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

<table>
<thead>
<tr>
<th>Feature</th>
<th>IPv4</th>
<th>IPv6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address space</td>
<td>Scarce</td>
<td>Huge</td>
</tr>
<tr>
<td>End to end connectivity</td>
<td>No (NAT)</td>
<td>Yes</td>
</tr>
<tr>
<td>Stateless auto-configuration</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>IPSec standard</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>IP mobility</td>
<td>Impractical</td>
<td>Yes</td>
</tr>
<tr>
<td>Network renumbering</td>
<td>Difficult</td>
<td>Easy</td>
</tr>
<tr>
<td>Peer to peer applications</td>
<td>Difficult</td>
<td>Easy</td>
</tr>
</tbody>
</table>

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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

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History of Windows and IPv6

- **1998**: Microsoft Research Stack
- **1999**: Technology Preview
- **2000**: Fully Integrated IPv6 Functionality
- **2001**: IPv6 CIFS Works!
- **2002**: Production Stack & Components
- **2003**: Windows XP
  - SP1: Production Stack + Firewall
  - Teredo and Peer to Peer
- **2004**: Windows 2003
  - SP1: Production Stack + Firewall
  - Teredo and Peer to Peer
  - SP2: Production Stack + Firewall
  - Teredo and Peer to Peer
- **2005**: Windows XP
  - IPv6 CIFS Works!
  - Advanced Networking Pack
- **2006**: Windows 2008
  - Fully Integrated IPv6 Stack and Services
  - Teredo Peer to Peer
- **2007**: Windows 2008
  - Fully Integrated IPv6 Stack and Services
- **2008**: Vista

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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

- 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

Randomly generated client interface address

Link-local

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NetBIOS NBT and IPv6

- NetBIOS does not work over IPv6
- Raw SMB over IPv6 works

<table>
<thead>
<tr>
<th>Port</th>
<th>Protocol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>137</td>
<td>UDP</td>
<td>NBT Name Service</td>
</tr>
<tr>
<td>137</td>
<td>TCP</td>
<td>NBT Name Service</td>
</tr>
<tr>
<td>138</td>
<td>UDP</td>
<td>Datagram service</td>
</tr>
<tr>
<td>138</td>
<td>TCP</td>
<td>Unused</td>
</tr>
<tr>
<td>139</td>
<td>UDP</td>
<td>Unused</td>
</tr>
<tr>
<td>139</td>
<td>TCP</td>
<td>Session Service</td>
</tr>
<tr>
<td>445</td>
<td>TCP</td>
<td>Raw SMB over TCP/IP</td>
</tr>
</tbody>
</table>

Will work with IPv6

Will never work with IPv6

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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
Linux/Unix and IPv6

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

```bash
# 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
}
```

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
IPv6 and \texttt{xinetd} Gotcha

You might be tempted to:

\begin{itemize}
  \item Enable IPV6 in \texttt{xinetd}
    \begin{verbatim}
    /etc/xinetd.conf
    v6only = yes
    \end{verbatim}
  \item And remove IPv6 in the \texttt{smb} configuration
    \begin{verbatim}
    /etc/xinetd.d/smb
    flags = REUSE IPV6
    \end{verbatim}
  \item This will configure SMB over IPv4!
    \begin{itemize}
      \item Dual stack uses IPv4-mapped IPv6 addresses
    \end{itemize}
\end{itemize}
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
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
  
