommended

Samba 2.2 (historic version)

IPv6 Support Added

Vista and Windows Server 2008 support for CIFS and AD over IPv6

Windows with Production IPv6 Stack & Components

IPv6 Support Works

2008

2009

2010

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History of Windows and IPv6

IPv6 CIFS Works!

Microsoft Research Stack
Technology Preview

Windows 2000

Windows XP

Windows 2003

Windows Vista

Windows 7

Windows Server 2008

IPv6 Active Directory


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## Differences in IPv6 Windows Networks

<table>
<thead>
<tr>
<th>Feature</th>
<th>IPv4</th>
<th>IPv6</th>
</tr>
</thead>
<tbody>
<tr>
<td>NBT/NetBIOS</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>WINS</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>NT Domains</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>SMB/CIFS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windows XP</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Windows 2003</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Active Directory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windows Vista</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Windows 7</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Windows Server 2008</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Linux CIFS and IPv6

- Kernel CIFS module is IPv6 enabled by default
  - Since SambaXP 2007

- `mount.cifs`

```bash
# mount -t cifs //W2008KENT/TESTSHARE /mnt/erion \
user=Administrator,pass='Pa$$w0rd'
```

- Just works – easy
Samba 3.x and IPv6

- IPv6 enabled by default
  - Samba 3.2 onwards
  - Tip: Use 3.6...
- IPv6 transport works!
  - Client and server side functionality over IPv6
  - Join Windows Server 2008 AD domains over IPv6
  - Serve shares and printers over IPv6

IPv6 Samba 3.2 Join to Windows Server 2008 Domain
Wednesday, January 30th, 2008

Yesterday I carried out the first every join of a Samba 3.2 server to a Windows domain over IPv6.

(see: http://www.ipv6consultancy.com/ipv6blog/?p=25)
Samba 4 and IPv6

● IPv6 *not* enabled by default
● Samba3 & 4 merge will bring IPv6 support
● **Samba4 will be released with IPv6 support**
● IPv6 was enabled with Erion hack
  ● **WARNING – Hack NOT production code (Don’t use)**
  ● See [http://www.ipv6consultancy.com/ipv6blog](http://www.ipv6consultancy.com/ipv6blog)
● IPv6 client and server side functionality
● IPv6 domain controller functionality
● Join Samba4 domains over IPv6
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Prepare IPv6 Infrastructure

- No need to turn IPv6 on (on by default)
- Assign IPv6 addresses
  - Static (manual)
  - SLAAC (StateLess Address Auto-Configuration)
  - SLAAC and Stateless DHCPv6
  - DHCPv6
- Configure basic network services
  - Name Services (DNS)
  - No WINS or NetBIOS for IPv6
Choosing IPv6 Addresses

- Not all IPv6 addresses are equal

**Tips**

1. Understand IPv6 address types (important)
2. Usually do not use link-local addresses for Samba
3. Use global addresses for production
4. Use native IPv6 addresses (if available)
5. Assign static addresses to servers and routers
6. Use SLAAC and DHCPv6
IPv6 Addresses – Quick Test

- You should know what these different addresses are and when to use them.
Get An Address Prefix

- Go Native – if possible!
- Tunnel if not – it is free and easy
  - /48 (64,536 subnets with 18,446,744,073,709,551,616 hosts each)

Example Tunnel Brokers

- SixXS
- Hurricane Electric
- freenet6

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Windows: Assign Addresses

- On Windows use GUI or command line (`netsh`)

Set address and prefix length
Set link local address of default router
Set global addresses of DNS server/s
Linux: Assign Addresses

- **On Linux/Unix** use `ifconfig`, `ip`, GUI etc...

```bash
# ifconfig eth0 add 2045:5249:4F4E::1

# ip -f inet6 addr add 2045:5249:4F4E::1/64 dev eth0
```

- IPv6 `ifconfig` syntax not consistent

- On Linux set IPv6 addresses in init scripts

```bash
# ifconfig eth0
eth0      Link encap:Ethernet  HWaddr 00:0C:29:BB:47:5F
inet6 addr: 2045:5249:4f4e::2/64 Scope:Global
inet6 addr: fe80::20c:29ff:febb:475f/64 Scope:Link
UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
RX packets:1672 errors:0 dropped:0 overruns:0 frame:0
TX packets:545 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:1987499 (1.8 MiB)  TX bytes:68438 (66.8 KiB)
Interrupt:19 Base address:0x2024
```
Prepare SLAAC and DHCPv6

- IPv6 router essential for IPv6 SLAAC & DHCPv6
- Linux/Unix Example (radvd.conf)

```plaintext
interface eth0
{
    AdvSendAdvert on;
    prefix 2045:5249:4F4E::/64
    {
        AdvManagedFlag off;
        AdvOtherConfigFlag off;
    };
}
```

