IPv6 on Windows

6::gle 2008

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IPv6 on Windows

- History of IPv6 on Windows
- Windows IPv6 Myths
- Key Features of IPv6 on Windows
- Developing IPv6 Applications on Windows
- References

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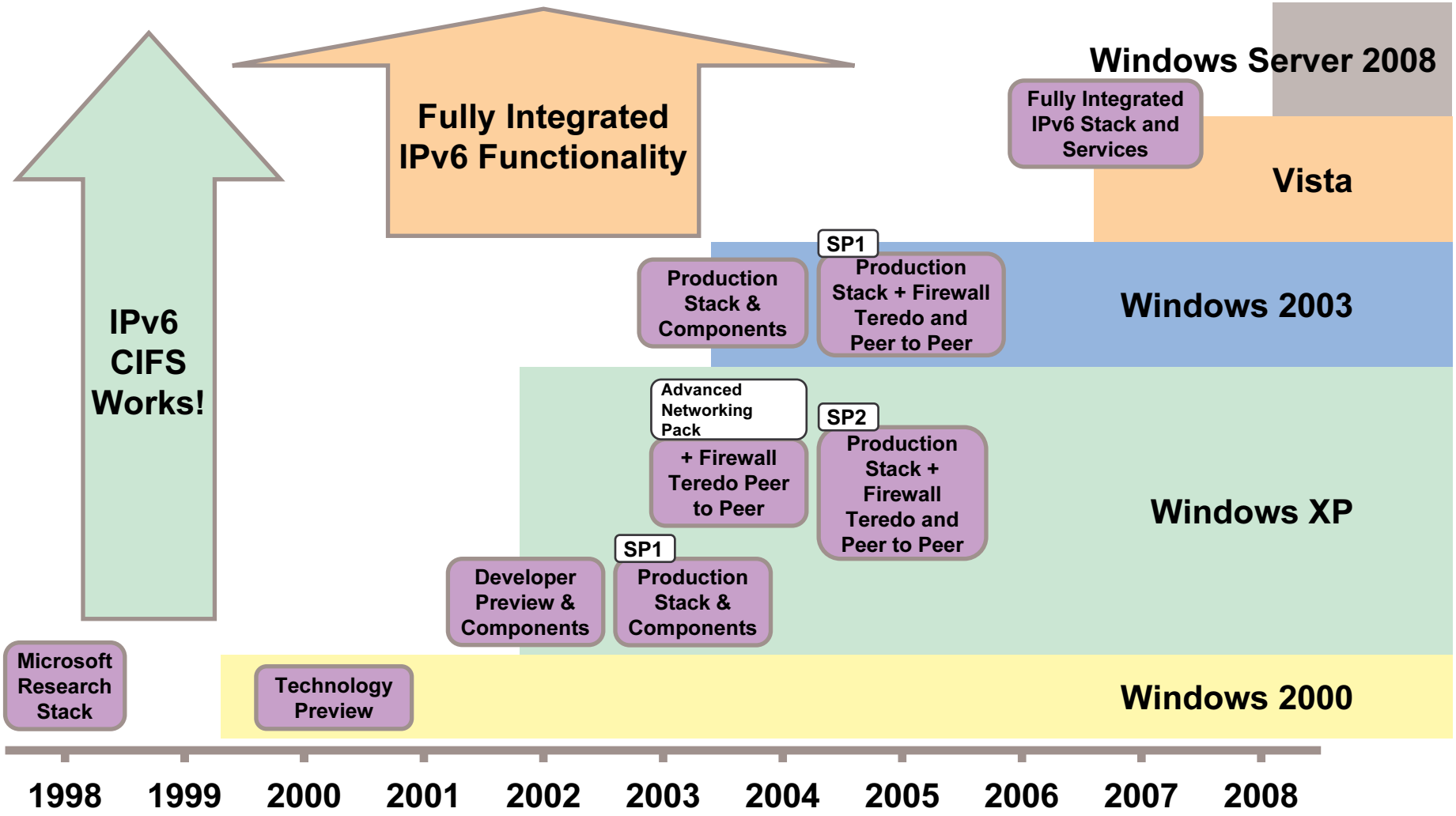
History of Windows and IPv6