  Server side now IPv6 clean as of this week, but
  
  * IPv4 is hard-code in some places

```c
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
Samba 4 and IPv6

てくる Cannot run Samba 4 from Internet Super Daemon

Samba4 `smbd` listens on multiple ports

Internet super daemons one port per daemon

<table>
<thead>
<tr>
<th>Protocol</th>
<th>Port 1</th>
<th>Port 2</th>
<th>Port 3</th>
<th>Port 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>_tcp</td>
<td>0</td>
<td>0.0.0.0:1024</td>
<td>0.0.0.0:*</td>
<td></td>
</tr>
<tr>
<td>_tcp</td>
<td>0</td>
<td>0.0.0.0:3268</td>
<td>0.0.0.0:*</td>
<td></td>
</tr>
<tr>
<td>_tcp</td>
<td>0</td>
<td>0.0.0.0:901</td>
<td>0.0.0.0:*</td>
<td></td>
</tr>
<tr>
<td>_tcp</td>
<td>0</td>
<td>0.0.0.0:389</td>
<td>0.0.0.0:*</td>
<td></td>
</tr>
<tr>
<td>_tcp</td>
<td>0</td>
<td>0.0.0.0:135</td>
<td>0.0.0.0:*</td>
<td></td>
</tr>
<tr>
<td>_tcp</td>
<td>0</td>
<td>0.0.0.0:139</td>
<td>0.0.0.0:*</td>
<td></td>
</tr>
<tr>
<td>_tcp</td>
<td>0</td>
<td>0.0.0.0:132:464</td>
<td>0.0.0.0:*</td>
<td></td>
</tr>
<tr>
<td>_tcp</td>
<td>0</td>
<td>0.0.0.0:132:88</td>
<td>0.0.0.0:*</td>
<td></td>
</tr>
<tr>
<td>_tcp</td>
<td>0</td>
<td>0.0.0.0:636</td>
<td>0.0.0.0:*</td>
<td></td>
</tr>
<tr>
<td>_tcp</td>
<td>0</td>
<td>0.0.0.0:445</td>
<td>0.0.0.0:*</td>
<td></td>
</tr>
<tr>
<td>_udp</td>
<td>0</td>
<td>0.0.0.0:389</td>
<td>0.0.0.0:*</td>
<td></td>
</tr>
<tr>
<td>_udp</td>
<td>0</td>
<td>0.0.0.0:132:137</td>
<td>0.0.0.0:*</td>
<td></td>
</tr>
<tr>
<td>_udp</td>
<td>0</td>
<td>0.0.0.0:255:137</td>
<td>0.0.0.0:*</td>
<td></td>
</tr>
<tr>
<td>_udp</td>
<td>0</td>
<td>0.0.0.0:137</td>
<td>0.0.0.0:*</td>
<td></td>
</tr>
<tr>
<td>_udp</td>
<td>0</td>
<td>0.0.0.0:132:138</td>
<td>0.0.0.0:*</td>
<td></td>
</tr>
<tr>
<td>_udp</td>
<td>0</td>
<td>0.0.0.0:255:138</td>
<td>0.0.0.0:*</td>
<td></td>
</tr>
<tr>
<td>_udp</td>
<td>0</td>
<td>0.0.0.0:138</td>
<td>0.0.0.0:*</td>
<td></td>
</tr>
<tr>
<td>_udp</td>
<td>0</td>
<td>0.0.0.0:132:464</td>
<td>0.0.0.0:*</td>
<td></td>
</tr>
<tr>
<td>_udp</td>
<td>0</td>
<td>0.0.0.0:132:88</td>
<td>0.0.0.0:*</td>
<td></td>
</tr>
</tbody>
</table>
Samba 4 and IPv6

Use IPv6 hack or port forwarder for Samba 4 over IPv6

- 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
SMB over IPv6 works using:
- IPv6 hack
- Port forwarding
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

<table>
<thead>
<tr>
<th>Version</th>
<th>Role</th>
<th>Works?</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Samba3</strong></td>
<td>Raw SMB over IPv6</td>
<td>Yes</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>NT DC over IPv6</td>
<td>No</td>
<td>No requirement</td>
</tr>
<tr>
<td></td>
<td>CIFS Client</td>
<td>Yes</td>
<td>As of SambaXP 2007</td>
</tr>
<tr>
<td></td>
<td>AD Client over IPv6</td>
<td>No</td>
<td>Required for Longhorn AD domains</td>
</tr>
<tr>
<td><strong>Samba4</strong></td>
<td>Raw SMB over IPv6</td>
<td>Yes*</td>
<td>Required. *only with hack</td>
</tr>
<tr>
<td></td>
<td>AD Client over IPv6</td>
<td>No</td>
<td>Required. Can be simulated by port forwarding.</td>
</tr>
<tr>
<td></td>
<td>AD DC over IPv6</td>
<td>Yes*</td>
<td>Required. *only with hack</td>
</tr>
<tr>
<td></td>
<td>LLMNR</td>
<td>No</td>
<td>Required</td>
</tr>
</tbody>
</table>

Can be simulated using port forwarding. IPv6 AD clients (Vista/Longhorn) cannot join a Samba4 domain.
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
*Samba 4 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?

<table>
<thead>
<tr>
<th>File</th>
<th>Type</th>
<th>Age</th>
<th>Time</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>socket.c</td>
<td>cset</td>
<td>1 month</td>
<td>2 weeks</td>
<td>Move tests a bit closer to the</td>
</tr>
<tr>
<td>socket.h</td>
<td>cset</td>
<td>1 month</td>
<td>2 weeks</td>
<td></td>
</tr>
<tr>
<td>socket_ipv4.c</td>
<td>cset</td>
<td>1 month</td>
<td>2 weeks</td>
<td></td>
</tr>
<tr>
<td>socket_ipv6.c</td>
<td>cset</td>
<td>1 month</td>
<td>2 weeks</td>
<td></td>
</tr>
</tbody>
</table>

This patch moves the encryption of bt to /lib/btrcrypt.so.

Check the return value of interpret.

Hopefully fix IPv6.
Contact Details

Erion IPv6 Services:
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