

IPv6 Enabling Unix/Linux and Windows Integration

Global IPv6 Summit in Korea 2008

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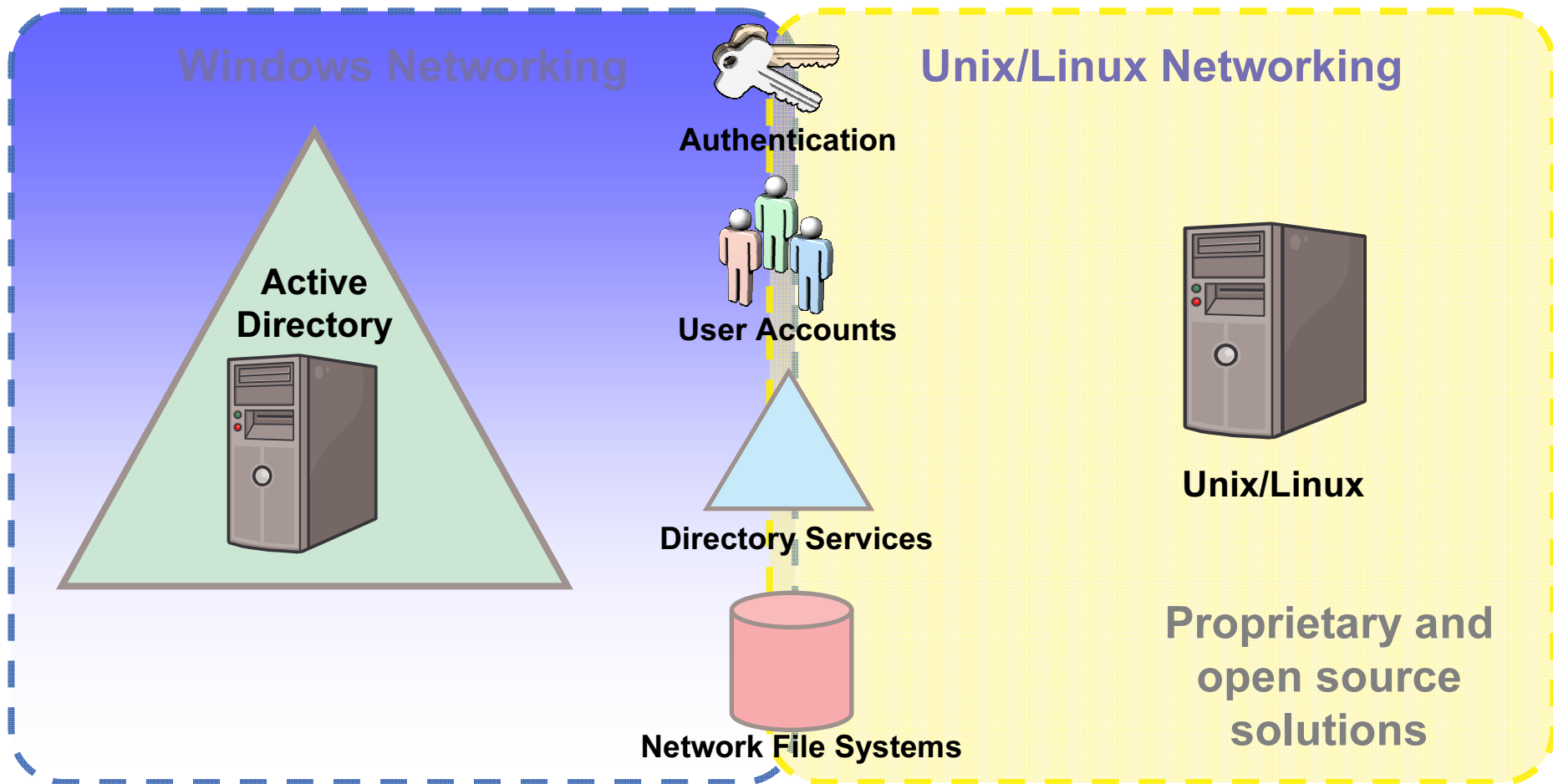
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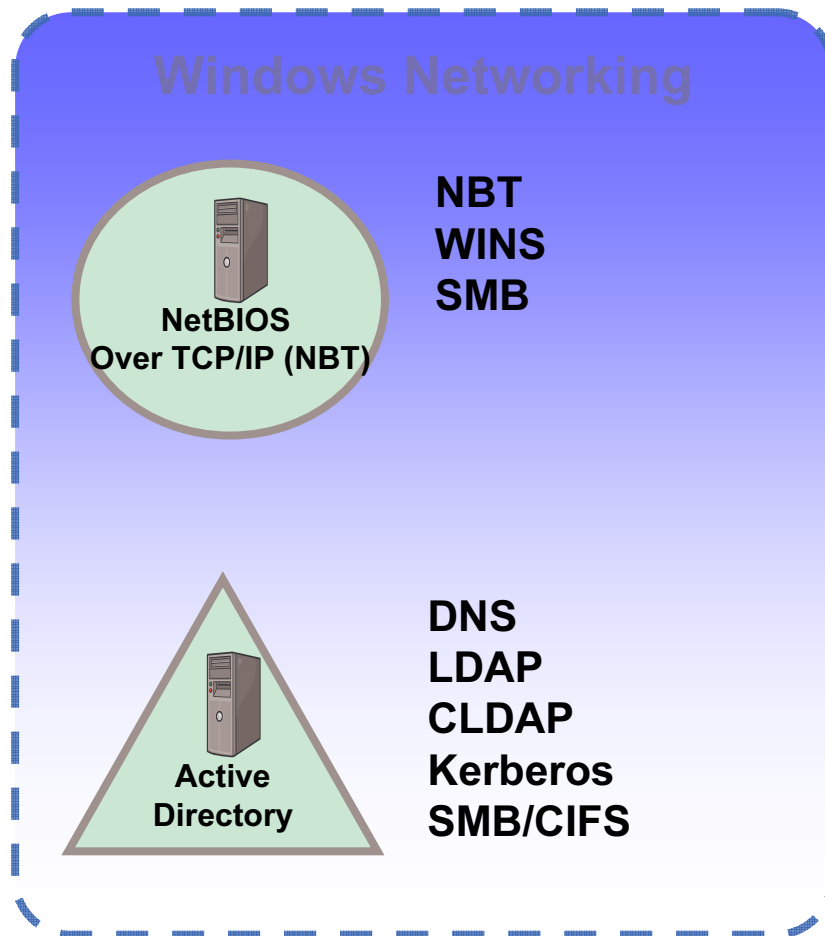
Why is Integration Important?