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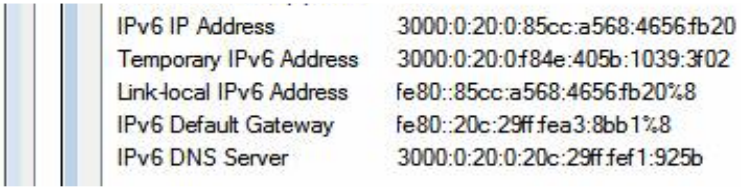
Windows and IPv6 Take-Up

- Vista & Windows Server 2008 and IPv6 take up
  - Enabled by default
  - Preferred protocol
  - Configured automatically
  - Fully integrated
  - Works in IPv4 networks
  - Full support in AD

- IPv6 by stealth
- IPv6 by design



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Windows IPv6 Myths

- Common Myths
  - Reduces Network Performance
  - Introduces Security Issues
- Don’t believe everything you read!
  - Lots of inaccuracies and errors
  - Some scare mongering
- Windows IPv6 is on a par with other platforms

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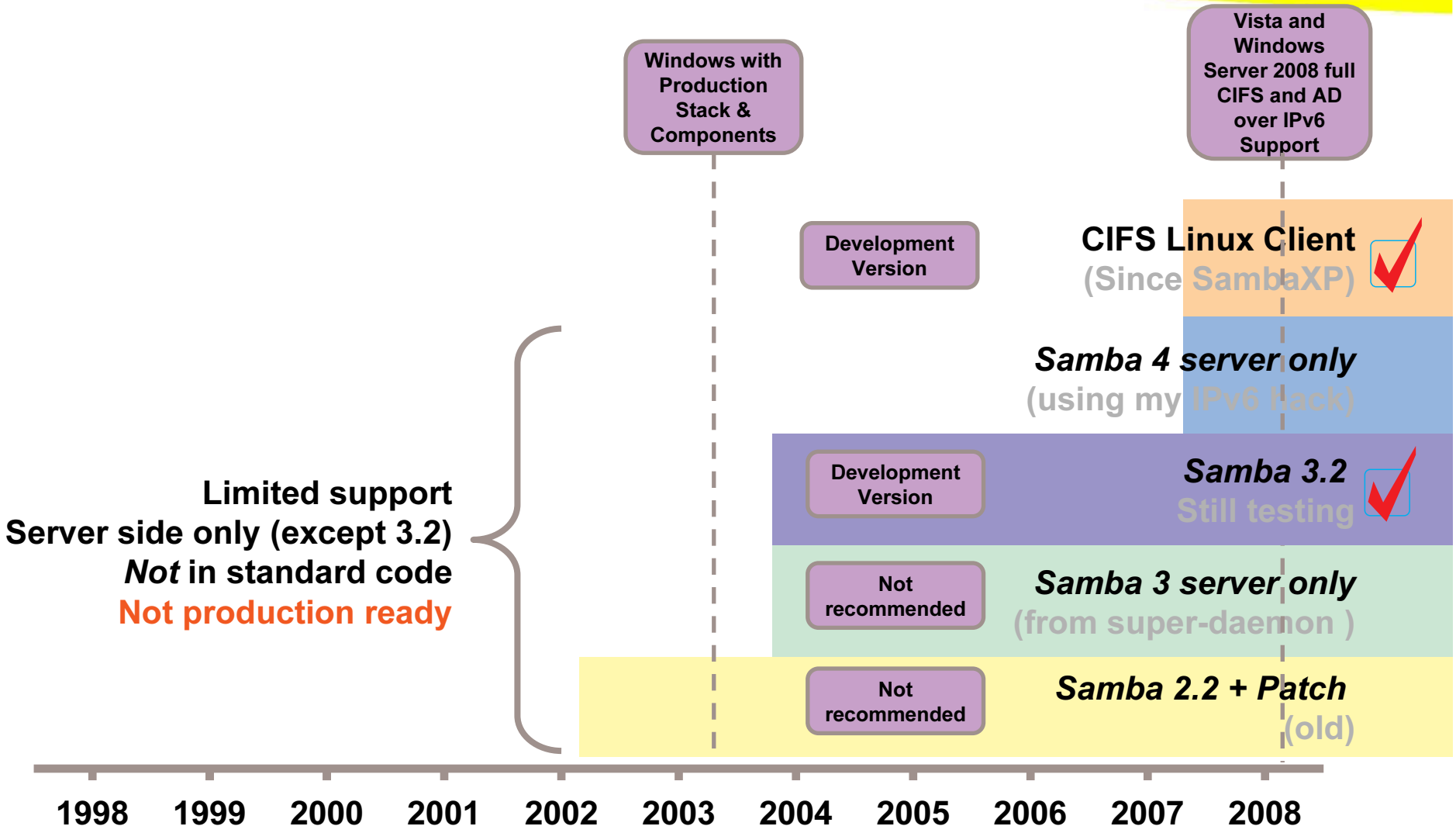
History of Samba and IPv6



