

ATEC – Workshop IPv6

Microsoft Status on IPv6

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IPv6 - History

1998 - Availability of an IPv6 implementation from Microsoft Research.

March 2000 - Technology preview released for Windows 2000-based computers

October 2001 - Windows XP released with a developer preview IPv6 stack and some components of the system enabled for IPv6

September 2002 - Windows XP Service Pack 1 released with the first edition of a production IPv6 stack and some IPv6-enabled components.

March 2003 - Windows Server 2003 was released with a production IPv6 stack and some IPv6-enabled components

July 2003 - Advanced Networking Pack for Windows XP released. Included the IPv6 Internet Connection Firewall, a Teredo client, and support for Windows Peer-to-Peer Networking.

IPv6 – History II

August 2004 - Windows XP Service Pack 2 released. Included the Teredo client, support for Windows Peer-to-Peer Networking and integrated IPv6 traffic support with the new Windows Firewall (replacing the IPv6 Internet Connection Firewall).

March 2005 - Windows Server 2003 Service Pack 1 released. Included the additional IPv6 features provided with Windows XP Service Pack 2.

July 2005 - Beta 1 of Windows Vista™ and Beta 1 of Windows Server 2008 released. Included the Next Generation TCP/IP stack, an integrated IPv4/IPv6 stack in a dual IP layer architecture

November 2006 - Windows Vista released

February 2008 - Windows Server 2008 released.

July 2009 - Windows 7 and Windows Server 2008 R2 released

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IPv6 – Strategy

High volume products - for the foreseeable future, Microsoft (as most manufacturers) will produce systems supporting both IPv4 and IPv6, so that if connections are not possible using IPv6 they can fall back and succeed using IPv4

Overall goal - to ensure a smooth transition and deployments where updated applications can take advantage of the new protocol, without breaking existing applications

Developer/Ecosystem care - New Windows APIs defined to specifically isolate the legacy applications from unintentional exposure to protocol differences.

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IPv6 – Adoption increase tactics

- CEC : Common Engineering Criteria
 - Compliance criteria list (revised annually) for server products.
 - Management Packs, Powershell commandlets, **IPv6 support**, ...
 - Mandatory, but an exemption process exists ☹️

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IPv6 – Adoption increase tactics II

IPv6 Dependent Solutions

- Peer to Peer API set
- Windows 7 Homegroup
- Parts of Remote Assistance
- Windows 7 DirectAccess
- Windows Meeting Space (and other applications that rely on the Windows Peer-to-Peer Networking platform or the Teredo transition technology)

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IPv6 – Adoption increase tactics III

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IPv6 Introduction

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Jun 8, 2011

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Agenda

- IPv6: What Is It And Why Is It Important?
- Practical Scenarios Around Deploying IPv6
- The Pros and Cons of Deploying IPv6 and of IPv6/IPv4 Co-existence
- Myths About IPv6
- Concerns About IPv6
- Next Steps
- Conclusion
- Q & A



IPv6 introduction

A Brief Outline of IPv6

**IPv4 IS THE CURRENT
INTERNET CARRIER**

**INTERNET IS GROWING
BEYOND THE LIMITS OF
IPv4**

**IPv6 DESIGNED BY
THE IETF TO ADDRESS
IPv4 SHORTCOMINGS**

IPv6 OFFERS:

- **Near unlimited addresses and subnet capability (no boundary to network growth)**
- **Standardized support for Internet Security Protocols (security built right in)**
- **More efficient node (host) discovery (rapid and automatic connectivity)**

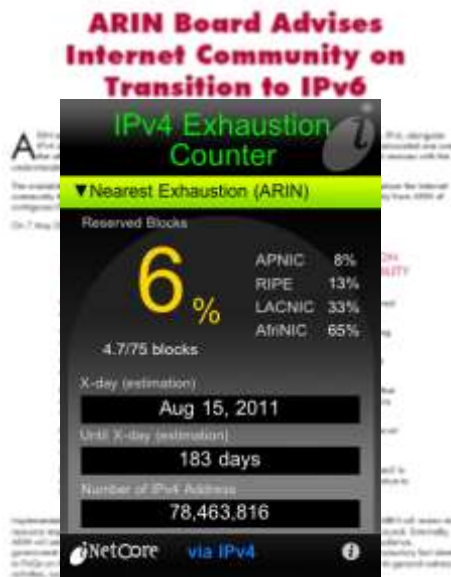
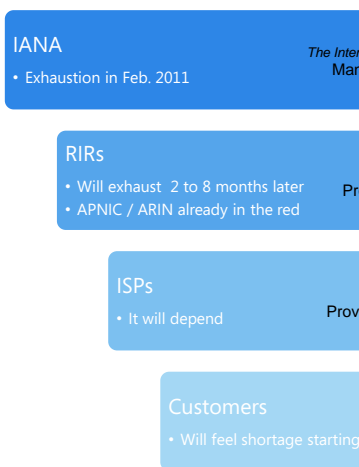
IPv6 introduction

Why Is It Important ?