- Heterogeneous environments common in enterprises
- Windows and Unix/Linux integration provides:
 - Single-Sign-On
 - Cross-platform user accounts
 - Access to the file and print resources on any operating system
 - Centralised administration
- **Note:** By integration we mean integration of Windows Networking not integration of common network services such as web and mail

Windows and Unix/Linux Integration



IPv6 and Windows Networking



- NetBIOS cannot be IPv6 enabled
- 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

IPv4 Specific



- AD Protocols: DNS, LDAP, CLDAP, Kerberos, SMB/CIFS can all work over IPv6 ☒

But Active Directory is more than *the sum of the individual protocols*

Windows and IPv6 Name Resolution

- NetBIOS name resolution

IPv4 Only

- WINS

IPv4 Only

- Hosts file

IPv4 and IPv6



- Link-local Multicast Name Resolution (LLMNR)

IPv4 and IPv6



- DNS

IPv4 and IPv6

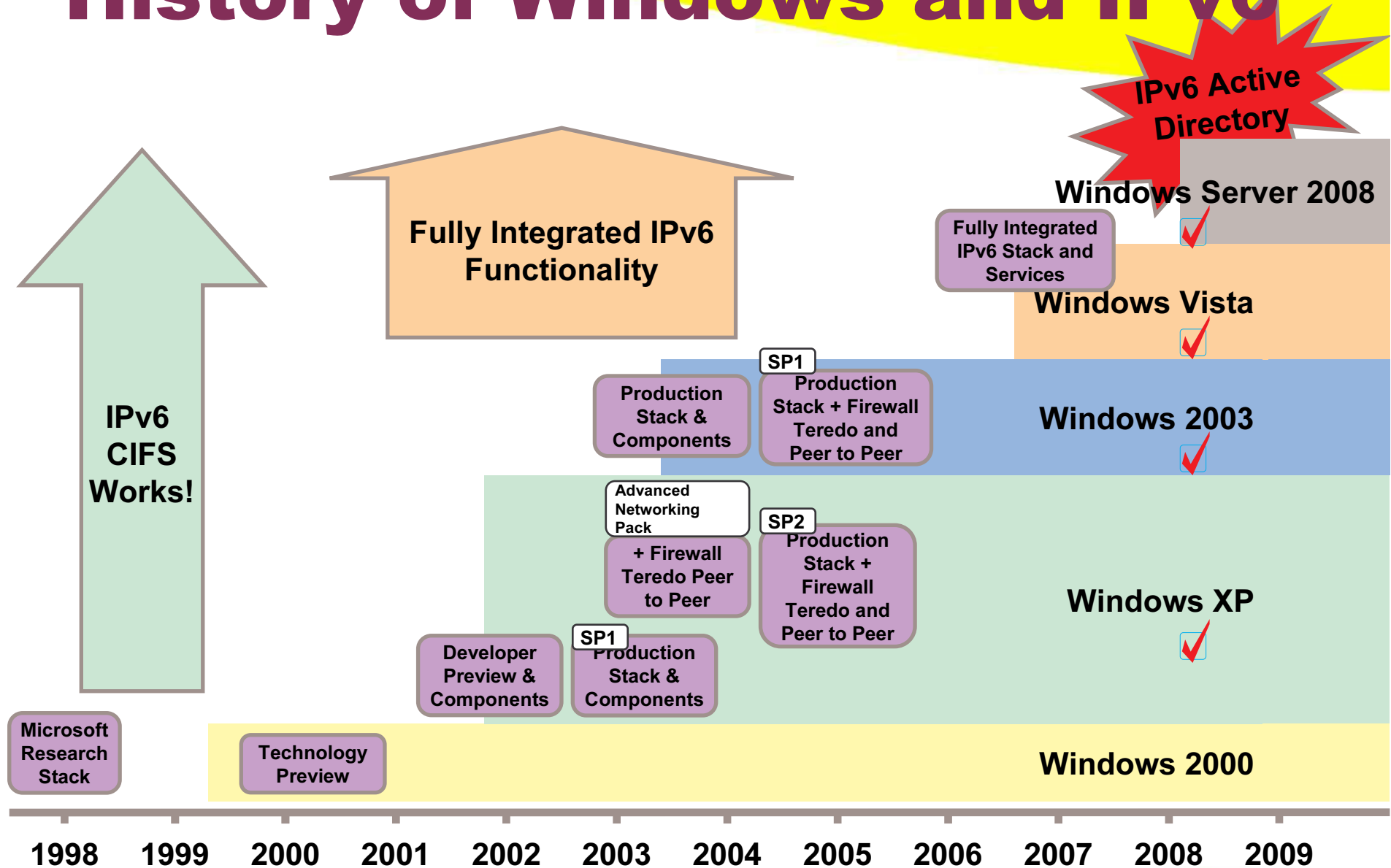


- Literal Addresses

IPv4 and IPv6



History of Windows and IPv6



Windows and IPv6 Take-Up

- Vista & Windows Server 2008 and IPv6

- Enabled by default
- Preferred protocol
- Configured automatically
- Fully integrated
- Works in IPv4 networks
- Full support in Active Directory

- IPv6 by stealth

- IPv6 by design

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

What Combinations Work for IPv6 and Windows Networks?