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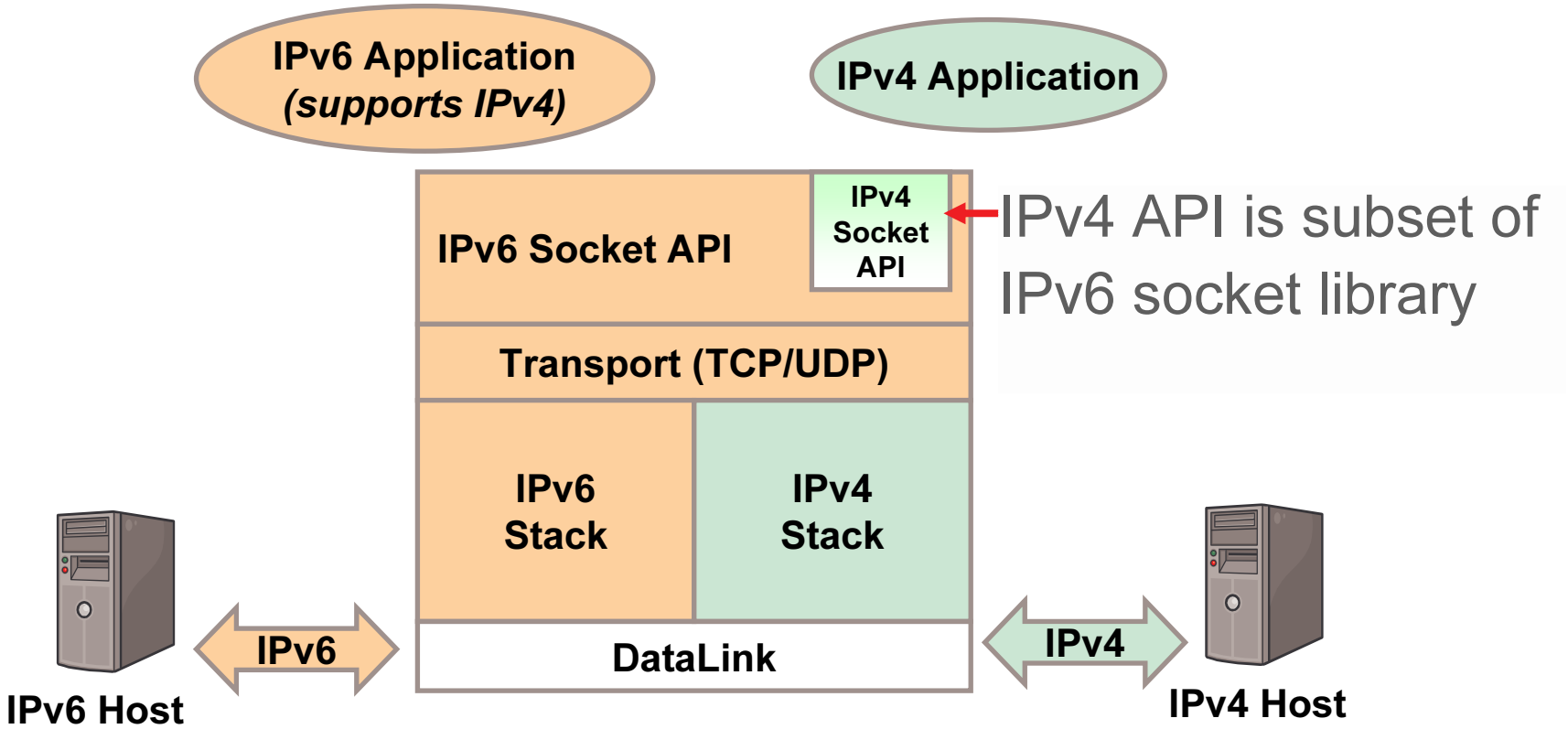
Windows Stack is a Dual Stack