IPv6 introduction: Why

IPv4 Address Depletion



IPv6 introduction: Why is it Important?

Government Mandates

- Numerous countries have mandated some form of IPv6 adoption
- All U.S. Federal Agencies must migrate from IPv4 to IPv6 by 2015
- European Union (EU) has mandated IPv6 adoption by 2010
- Government of Taiwan has mandated IPv6 adoption by 2010
- Governmental

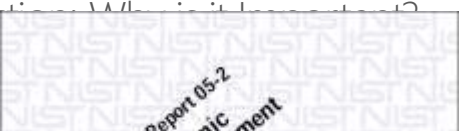


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IPv6 introduction: Why is it Important?

Business Drivers and

- A number of countries have mandated IPv6 adoption
- Cost
- Cost
- Value
- Innovation
- Innovation
- It is calculated to be as high as



OECD resources on Internet addressing: IPv4 and IPv6

In May 2008, the OECD warned that **Governments and business must tackle Internet address shortage together**. In particular, governments and business needed to work together more effectively and urgently to meet the growing demand for Internet addresses and secure the future of the Internet economy by implementing IPv6. Not implementing IPv6, it warned, would impact the economic opportunities offered by the Internet with severe consequences in terms of stifled creativity and deployment of new services.

- See OECD report: ["Economic Considerations in the Management of IPv4 and in the Deployment of IPv6"](#), June 2008
- Presentation: [IPv6 and the Future of the Internet Economy from a public policy perspective](#)

Nearly two years later, the OECD followed up on previous work by trying to assess the level of IPv6 deployment by **presenting several indicators, each of which offers information on a specific aspect of IPv6 development and from a societal vantage point**. It warns, importantly, that the Internet's distributed nature makes measuring IPv6 deployment very challenging and necessarily limited.

- See OECD report: ["Measuring Deployment of IPv6"](#), April 2010
- Presentation: [Measuring Deployment of IPv6](#)

Permanent URL: www.oecd.org/it/it/ipv6

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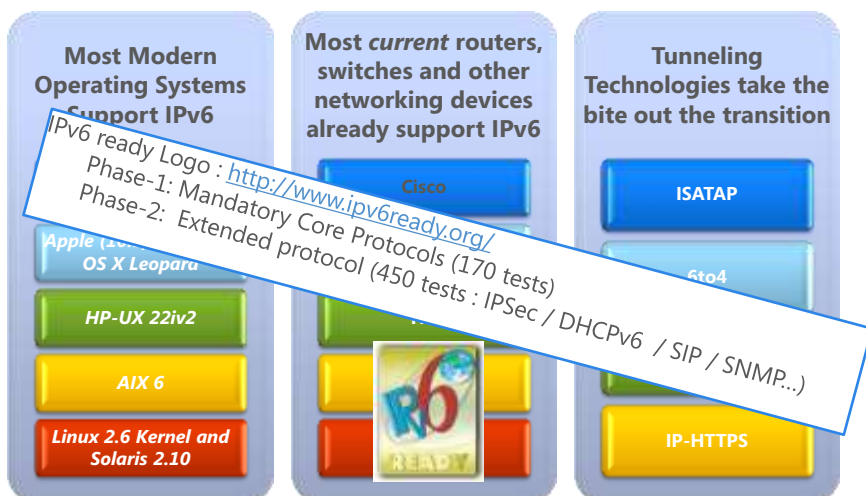
* RTI International **6 Economic Impact Assessment**" (<http://www.nist.gov/director/prog-ofc/report05-2.pdf>), October, 2005

Practical Scenarios Around Deploying IPv6



Pros and Cons of Deploying IPv6

IPv6 Deployment Landscape – Overall



Pros and Cons of Deploying IPv6

IPv6 Deployment Landscape – Microsoft’s Commitment

- IPv6 ready

- Phase 1

- Windows Server 2008 R2

- Windows Server 2008

- Phase 2 (core products)

