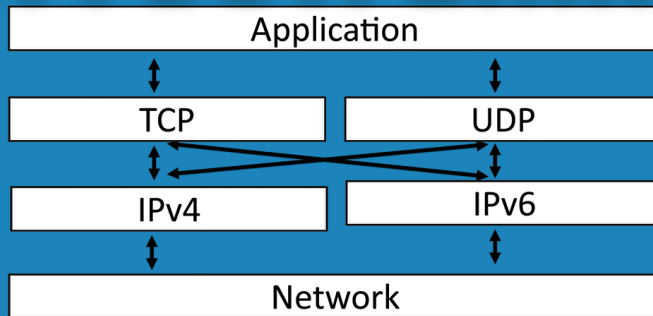


ITFreeTraining



Co-Existence IPv4 and IPv6

For the free video please see
<http://itfreetraining.com/ipv6/coexistence>

Welcome to the ITFreeTraining video on co-existence of the IPv4 and the IPv6 protocols. Inevitably, Internet Protocol version 6 will replace version 4 but that day seems to still be a rather long way away. Adoption is still slow for IPv6. Until then, network administrators will remain in a situation where they will likely encounter a need to utilize both protocols. Our video will cover the changes to IPv6 over IPv4 and the impact of using IPv6 and IPv4 on the same network.

History of IPv6

| Year | Major development and milestones |
|------|---|
| 1994 | Work initiated for a successor to IPv4 protocol |
| 1996 | Alpha IPv6 support added to Linux kernel |
| 1998 | Internet Engineering Task Force (IETF) formalized IPv6 as successor |
| 2002 | Windows XP adds support for IPv6 |
| 2005 | Linux support changed from experimental to implemented |
| 2007 | Windows Vista supports IPv6 by default |
| 2008 | IANA adds AAAA records for the IPv6 six root name servers. DNS resolving now possible |

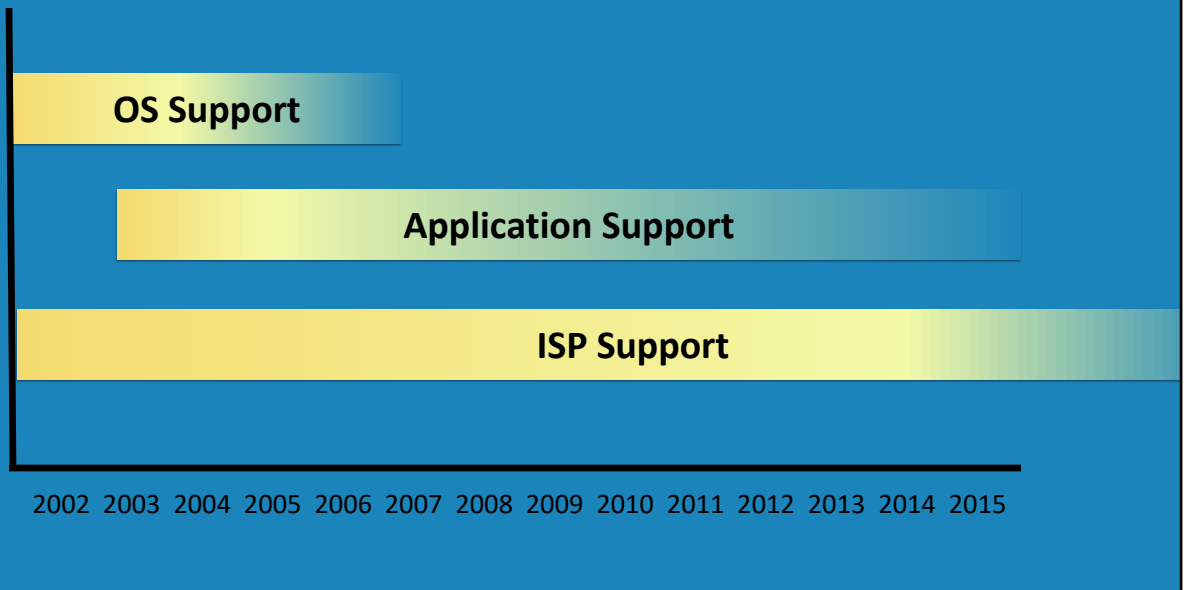
0:25 – To begin, we'll review the major developments and milestones of the IPv6 protocol to provide you with an understanding of how it is today. Back in 1994, work was initiated for a successor to IPv4 due to the forecasted crowding of the public addresses. The 1990s saw an exponential growth in the size of the Internet and it was quickly determined that the address space for the entirety of the IPv4 protocol was overwhelmingly small and would not be able to accommodate the future growth of the Internet. In 1996 alpha code was added to the Linux kernel. It would still be considered experimental, but operating system support was on the way.