- New socket API is *explicitly* dual stack
- Stack supports ***both*** IPv6 **and** IPv4
- IPv6 applications are *also* IPv4 applications



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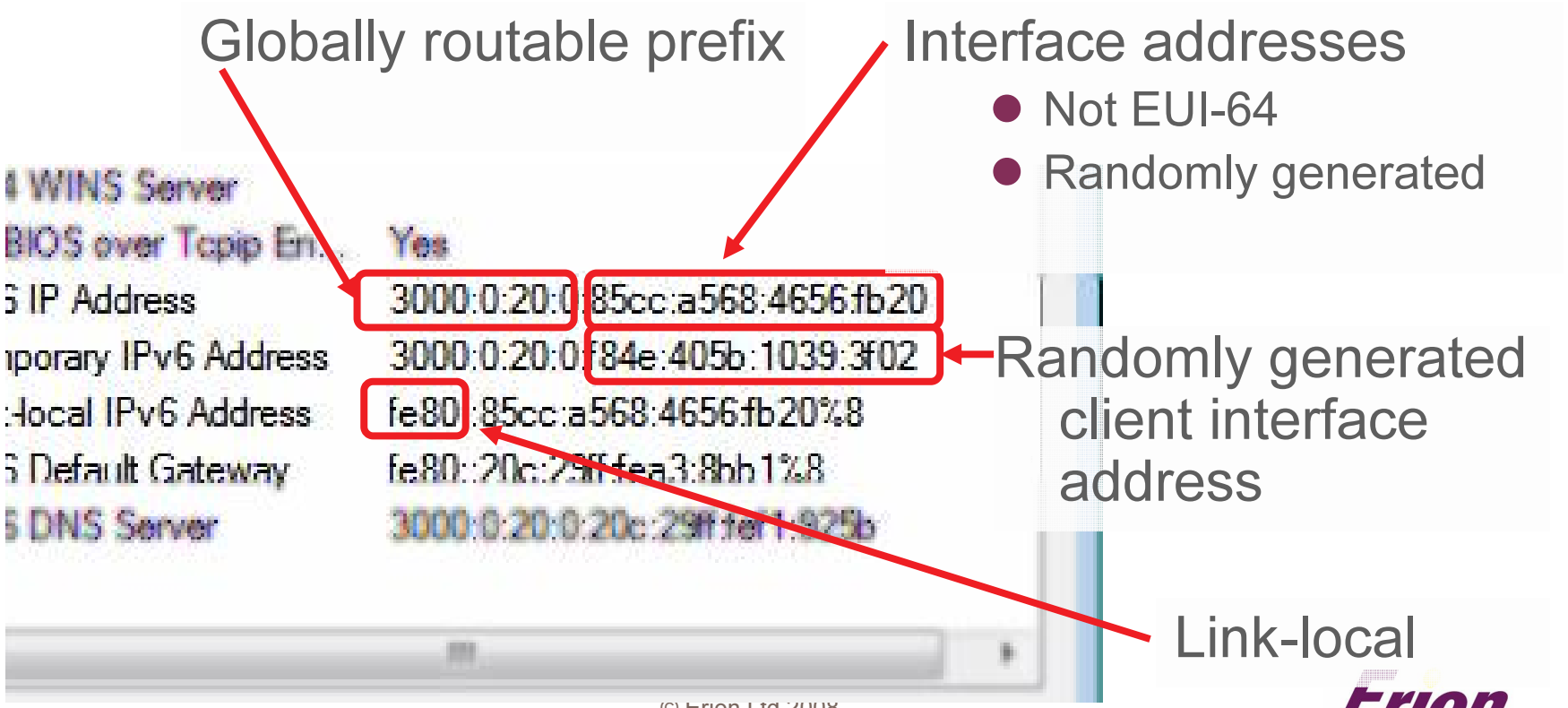
IPv6 Addresses in Windows

