

IPV6

Sacramento PC Users' Group

ATT Video about IPv6

<http://www.att.com/esupport/ipv6.jsp#fbid=evN7qmJQr0u>

PACKET SWITCHING NETWORKS

- ✘ Every computer on a network has an address.
- ✘ Many competing protocols used in 1960's and 70's by Dept. of Defense, Schools, etc.
- ✘ ARPANET, Aloha Network, ARCNET
- ✘ TCPv1, TCPv2, TCPv3 and IPv3
- ✘ TCPv4 and IPv4 (1977)
- ✘ (IPv5 was a testing protocol not publicly used)
- ✘ IPv6 or TCP/IPv6 (1995)

PACKET SWITCHING

- × Packets (“Envelopes” in Video)
 - + Header (different for different IPv)s)
 - + Data
- × Addressing
- × Routing
- × Clients

COMPARING IPV4 AND IPV6

Item	IPv4	IPv6
Address Length	32 bits	128 bits
Number of Addresses	4.3 Billion	340 Undecillion (3.4×10^{38})
Domain Name Services	DNS	DNS
Client Address Assignment	Static IP	Static IP
	DHCP	DHCP6
		Stateless Address Autoconfiguration
Typical Addresses per Client	1	2+

IPV6 ADDRESSING

- ✘ Definition settled on in January, 1995.
- ✘ World Launch: June 6, 2012
- ✘ IPv6 addresses (Hexidecimal notation)
 - + 0:0:0:0:0:0:0:0 to ffff:ffff:ffff:ffff:ffff:ffff:ffff:ffff
 - + 128 bits in 8 “hextets”
 - + Roughly 3.4×10^{38} (340 undecillion) addresses
 - + E.G. Google.com:
2001:4860:4001:0001:0000:0000:0000:1004

SHORTENING IPV6 ADDRESSES

- ✘ Initial address:
2001:0db8:0000:0000:0000:ff00:0042:8329
- ✘ After removing all leading zeroes:
2001:db8:0:0:0:ff00:42:8329
- ✘ After omitting consecutive sections of zeroes:
2001:0db8::ff00:0042:8329
- ✘ After doing both: 2001:db8::ff00:42:8329

ADDRESS FIELDS

- × 128 bits
- × Leftmost 48 bits generally assigned to company, etc.
- × Next 16 bits for subnet designation
- × Right 64 bits for individual devices.

2607:f8b0:400a	:801	:0:0:0:1003
Company, etc.	Subnet	Device

2607:f8b0:400a:801::1003

IPV6 ADDRESSING

- ✘ There are 3 ways of addressing:
 - unicast (single)
 - multicast (group)
 - broadcast (many, not implemented)
- ✘ Link-Scoped Unicast (Linked-Local) fe80:.....
- ✘ Site-Local: fec0:.....
- ✘ Loopback ::1 (like 127.0.0.1)
- ✘ Present Unicast Addresses: 2xxx:

ADVANTAGES OF IPV6

- ✘ So many addresses that everything can have it's own address. You can have 2^{64} devices for an IP assignment.
- ✘ Useful for things like home automation from big companies like Comcast.
- ✘ Easy to address appliances, etc. (NAT port forwarding not necessary).
- ✘ Don't need NAT any more (but can have it).
- ✘ Easier to route worldwide.
- ✘ IP packets have bigger header but faster in routing.
- ✘ IPSec built into IPv6

DISADVANTAGES OF IPV6

- ✘ Embryonic, “Version 1.0”
- ✘ Hard to get now and implementations vary.
- ✘ Firewall rules get to be interesting, especially without NAT.
- ✘ IT Pros, Tech supports, etc. don’t know much about it.
- ✘ Most existing home routers can’t deal with it, need to buy new equipment.

DISADVANTAGES OF IPV6

- ✘ Routers that can do IPv6 don't do it uniformly (may or may not work with your isp's IPv6).
- ✘ Many different ways of having a computer/device getting an address:
 - + Static IP
 - + DHCP6
 - + SLAAC/RA (Router Advertisement)

OPERATING SYSTEMS SUPPORT

- ✘ Windows Vista, 7 and 8 give priority to IPv6, if available. (can be changed via registry hack)
- ✘ Windows XP, can be implemented
- ✘ iPhone (IOS 4.1 and higher)
- ✘ Windows Phone (6.5, not 7.5)
- ✘ Android (4.2 jellybean), partial (no DHCP6)
- ✘ Mac OS X (10.7 Lion)
- ✘ Most Linux and BSD versions.