- Windows Vista

- Windows 7

- Windows Server 2008 R2

- Windows Mobile 7

Data Center and Enterprise Readiness											
Health and performance management packs:	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Active Directory Support:	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
IPv6 Support:	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Support for a Server Core installation:	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Security configuration wizard support:	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Best Practices Analyzer:	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Reliability											
Microsoft Update servability:	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
High availability:	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Smarter setup:	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Certified for Windows Server 2008 R2 apps:	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

- CEC : Common Engineering Criteria

- Compliance criteria list (revised annually) for server products.
 - Management Packs, Powershell commandlets, **IPv6 support**, ...
 - Mandatory, but an exemption process exists
 - <http://www.microsoft.com/cec/en/us/default.aspx>

Pros and Cons of Deploying IPv6

IPv6 Deployment Landscape – Microsoft IPv6-Dependent Features and APIs

- Peer to Peer API set
- Windows 7 Homegroup
- Parts of Remote Assistance
- Windows 7 DirectAccess
- Windows Meeting Space or any application that relies on the Windows Peer-to-Peer Networking platform or the Teredo transition technology

Pros and Cons of Deploying IPv6

Microsoft KB Articles (1/2)

KB	Title	Comment
923398	How to configure an IPv6 resource for a SQL Server 2005 cluster on a Windows Server 2008-based computer	
975951	You receive an error message when you set up a SQL Server 2008 failover cluster on a subnet that contains only IPv6 addresses	SQL CU7 to correct
963042	IPv6 network connectivity problems occur on a Windows Server 2008-based computer when the Network Load Balancing feature is enabled	Fixed
2000919	Network Load Balancing (NLB) can not connect with IPv6 address on Windows Server 2008	Fixed in Windows 2008 R2
947050	Advanced resource configuration in Windows Server 2008 failover clusters	Info
941754	Incoming messages may be rejected by the queue manager on the cluster after you configure the clustered instance of Message Queuing to use HTTP messaging in Windows Server 2008	IPv6 lookup zone
969256	The validation fails when you run a cluster validation wizard for a Windows Server 2008 cluster	Teredo should be disabled
947044	When you use a cluster name instead of a node name to make a connection in Windows Server 2008, the DHCP MMC responds very slowly	IPv6 Reverse lookup for the cluster name

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Pros and Cons of Deploying IPv6

Microsoft KB Articles (2/2)

KB	Title	Comment
980054	Recommended hotfixes and updates for Windows Server 2008 R2-based server clusters	Info
978309	IPv6 transition technologies, such as ISATAP, 6to4 and Teredo do not work on a computer that is running Windows Server 2008 R2 Server Core	
976571	Stability update for Windows Server 2008 R2 Failover Print Clusters	
981953	An incorrect IP address is returned when you ping a server by using its NetBIOS name in Windows Server 2008 or in Windows Server 2008 R2	Covers both IPv4 / IPv6
2018583	Windows 7 or Windows Server 2008 R2 domain join displays error "Changing the Primary Domain DNS name of this computer to "" failed..."	Display error due to lack of Netbios (IPv4 or IPv6)
944007	You cannot access shares by using an IPv6 address that has a colon (:) character in the command	IPv6 literals explanation
929852	How to disable certain Internet Protocol version 6 (IPv6) components in Windows Vista, Windows 7 and Windows Server 2008	
2014131	Microsoft iSCSI Initiator never reconnects after failing and re-establishing a path to iSCSI storage when Multiple Connected Sessions and both IPv4 and IPv6 addresses are configured	Switch to IPv4

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Pros and Cons of Deploying IPv6

Pros



Pros and Cons of Deploying IPv6

Disadvantages of Not Deploying IPv6



Top 10 Myths About IPv6

Dispelling the Most Prevalent Un-Truths

There's just no ROI	It's going to cost us big-time to switch to IPv6	Nothing "bad" is going to happen – everything is fine with IPv4	We'll switch later – there's lots of time
Transitioning to IPv6 will be too disruptive	Nothing works with IPv6 right now	I need to turn off IPv4 first	I have to change my entire network infrastructure
	Disabling IPv6 solves my problems	IPv6 will increase my attack surface	

Top 10 Concerns About IPv6

Addressing Valid Issues

My custom applications are not ready for IPv6	Are Microsoft and 3rd party COTS applications ready for IPv6?	IPv6 will impact my security design (including IPv6 firewall)	I will have to abandon the security of NAT
DirectAccess (DA) server is an Internet-facing Domain member	In this economy, I can't afford to deploy IPv6	I need to avoid large capital expenses	I need to train my staff
	Converting from transition protocols to native IPv6 will be hard	Using NAT64 with DNS64 as a mitigation for legacy services	

Next Steps

How Can Microsoft Help?