- Interfaces have **many** IPv6 addresses
- Vista and Windows Server 2008 use pseudo random interface IDs by default



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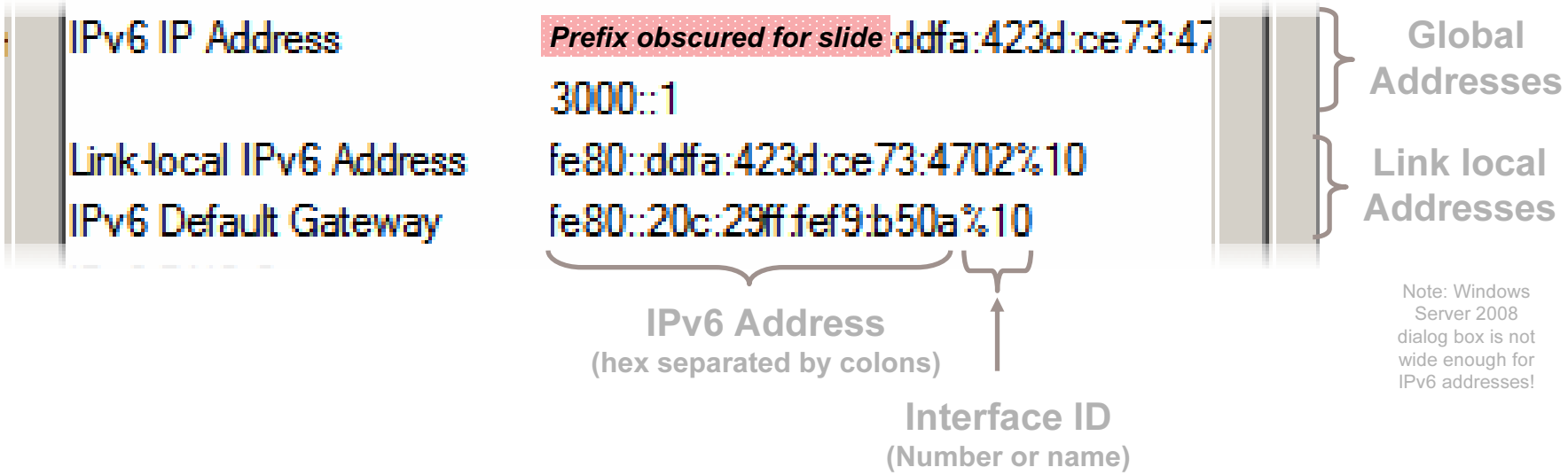
Textual Address Formats (1)