HOW DO I GET IPV6?

- ✗ Provided by your ISP
 - + Comcast, June 2013 (?), dual stack IPv4 and IPv6.
 - + AT&T (It'll be ready when you need it....)
- ✗ Several tunneling techniques (e.g. Hurricane Electric) that use IPv4 connection to carry IPv6 traffic
- ✗ Need router that supports IPv6 on your ISP

DOCSIS Device Compatibility and Capability



This site provides a list of all currently approved cable modems and EMTA devices. Use this site to ensure your device is compatible with the service level that you subscribe to. For additional information on End of Life (EOL) devices, please review the [EOL FAQs](#).

Comcast strongly recommends customers only purchase devices that include a warranty and/or return policy. Cable modems and eMTAs operate with firmware/software and could make the device defective and inoperable if compromised in any way.

- ✔ [Click here to purchase a new DOCSIS 3.0 modem](#)
- ✔ [Click here for details of where to purchase a new Telephony modem](#)

Showing IPv6 Home Gateways. [CLICK HERE](#) to view Comcast tested Cable Modems.

Home Gateway Devices

The following list of devices are recommended by Comcast for use as part of our IPv6 enabled broadband services. These devices along with the corresponding firmware have been tested in Comcast labs and are known to be compatible. While other devices may also be compatible we strongly recommend the use of devices we have tested. This will help to ensure you have a consistent broadband experience throughout the IPv6 transition.

It is important that you pay close attention to the notes that pertain to each of the listed devices. We will document important information and recommendations for each in this area.

For more information about Comcast's IPv6 transition planning please visit our IPv6 Information Center:

<http://www.comcast6.net/>

Vendor	Model	Firmware	Vendor Link	User Guide	Notes
D-Link	DIR 655	2.03NA	http://dlink.com/us/en/home-s...		
D-Link	DIR 825	2.06NA	http://dlink.com/us/en/home-s...		
D-Link	DIR 827	v1.04	http://www.dlink.com/us/en/su...		
D-Link	DIR 657	V1.01	http://www.dlink.com/us/en/su...		
Linksys	E4200v2	2.0.36	http://homestore.cisco.com/en...		
Netgear	WNR1000v2	1.1.2.54	http://support.netgear.com/pr...		
Netgear	WNDR4500	1.0.1.20	http://support.netgear.com/pr...		
Apple	Airport Extreme	7.5.2 or better	http://www.apple.com/airporte...		
Asus	RT-N66U Dark Knight	3.0.0.4.270	http://www.asus.com/Networkin...		
Open Source	Tomato USB	Shibby or Toastman mods	http://tomatousb.org		

IPv6 Equipment Compatibility Table

Close X

- Windows 8

Note: You may need to take steps to enable IPv6 for your IPv6 compatible operating system. Contact the manufacturer for detailed instructions.

IPv6 compatible Modems, Routers, and Gateways

If you have one of the devices shown below, it will be IPv6-enabled through an automatic firmware update. These updates began in 2011 and are expected to continue through 2014 *

AT&T DSL High Speed Internet

- Motorola 3360
- Netgear 6200 A90 (Compatible now)
- Netgear 7550 B90 (Compatible now)
- Pace 4111 N

* For DSL customers who do not have one of the devices listed above, IPv6-compatible devices are now available for purchase in the [AT&T Equipment Shop](#).

AT&T U-verse High Speed Internet

- 2Wire/Pace 3600
- 2Wire/Pace 3800
- 2Wire/Pace 3801
- 2Wire/Pace i38HG
- Motorola NVG510 (Compatible now)

* If you have a Motorola 2210 or 2Wire 2701 device and you want to upgrade to an IPv6-capable device, visit the [AT&T Equipment Shop](#).

Note: To determine your device's model number, consult the device information sticker on the back of your device. For non-AT&T provided modems/routers/gateways, please check with equipment manufacturer.