- Note: DHCPv6 different from DHCPv4 in many ways...
DHCPv6

- No router option
- Exclusions on Windows rather than ranges
Check IPv6 Configuration

- On Windows use GUI, `netsh`, `ipconfig` or other
Test IPv6 Connectivity

- Use **ping** or **ping6** (platform dependent)
  - Link-local:
    ```
    # ping6 fe80::9416:bd6b:8d9c:7490%eth0
    ```
  - Global:
    ```
    # ping6 2045:5249:4f4e::1
    ```
- **Tip:** Default Windows firewall blocks IPv6 ICMPv6 echo
- Routing problems
  - Use **tracert**, **netstat**, **route**, **netsh** on Windows
  - Use **traceroute6**, **netstat**, **route** or **ip** on Linux
Samba 3.x Client IPv6 Test

# smbclient -L //2045:5249:4F4E::1 -U Administrator
Enter Administrator's password:

<table>
<thead>
<tr>
<th>Sharename</th>
<th>Type</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADMIN$</td>
<td>Disk</td>
<td>Remote Admin</td>
</tr>
<tr>
<td>C$</td>
<td>Disk</td>
<td>Default share</td>
</tr>
<tr>
<td>IPC$</td>
<td>IPC</td>
<td>Remote IPC</td>
</tr>
<tr>
<td>Testshare</td>
<td>Disk</td>
<td></td>
</tr>
<tr>
<td>Users</td>
<td>Disk</td>
<td></td>
</tr>
</tbody>
</table>

2045:5249:4F4E::1 is an IPv6 address -- no workgroup available

# smbclient -L //fe80::9416:bd6b:8d9c:7490%eth0 -U Administrator
Windows/Samba and IPv6 Name Resolution Options

- NetBIOS name resolution
  - IPv4 Only
- WINS
  - IPv4 Only
- Hosts file
- Link-local Multicast Name Resolution (LLMNR)
  - IPv4 and IPv6
  - Note: Windows Only
- DNS
  - IPv4 and IPv6
- Literal Addresses
  - IPv4 and IPv6
  - Linux/Unix NSS module
Prepare IPv6 DNS Server

- Use IPv6 enabled DNS server
  - e.g. BIND or Windows Server 2008 DNS)
- Configure forward lookups
- Configure reverse lookups
- Enable IPv6 transport
- Ensure EDNS0 is supported

```
win2008.example.com. IN AAAA 2045:5249:4F4E::1

1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.e.4.f.4.9.4.2.5.5.4.0.2.ip6.arpa. IN PTR server.domain.name.

listen-on-v6 {any;};
```
Configure DNS Clients

- Configure DNS clients (manually or via DHCPv6)
- Linux/Unix (/etc/resolv.conf)
  
  nameserver 2045:5249:4f4e::2

- Windows
Test IPv6 DNS Samba Client

- Test with `dig`, `host` and `nslookup` first then...

```bash
# smbclient -L //win2008.example.com. -U Administrator
Enter Administrator's password:
```

<table>
<thead>
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</tr>
<tr>
<td>Testshare</td>
<td>Disk</td>
<td></td>
</tr>
<tr>
<td>Users</td>
<td>Disk</td>
<td></td>
</tr>
</tbody>
</table>

Win2008.example.com. is an IPv6 address -- no workgroup available

- **Tip:** Do not put link-local addresses in DNS, also if possible avoid transition addresses in DNS
Textual Address Formats

- URLs, URIs and UNCs (not RFC2821 SMTP)
- Use IPv6 in square brackets in URIs and URLs
  \[3000:0:20:0:3de2:17ca:d07d:5f10\]
- Not in UNCs (use ipv6-literal.net. names instead)
  3000-0-20-0-3de2-17ca-d07d-5f10.ipv6-literal.net.
Literal Addresses

- In UNC's can use ipv6-literal.net. names
  2045-5249-4f4e--1.ipv6-literal.net

- Literal DNS name converts to IPv6 addresses
- Hyphens replace colons in domain name
- s indicates interface
- NSS module nss-ipv6literal provides this on Linux/Unix
Literal Addresses NSS

- Thanks to Simo Sorce

- Linux/Unix (/etc/nsswitch.conf)
  
  ```
  hosts: files ipv6literal dns
  ```

- Just works

  ```
  # ping6 2045-5249-4f4e--2.ipv6-literal.net
  PING 2045-5249-4f4e--2.ipv6-literal.net (fc12.example.com.): 64 bytes from fc12.example.com.: icmp_seq=1
  ```
Link-local Multicast Name Resolution (LLMNR)

- Performs name resolution without DNS
- DNS over multicast (not mDNS)
- Works for IPv4 and IPv6 hosts
- Uses multicast addresses
  - IPv6: FF02::1:3
  - IPv4: 224.0.0.252
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IPv6 addresses can be used in most places

![Configuration snippet]

```
[global]
  bind interfaces only=yes
  interfaces=::1
```

```
# smbcclient //::1/ipv6share
```

Excepting things that don’t work with IPv4!