- Global and Link Local addresses



  - IPv6 interfaces have unique interface ID and name

- IPv4-mapped IPv6 addresses

  `::ffff:192.168.1.1`

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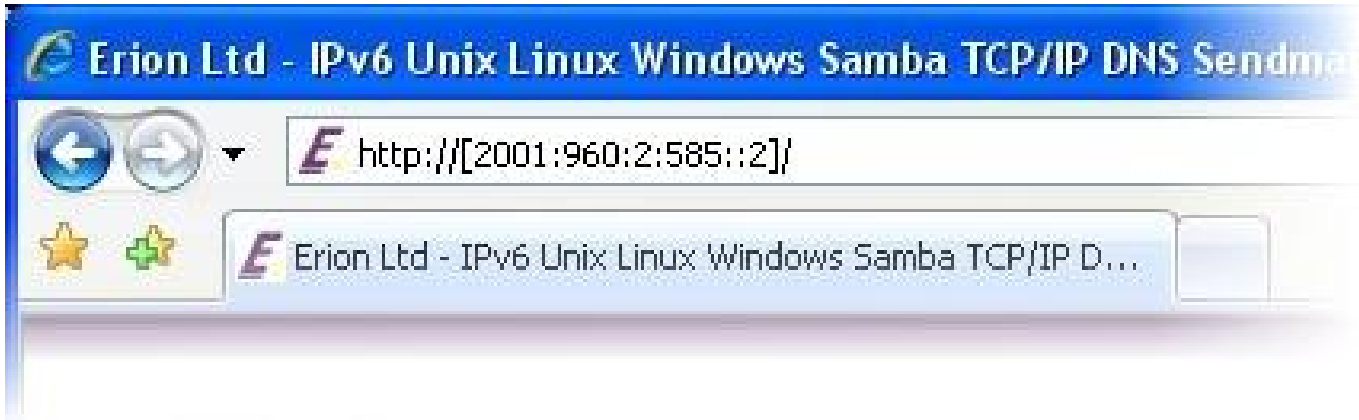
Textual Address Formats (2)

- URLs, URIs and UNCs
  - 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.

```
TCP    [3000:0:20:0:3de2:17ca:d07d:5f10]:49165  [3000:0:20:0:20c:29ff:fef1:925b]:445  ESTABLISHED
```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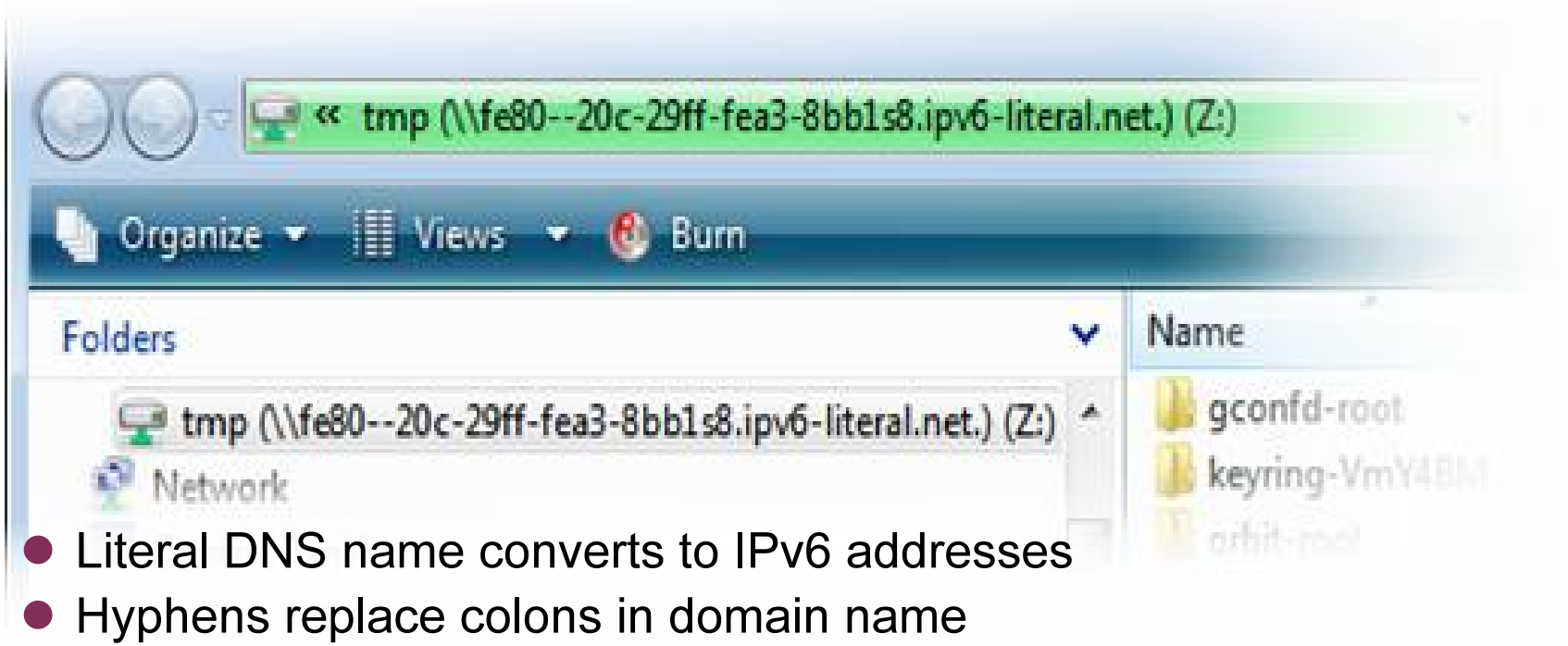
Literal Addresses