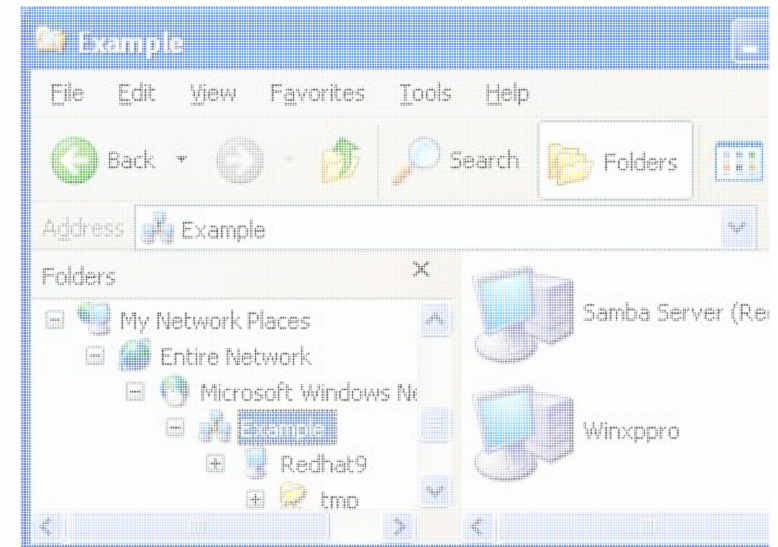
- DOES NOT WORK WITH IPv6:
 - NetBIOS based systems
 - NT Domain based systems (reliance on NetBIOS)
 - WINS name resolution
 - Pre Windows Server 2008 and Windows Vista Active Directory
- WORKS WITH IPV6:
 - File Sharing (raw SMB over TCP/IP on port 445)
 - Basic networking services (e.g. DNS)
 - Active Directory **only using** Windows Server 2008 and Windows Vista

Case Study: Samba and IPv6

- Most widely used integration package
 - Most Linux/Unix systems
 - NAS boxes, PDAs, Mainframes, Macs
 - Many commercial products based on Samba



- Samba 3.0 and Samba 3.2
 - Active Directory member server
 - NT domain controller (PDC/BDC)
 - File and print server
- Samba 4.0
 - Active Directory domain controller
- Samba Linux CIFS client
 - Software to mount Windows shares on Linux file system



Samba 3.2 and IPv6

- 30th January 2008 – I carried out first ever IPv6 join of Samba 3.2 to Windows Server 2008 Active Directory domain
(<http://www.ipv6consultancy.com/ipv6blog/?p=25>)
- IPv6 enabled by default
- 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 addresses can be used in:
 - Configuration files
 - Command line utilities

Samba 3.2 and IPv6 Example

```
# smbclient -L //3000::1 -U Administrator
```

```
Password:
```

```
Domain=[TREE] OS=[Windows Server (R) 2008 Enterprise 6001 Service  
Pack 1] Server=[Windows Server (R) 2008 Enterprise 6.0]
```

Sharename	Type	Comment
-----	----	-----
ADMIN\$	Disk	Remote Admin
C\$	Disk	Default share
IPC\$	IPC	Remote IPC
NETLOGON	Disk	Logon server share
SYSVOL	Disk	Logon server share
TestShare	Disk	

```
timeout connecting to 3000::1:139
```

```
Connection to 3000::1 failed (Error NT_STATUS_ACCESS_DENIED)
```

```
NetBIOS over TCP disabled -- no workgroup available
```

Samba 4 and IPv6

- IPv6 *not* enabled by default
 - IPv6 provisioning works with IPv6 address option
 - IPv6 development branch
- IPv6 can be enabled with Erion patch
 - See <http://www.ipv6consultancy.com/ipv6blog>
- With patch IPv6 transport works!
 - IPv6 client and server side functionality
 - IPv6 domain controller functionality
 - Join Samba4 domains over IPv6

IPv6 Enabled Samba4

```
root@fedora8:~  
File Edit View Terminal Tabs Help  
[root@fedora8 ~]# netstat --inet -anp|grep smbd  
udp        0      0 192.168.108.53:137      0.0.0.0:*  
udp        0      0 192.168.108.255:137     0.0.0.0:*  
udp        0      0 0.0.0.0:137            0.0.0.0:*  
udp        0      0 192.168.108.53:138      0.0.0.0:*  
udp        0      0 192.168.108.255:138     0.0.0.0:*  
udp        0      0 0.0.0.0:138            0.0.0.0:*  
[root@fedora8 ~]# netstat --inet6 -anp|grep smbd  
tcp        0      0 :::1024                 :::*      LISTEN  
tcp        0      0 :::3268                 :::*      LISTEN  
tcp        0      0 :::389                  :::*      LISTEN  
tcp        0      0 :::135                  :::*      LISTEN  
tcp        0      0 :::139                  :::*      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                  :::*      LISTEN  
udp        0      0 :::464                  :::*      LISTEN  
udp        0      0 :::88                   :::*      LISTEN  
[root@fedora8 ~]#
```