Behaviour changes in Samba 3.6.x

```
%i
  the local IP address to which a client connected.
  Before 3.6.0 it could contain IPv4 mapped IPv6 addresses, now it only contains IPv4 or IPv6 addresses.
```
IPv6 addresses can be used access control.

```
C:\Users\Administrator>x:
Access is denied.
C:\Users\Administrator>x:
X:\>dir
 Volume in drive X is ipv6share
 Volume Serial Number is 78EC-0B71
 Directory of X:\
 05/10/2011  10:40 AM   <DIR>
[ipv6share]
  comment = IPv6 Share
  path = /home/ipv6share
  public = yes
  writable = yes
  printable = no
  create mask = 0765
  hosts allow = 2045:5249:4f4e::1
```
Samba 3.x Server Test

- Windows Server 2008 or Windows 7 Client

```
C:\Users\Administrator>net use x: \2045-5249-4f4e--2.ipv6-literal.net\ipv6share
Enter the user name for '2045-5249-4f4e--2.ipv6-literal.net': root
Enter the password for 2045-5249-4f4e--2.ipv6-literal.net:
The command completed successfully.
```
```
C:\Users\Administrator>net use
New connections will be remembered.

<table>
<thead>
<tr>
<th>Status</th>
<th>Local</th>
<th>Remote</th>
<th>Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>OK</td>
<td>✔</td>
<td>✗</td>
<td>\2045-5249-4f4e--2.ipv6-literal.net\ipv6share Microsoft Windows Network</td>
</tr>
</tbody>
</table>
```
```
# netstat --inet6 -an
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address Foreign Address State
tcp 0 0 2045:5249:4f4e::2:445 2045:5249:4f4e::1:49158 ESTABLISHED
```
```
C:\Users\Administrator>net use x: \fc12.example.com\ipv6share
Enter the user name for 'fc12.example.com': root
Enter the password for fc12.example.com:
The command completed successfully.
```
IPv6 Just Works

- Traffic is all IPv6
- Works if you block legacy traffic (AKA IPv4)
Benefits of IPv6 for Samba

- Auto Configuration is easy
  - Very useful for appliances
- End to end connectivity is restored (no NAT)
  - Access Samba from anywhere
- End to end security is possible (Addresses + IPsec)
  - Secure access for Samba from anywhere
- IPv6 is mandatory in many environments
  - Stops Samba being automatically rejected from tenders...
- Theoretical possibilities
  - QoS, Jumbo datagrams etc

- See Microsoft DirectAccess and RemoteAccess
Finally – Watch out for:

- Don’t Underestimate the Need for IPv6 Training
- Don’t Assume IPv6 = IPv4 + Longer Addresses
- Old Habits Must be Unlearned for IPv6
- Remember that Detail *is* Important in IPv6
- Common Problem: Name Resolution *not* IPv6
- Common Problem: Misuse of Addresses
- What out for Security: Two Protocols Complex Interactions
IPv6 and Samba References

- EU IPv6 Curricula Day
  - http://www.ipv6consultancy.com/ipv6blog/?p=70
- Storage Developers Association 2010
  - http://www.ipv6consultancy.com/ipv6blog/?p=64
- SambaXP 2008 Presentation
  - http://www.ipv6consultancy.com/ipv6blog/?p=34
- Google IPv6 Conference 2008 (YouTube)
  - http://youtube.com/watch?v=iK0nzdtzjvM
- Google CIFS Workshop Presentation
  - http://www.ipv6consultancy.com/ipv6blog/?p=21
- SambaXP 2007 Presentation
  - http://www.ipv6consultancy.com/ipv6blog/?p=8
- Linux CIFS Client
  - http://www.ipv6consultancy.com/ipv6blog/?p=9
- Samba4 Hack (old version don’t use)
  - http://www.ipv6consultancy.com/ipv6blog/?p=12
Further Information

- IPv6 Services
  - http://www.erion.co.uk/ipv6.html
- IPv6 Blog
  - http://www.ipv6consultancy.com/ipv6blog
- IPv6 Training
  - http://www.ipv6training.com
- IPv6 Consultancy
  - http://www.ipv6consultancy.com
- Contact david.holder@erion.co.uk
Profile: David Holder

- Co-Founder and Managing Director Erion Ltd
- Over 20 years experience in IT industry senior technical and IT management posts
- Chairman of IPv6 Task Force Scotland
- Regular speaker at global conferences on IPv6
- Extensive experience of IPv6 spanning over a decade
- Customers include; Microsoft, IBM, HP, Cisco, RIM, Orange, 3Com, Atos Origin
  - PhD in electronic engineering (Microwave Semiconductor Devices)
  - Fellow of IET (FIET)
  - Member of IEEE (MIEEE)
  - Chartered Engineer (CEng)
Questions

Thank you for listening