- Connect from Vista using link local address and no DNS



- Literal DNS name converts to IPv6 addresses
- Hyphens replace colons in domain name
- s indicates interface

Note: Example is shows shared from IPv6 enabled Samba

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File Sharing 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

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IPv6 and 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**

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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**

```
TCP    [fe80::85cc:a568:4656:fb20%8]:49167  [fe80::6463:a7a0:d182:adc8%8]:445  ESTABLIS
```


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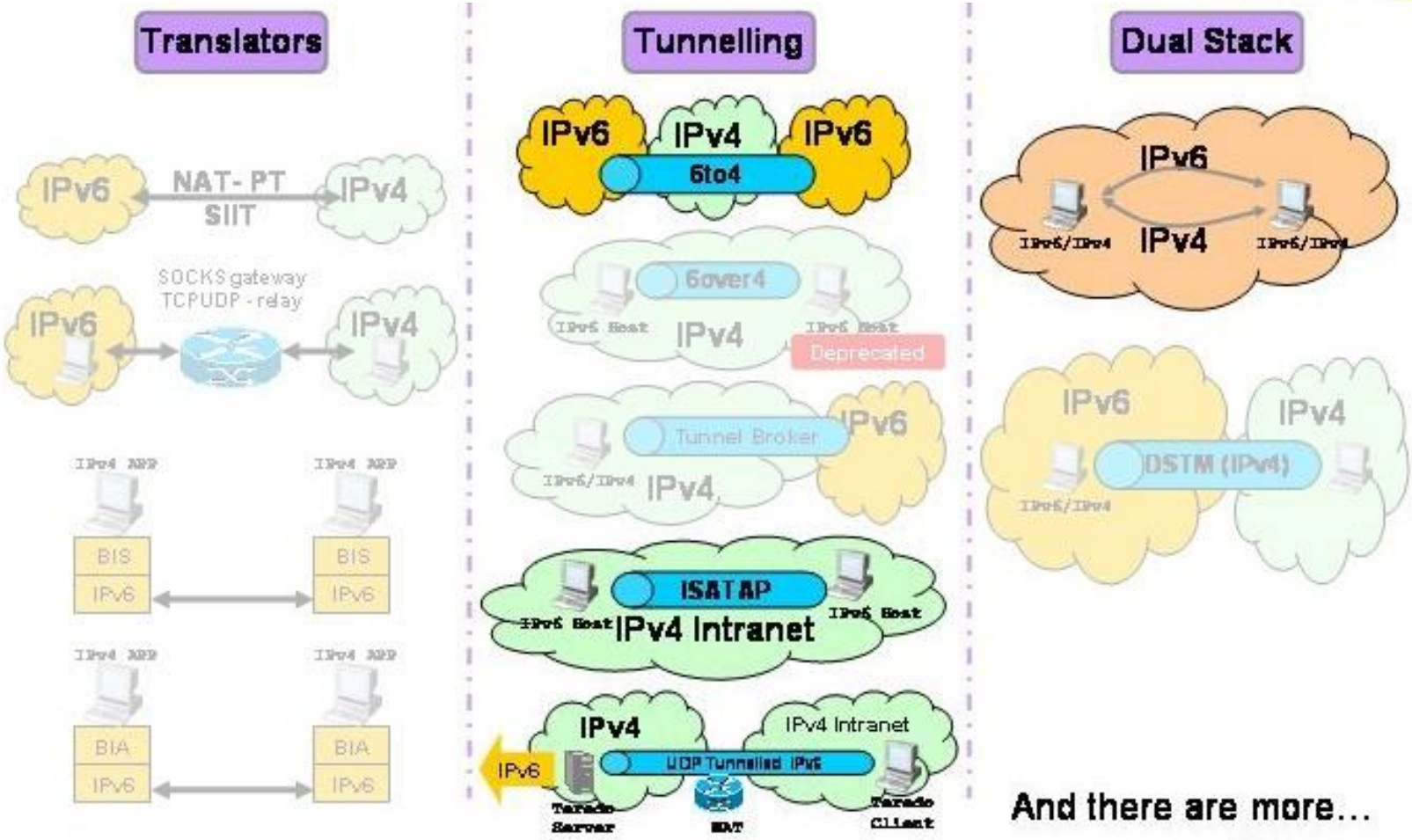
Transition Mechanisms