IPv4 only

IPv6 AND IPv4

WINS

NetBIOS

LDAP

NetBIOS

Kerberos

Kerberos

LDAPS

SMB

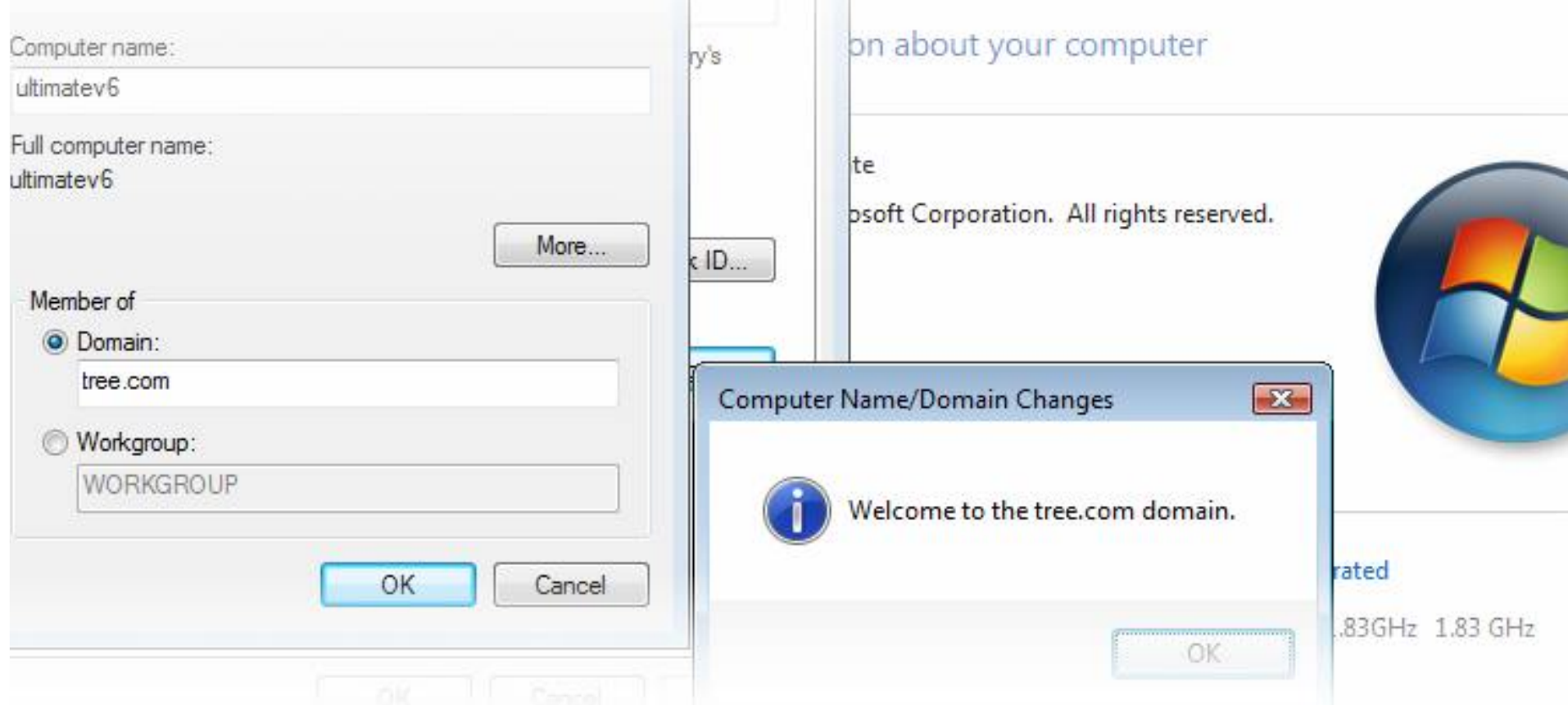
LDAP

Kerberos