IPv6 BENEFITS ANALYSIS

**IPv6 READINESS
ASSESSMENT**

**IPv6 DEPLOYMENT
PLANNING**

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Conclusion

- In the new decade the demands on the Internet and internetworking technology will continue to grow

“Implementing IPv6 has consumed less than 1 percent of our IT budget, and the IT budget is only a small part of the overall corporate budget. These costs are modest compared to the expected benefits.”

Fred Wettling, Bechtel Fellow and Technology Strategy Manager, Bechtel Corporation

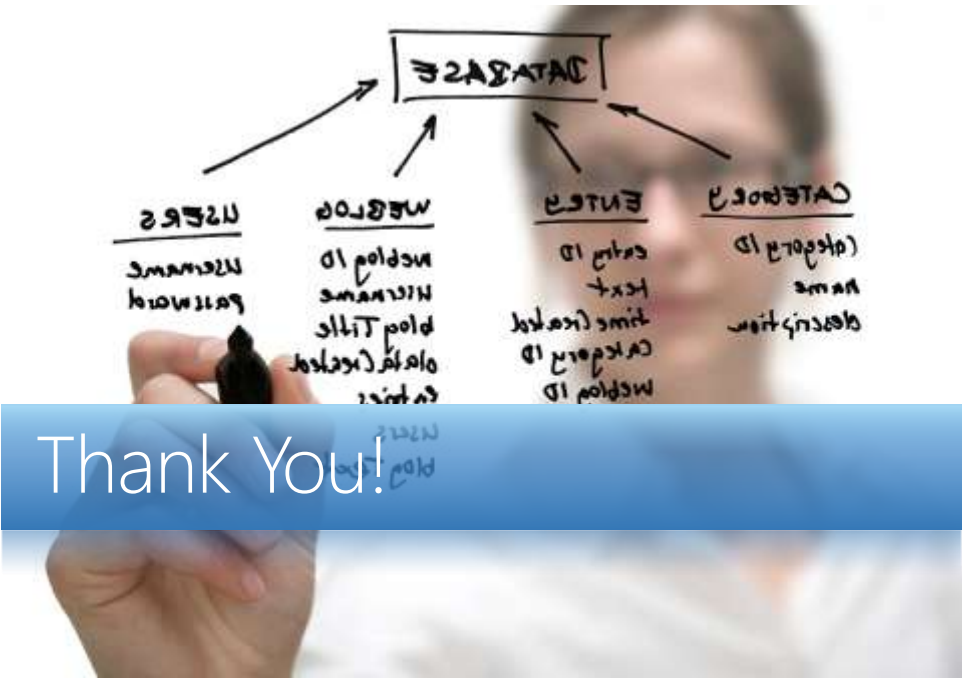
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References

- ARIN Board Resolution: https://www.arin.net/knowledge/about_resources/v6/v6-resolution.html
- Planning Guide\Roadmap Toward IPv6 Adoption within the US Government: http://www.ipv6council.de/fileadmin/documents/Planning_GuideRoadmap_Toward_IPv6_Adoptionin_USG_May_2009_final1.pdf
- Action Plan for the Deployment of Internet Protocol version 6 (IPv6) in Europe: http://ec.europa.eu/information_society/policy/ipv6/docs/european_day/comm-ipv6-final_en.pdf
- Action plan and Milestone Toward IPv4 Address Exhaustion (Japan): http://www.kokatsu.jp/blog/ipv4/en/data/091005_v4exh_actionplan_en.pdf
- IPv6 Economic Impact Assessment (Report to the US Department of Commerce): <http://www.nist.gov/director/prog-ofc/report05-2.pd>
- IPv6 Ready Logo Program: http://www.ipv6forum.com/dl/white/IPv6_Ready_Logo_White_Paper_Final.pdf
- Microsoft's TechNet IPv6 Site: <http://technet.microsoft.com/en-us/network/bb530961.aspx>