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Socket API IPv4 vs IPv6

	IPv4 Socket API	IPv6 Socket API
Protocol Independent Name Resolution	No	Yes 
Protocol Independent Address Structure	No	Yes 
Supports IPv4 & IPv6 Protocols	No	Yes 
Supports IPv4 & IPv6 Applications	No	Yes 
Source & binary compatibility for IPv4 Apps	Yes it is IPv4!	Yes 
Protocol Independent Interface Identification	No	Yes 
Thread safe	Depends…	Yes 

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IPv6 Programming Key Points

- IPv6 Socket API fully supported on Windows
- Microsoft provide simple porting tool
  - Checkv4.exe

- Write all programs using IPv6 socket API
- Write protocol independent code
- Remember that you get IPv4 for free

Microsoft IPv6 References

- Microsoft's IPv6 Home Page
  - http://technet.microsoft.com/en-gb/network/bb530961.aspx
- Microsoft's IPv6 Objectives
  - http://technet.microsoft.com/en-gb/library/bb726949.aspx
- Microsoft's IPv6 Blog
  - http://blogs.technet.com/ipv6/

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IPv6 and Samba References

- 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

IPv6 API References

- IPv6 Blog and Samba Patches
  - www.ipv6consultancy.com/ipv6blog
- Current RFCs
  - RFC4584 **Extension to Sockets API for Mobile IPv6**.
  - RFC4038 **Application Aspects of IPv6 Transition**.
  - RFC3542 **Advanced Sockets Application Program Interface (API) for IPv6**
  - RFC3678 **Socket Interface Extensions for Multicast Source Filters**
  - RFC3493 **Basic Socket Interface Extensions for IPv6**
  - RFC3338 **Dual Stack Hosts Using "Bump-in-the-API" (BIA)**
- Porting Guides
  - HP-UX IPv6 Porting Guide, HP
  - Porting Networking Applications to the IPv6 APIs, Sun
  - Many more…

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Erion and IPv6

- 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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Summary

- IPv6 is the default protocol in Windows Vista and Windows Server 2008
- Everything that should work does
- New things to be aware of include:
  - IPv6 address configuration
  - IPv6 address resolution
  - IPv6 address representation representations
  - Transition mechanisms
- Programming for IPv6 in Windows is easy

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