Kerberos

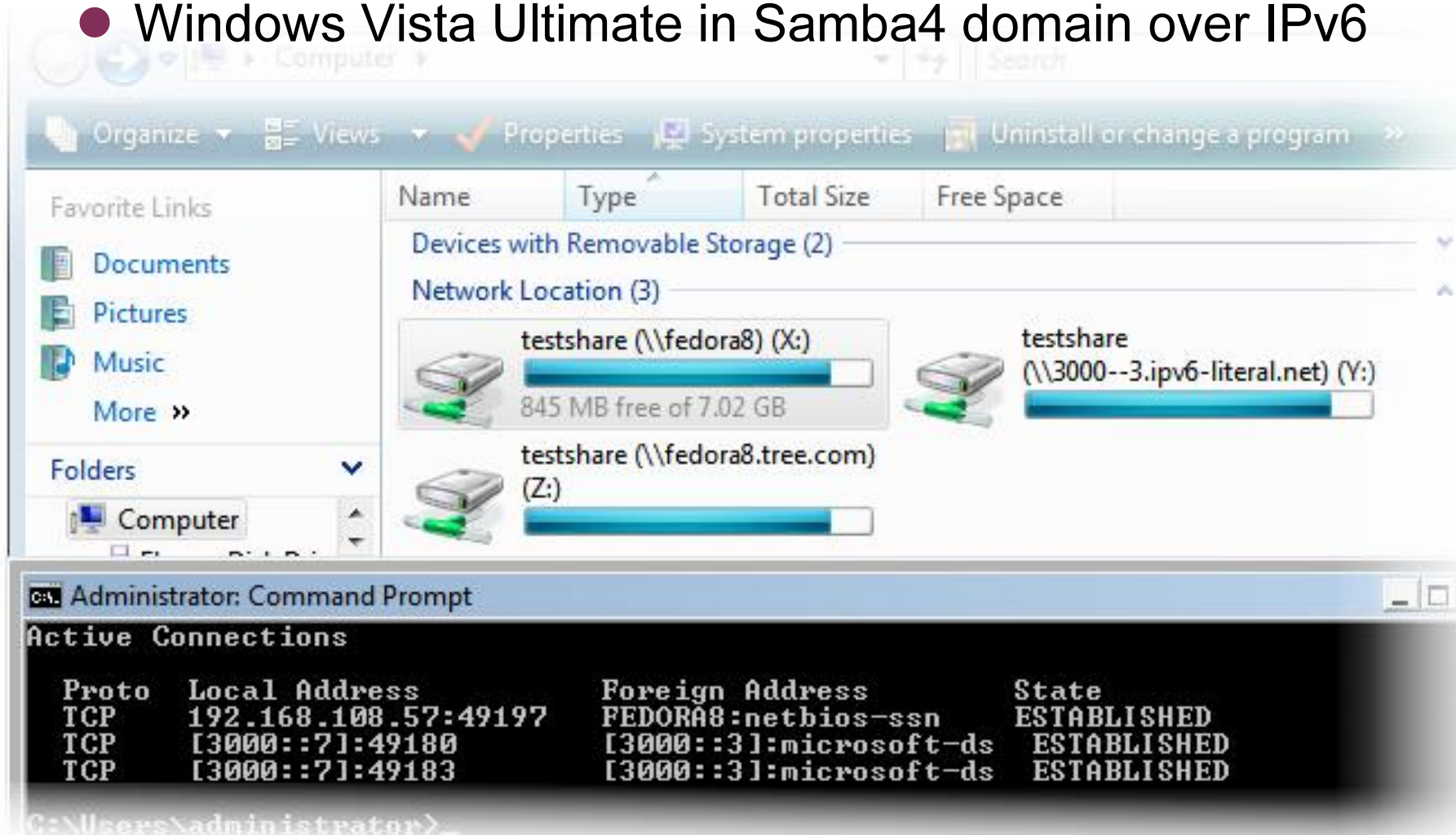
Joins to Samba4 over IPv6

- Windows Vista and Windows Server 2008 join Samba4 domains over IPv6!