IPv6 Compatibility Upgrades

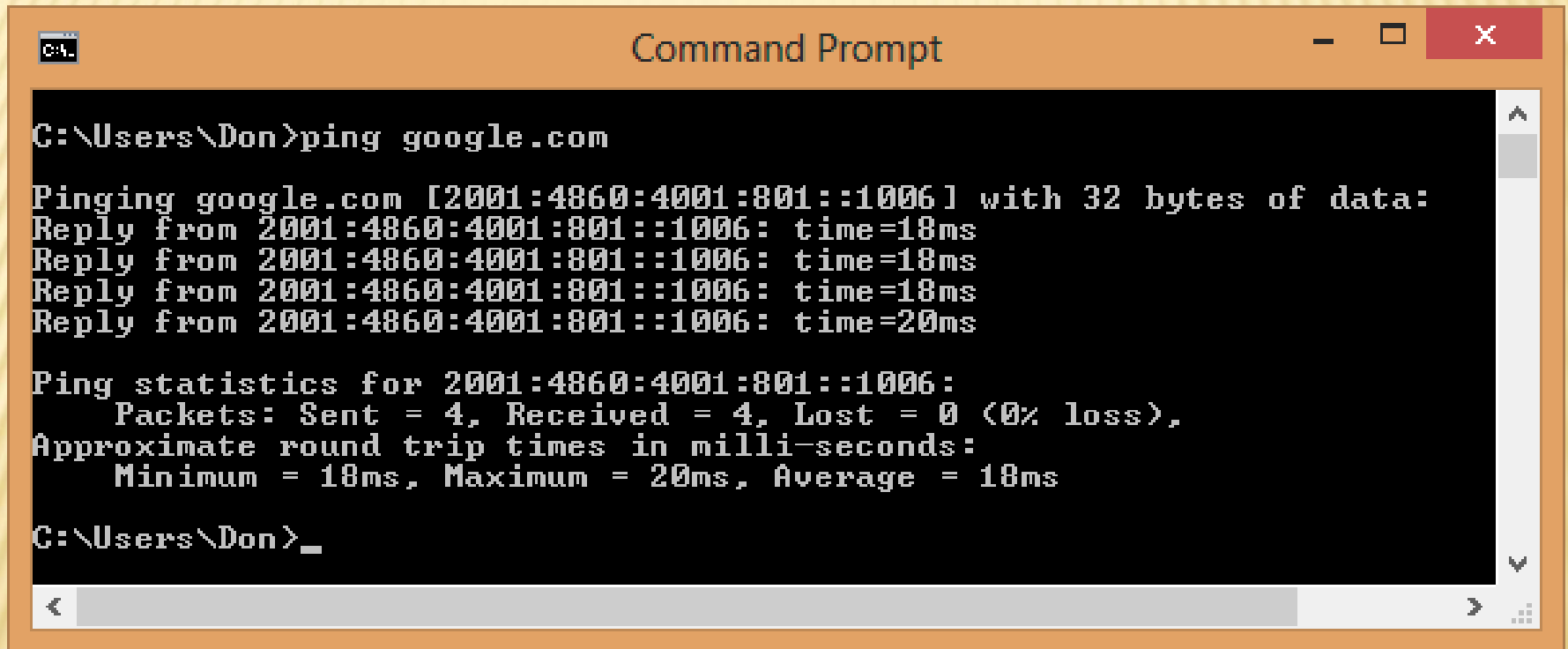
The transition to IPv6 will allow you to access IPv4 content on the Internet. As IPv6 becomes more prevalent, the equipment in your home may not be IPv6-compatible. We will ensure that it is IPv6-compatible or will not need to take any action on your part.

For a list of IPv6-compatible modems, routers, and gateways, visit our [compatibility matrix](#).

Test Now IPv6 compatible system

Wireless Digital TV Internet

Support > Internet > IPv6



The image shows a Windows Command Prompt window titled "Command Prompt". The window has a standard Windows title bar with minimize, maximize, and close buttons. The command prompt shows the following text:

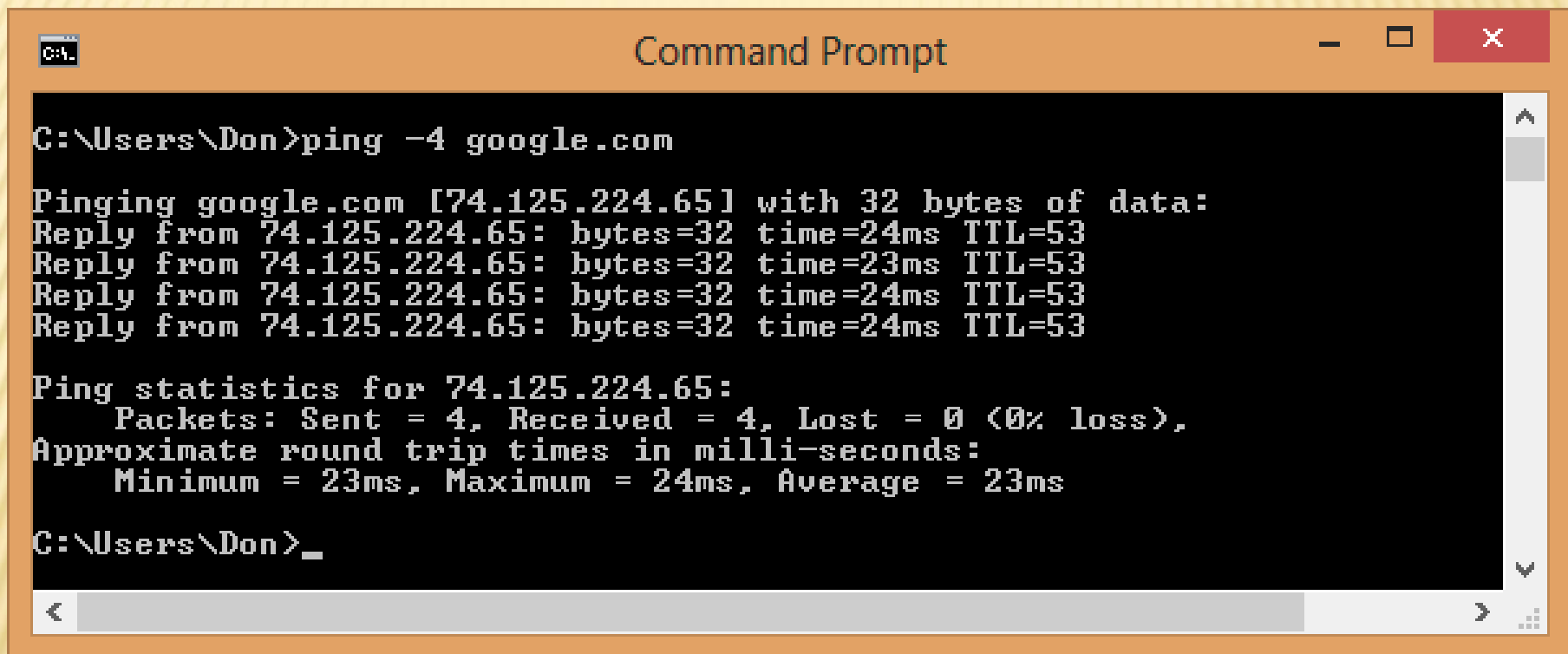
```
C:\Users\Don>ping google.com

Pinging google.com [2001:4860:4001:801::1006] with 32 bytes of data:
Reply from 2001:4860:4001:801::1006: time=18ms
Reply from 2001:4860:4001:801::1006: time=18ms
Reply from 2001:4860:4001:801::1006: time=18ms
Reply from 2001:4860:4001:801::1006: time=20ms

Ping statistics for 2001:4860:4001:801::1006:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 18ms, Maximum = 20ms, Average = 18ms

C:\Users\Don>_
```

The output indicates that the ping to google.com was successful, with 4 packets sent and 4 received, resulting in 0% loss. The approximate round trip times are: Minimum = 18ms, Maximum = 20ms, and Average = 18ms.

A screenshot of a Windows Command Prompt window. The title bar reads "Command Prompt" and includes standard window controls (minimize, maximize, close). The command prompt shows the execution of the command "ping -4 google.com". The output displays four successful ping replies from IP address 74.125.224.65, each with 32 bytes of data, a time of 23ms or 24ms, and a TTL of 53. Below the replies, it shows ping statistics for 74.125.224.65: 4 packets sent, 4 received, 0% loss, with a minimum round trip time of 23ms, a maximum of 24ms, and an average of 23ms. The prompt ends with "C:\Users\Don>_" and a scroll bar is visible at the bottom.

```
C:\Users\Don>ping -4 google.com

Pinging google.com [74.125.224.65] with 32 bytes of data:
Reply from 74.125.224.65: bytes=32 time=24ms TTL=53
Reply from 74.125.224.65: bytes=32 time=23ms TTL=53
Reply from 74.125.224.65: bytes=32 time=24ms TTL=53
Reply from 74.125.224.65: bytes=32 time=24ms TTL=53

Ping statistics for 74.125.224.65:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 23ms, Maximum = 24ms, Average = 23ms

C:\Users\Don>_
```

WEB SITES

- × <http://www.att.com/ipv6>
- × <http://www.comcast6.net/>
- × <http://www.test-ipv6.com>
- × <http://www.tunnelbroker.net/>
- × <http://www.pfsense.org>
- × <http://snapshots.pfsense.org/>
- × <http://mydeviceinfo.comcast.net/>