IPv6 Addressing Reference

```

C:\ipconfig

Wireless LAN adapter Wireless Network Connection:
   Connection-specific IPv6 Address . . . . . : ::
   IPv6 Address. . . . . : 2001:480:1000:c780:172
   Link-local IPv6 Address . . . . . : fe80::502:7b6c:e90b%12
   IPv6 Address . . . . . : fe80::1:0:0:0
   Subnet . . . . . : 2001:480:1000:c780:1
   Default Gateway . . . . . : fe80::1:0:0:0

Tunnel adapter Local Area Connection 6:
   Connection-specific IPv6 Address . . . . . : ::
   IPv6 Address. . . . . : 2001:480:1000:c780:172:19:4:59
   Link-local IPv6 Address . . . . . : fe80::502:7b6c:e90b%12
   IPv6 Address . . . . . : fe80::1:0:0:0
   Subnet . . . . . : 2001:480:1000:c780:1
   Default Gateway . . . . . : fe80::1:0:0:0

Tunnel adapter IPv6TunnelInterface:
   Connection-specific IPv6 Address . . . . . : 2002::e48:7611:2:142b:515ee43e4167
   IPv6 Address. . . . . : fe80::42b:e73e:e73e:4857:20
   Link-local IPv6 Address . . . . . : fe80::40a:156:c679:48f7:20
   IPv6 Address . . . . . : fe80::1:0:0:0
   Subnet . . . . . : 2002::e48:7611:2:142b:515ee43e4167
   Default Gateway . . . . . : 2002::e48:7611:2:142b:515ee43e4167

Tunnel adapter Local Area Connection 6:
   Connection-specific IPv6 Address . . . . . : 2001:0:480:1012:306a:2194:1e4b:185f
   IPv6 Address. . . . . : fe80::306a:2194:1e4b%12
   Link-local IPv6 Address . . . . . : fe80::1:0:0:0
   IPv6 Address . . . . . : fe80::1:0:0:0
   Subnet . . . . . : 2001:0:480:1012:306a:2194:1e4b:185f
   Default Gateway . . . . . : fe80::1:0:0:0
        
```

Native IPv6 Address

First digit will be a 2 or a 3

Subnet ID

Global routing prefix assigned by ISP

Interface Number

64-bit interface ID

IPv6 addresses are 128 bits long, written as 8 colon-separated parts of 4 hex digits. Leading 0's in each part can be omitted. **0** can replace multiple parts of all 0's.

Example: **2001:0db8:0000:0000:0000:0000:0000:0000**

Link Local IPv6 Address

Not routable address. Can be used to communicate only with other computers on the same link (subnet).

First 10 bits are always fe80:

Interface Number

Number 64-bit interface ID

Example: **fe80::1:0:0:0**

The IPv6 loopback address is **0:0:0:0:0:0:0:1**.

ISATAP IPv6 Address

Takes directly to other ISATAP computers on Internet without going through ISATAP router (if present at).

Prefix from border router (e.g. DNS)

IPv6 address of the computer

Example: **2001:7b6c:e90b:1:0:0:0:0**

IPv6TUNNEL IPv6 Address

IPv6 interface of tunnel router. If a working interface (that is tunnel address is available), IPv6TUNNEL will identify itself.

Global prefix

SLA (subnet)

Randomly generated by the computer

Interface ID

Example: **2002::e48:7611:2:142b:515ee43e4167**

By default, IPv6TUNNEL will use 2002::e48:7611:2:142b:515ee43e4167 as the prefix.

EUI-64 IPv6 Address

Available only if you have a public IPv4 address (or a third gateway). Transmits router ID (instead of 1).

Public IPv4 address of the computer

Example: **2002::e48:7611:2:142b:515ee43e4167**

IPv4 identifier

Public IPv4 address of the computer

Teredo IPv6 Address

Used for clients with private IPv4 addresses. Transmits router ID (instead of 1).

Teredo prefix

Type of NAT

Example IPv6 address

Example IPv4 address

Example NAT port or NAT

Example: **2001:0:480:1012:306a:2194:1e4b:185f**

Notes

The common types of IPv6 addresses are shown in the example ipconfig output. Each address type has associated details of how the address is formed, notes, and any useful commands that can give more details about the interface for that address type.

Controlling IPv6

- Described in KB 929852
- All components behavior in :
 - HKLM\SYSTEM\CurrentControlSet\Services\tcpip6\Parameters\DisabledComponents

Behavior	DisabledComponents value
Disable all tunnel IPv6 interfaces	0x1
Disable 6to4	0x2
Disable ISATAP	0x4
Disable Teredo	0x8
Disable Teredo and 6to4	0xA
Disable native IPv6 interfaces.	0x10
Disable all IPv6 interfaces except loopback interface	0x11
Use IPv4 instead of IPv6 in prefix policies	0x20
Disable all IPv6 components, except the IPv6 loopback, use IPv4 instead of IPv6	0xFF