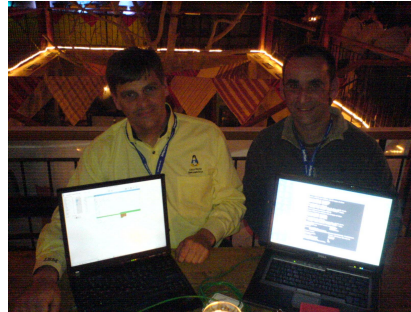
Samba4 IPv6 Shares

- Windows Vista Ultimate in Samba4 domain over IPv6



Linux CIFS and IPv6

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



Steve French (IBM) and
David Holder (Erion)
The first ever CIFS client
connection over IPv6

- **mount.cifs**

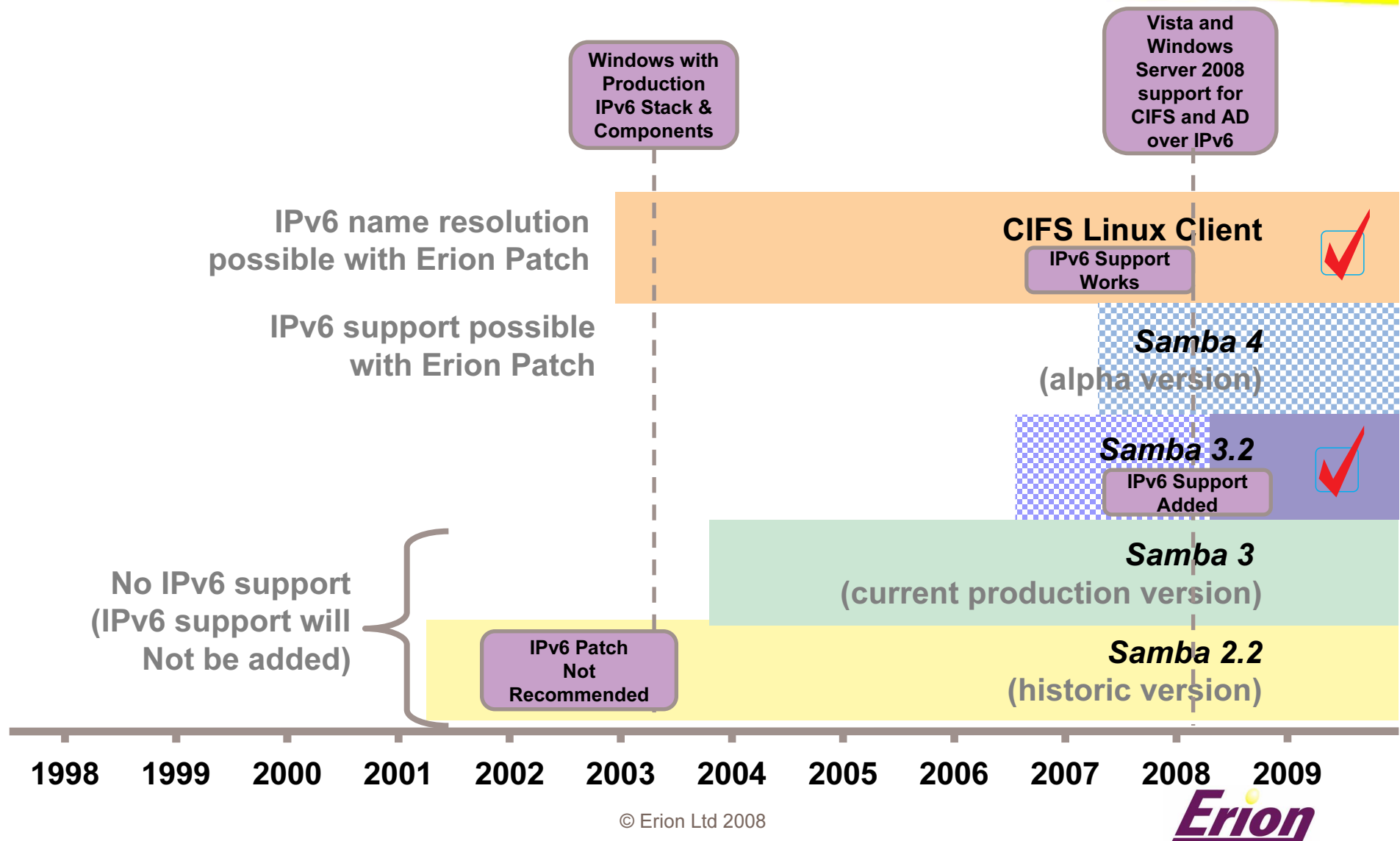
- Supports IPv6 addresses in the `ip` option

```
# mount -t cifs //W2008KENT/TESTSHARE /mnt/erion \  
-o ip=2a01:384:e14:0:fc6f:e78f:6507:4ad, \  
user=Administrator,pass='Pa$$w0rd'
```

- **Note:** No IPv6 name resolution
- Erion IPv6 patch enables IPv6 name resolution
 - See <http://www.ipv6consultancy.com/ipv6blog/?p=32>

```
Local Address      Foreign Address    State  
[2a01:348:13e:0:fc6f:d88f:6507:4ad]:445  [2a01:348:13e:0:20c:29ff:fea0:3883]:35906  ESTABLISHED  
Administrator>
```


History of Samba and IPv6



Samba and IPv6: What Works

- Mounting windows shares as Linux networked file systems
 - The Linux CIFS client
- IPv6 file sharing
 - Windows XP, Windows Vista, Windows Server 2003, Windows Server 2008, Linux CIFS client, Samba 3.2 & **patched** Samba 4
- Joining Windows Server 2008 Active Directory domain
 - Samba 3.2
 - Samba 4 (alpha, patched)
- Acting as a Domain Controller
 - **Patched** Samba 4 (alpha)





Note: Cannot use Samba 3.2 as domain controller as it can only act as an NT domain controller and this is not IPv6 enabled in Samba or Windows

Things to Watch Out For

- Name resolution
- Global verses Link local addresses

	Link-local IPv6 Address	fe80::85cc:a568:4656:fb20%8	
---	-------------------------	-----------------------------	---

- Privacy addresses

	IPv6 IP Address	3000:0:20:0:85cc:a568:4656:fb20	
	Temporary IPv6 Address	3000:0:20:0:f84e:405b:1039:3f02	

- IPv4-mapped IPv6 addresses
- Textual address formats
 - IPv6, IPv4-mapped IPv6, UNC, URI and literal.net
- Name resolution

What Needs to Happen Next

- Unix & Linux Distributions update Samba to version 3.2
 - Production release of Samba 3.2 expected soon
 - Supports IPv6 by Default
- Commercial integration software vendors need to release IPv6 ready versions
 - Some products are based on Samba so move to Samba 3.2 when available
- Network Attached Storage (NAS) vendors move to Samba 3.2 to support IPv6
- Vendors using Linux CIFS Client need IPv6 name resolution
 - Either:
 - Use Erion patch (not recommended for production use)
 - Wait for new IPv6 enabled version of mount.cifs

Conclusion

- IPv6 Windows and Unix/Linux interoperability is possible now
- Open source Samba project poised for full IPv6 support
- Commercial products and embedded solutions need to upgrade to IPv6

IPv6 and Samba References

- SambaXP 2008 Presentation
 - <http://www.ipv6consultancy.com/ipv6blog/?p=34>
- Google IPv6 Conference 2008 (YouTube)
 - <http://youtube.com/watch?v=iK0nzdztjvM>
- Google CIFS Workshop Presentation
 - <http://www.ipv6consultancy.com/ipv6blog/?p=21>
- SambaXP 2007 Presentation
 - <http://www.sambaxp.org/files/SambaXP2007-PDF/Holder-SambaVistawithIPv6V2.pdf>
 - <http://www.ipv6consultancy.com/ipv6blog/?p=8>
- Linux CIFS Client
 - <http://www.ipv6consultancy.com/ipv6blog/?p=9>
- Samba4 Hack (*old version*)
 - <http://www.ipv6consultancy.com/ipv6blog/?p=12>

Erion and IPv6 References

- 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

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Questions

Thank you for listening