1:00 – In 1998, the Internet Engineering Task Force (IETF) formally announced that IPv6 would be the successor to the IPv4 protocol. Obviously, a lot of work had been done before this announcement on this protocol including work on IPv5. The announcement meant that IPv4 was being replaced with the IPv6 protocol, one day. In 2002, Microsoft began supporting IPv6 within their Windows XP operating system. The protocol was effectively tossed into the operating system and though it provided functionality and support for IPv6, performance was lacking.

1:34 – In 2005, Linux began experimental support of IPv6 which marked the beginning of official Linux support. At this point, it considered IPv6 in Linux to be stable. Following up in 2007, Microsoft released the operating system, Vista for its Windows lineup and with it, complete IPv6 functionality. This addition of IPv6 in Windows Vista was completely redesigned and was not simply an add-on to the operating system as it was previously. It was also made IPv6 the default protocol to use within the operating system, so when IPv6 is available, Windows will utilize that protocol over IPv4.

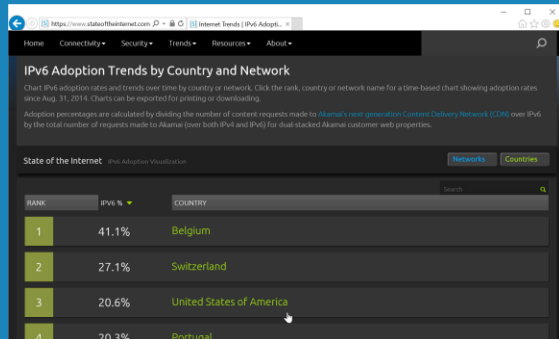
2:05 – Finally, as recently as 2008, six of the root name servers (backbones of the internet) had IPv6 quad A records added to their systems. This means that IPv6 resolution on the Internet was now made possible. You can see that after 2008, operating systems and core internet DNS services were capable and ready to support IPv6. So why has deployment of IPv6 been so slow?

Status of IPv6 Deployment



2:28 – If I now have a closer look at the current status of IPv6, it can be seen that OS support is fairly complete. They support IPv6 and all of its functionality as a whole. Even mobile devices such as Android and iOS support IPv6. Due to this long time of availability, application support has improved greatly. It is up to the application developer, however, to ensure their program is compatible with IPv6. There's no statistics for how many applications support IPv6, however a quick check of the feature list of many applications show that IPv6 support is very prevalent.

IPv6 Statistics



The screenshot shows the 'Network operator measurements, 16th October 2015' page from World IPv6 Launch. It includes a search bar and a table of network operators ranked by IPv6 deployment percentage. The table has columns for Rank, Participating Network, ASN(s), and IPv6 deployment.

| Rank | Participating Network | ASN(s) | IPv6 deployment |
|------|-----------------------|--|-----------------|
| 1 | Comcast | 7015, 7016, 7725, 7922, 11025, 13367, 13385, 20214, 21508, 22258, 22909, 33287, 33489, 33490, 33491, 33650, 33651, 33652, 33653, 33654, 33655, 33656, 33657, 33659, 33660, 33661, 33662, 33664, 33665, 33666, 33667, 33668, 36732, 36733 | 40.89% |
| 2 | ATT | 6389, 7018, 7132 | 51.13% |
| 3 | KDDI | 2516 | 23.14% |
| 4 | Verizon Wireless | 6167, 22394 | 72.09% |
| 5 | Time Warner Cable | 7843, 10796, 11351, 11426, 11427, 12271, 20001 | 22.29% |
| 6 | T-Mobile USA | 21928 | 50.06% |
| 7 | Deutsche Telekom AG | 3320 | 21.65% |
| 8 | SoftBank | 17676 | 6.67% |

3:10 Open internet explorer and go to the page <https://www.akamai.com/us/en/about/our-thinking/state-of-the-internet-report/state-of-the-internet-ipv6-adoption-visualization.jsp> You can also find this page by doing a search for state of the internet. This page shows the current adoption of IPv6 per country. At the time this video was made, United States of America was 20% but is now about %40. The top country was still however below 50%.

04:12 In Internet Explorer, open the page <http://www.worldipv6launch.org/measurements> Since the recording of this video the measurements have changed. Comcast is now about 60% and Verizon Wireless is about 82%. One of the reasons that IPv6 deployment has been slow was that initially IPv6 equipment was expensive. ISP's were reluctant to upgrade equipment on networks where there is little demand. As technology improve, become cheaper and IPv6 becomes more standard on equipment, ISP's are slowly upgrading their equipment. If you can get IPv6 will determine on which ISP you connect to and where you are located. In some locations, IPv6 may not yet be available.

05:30 As the time of recording this video, the number of website available was just below 20%, currently it is now just below %30.

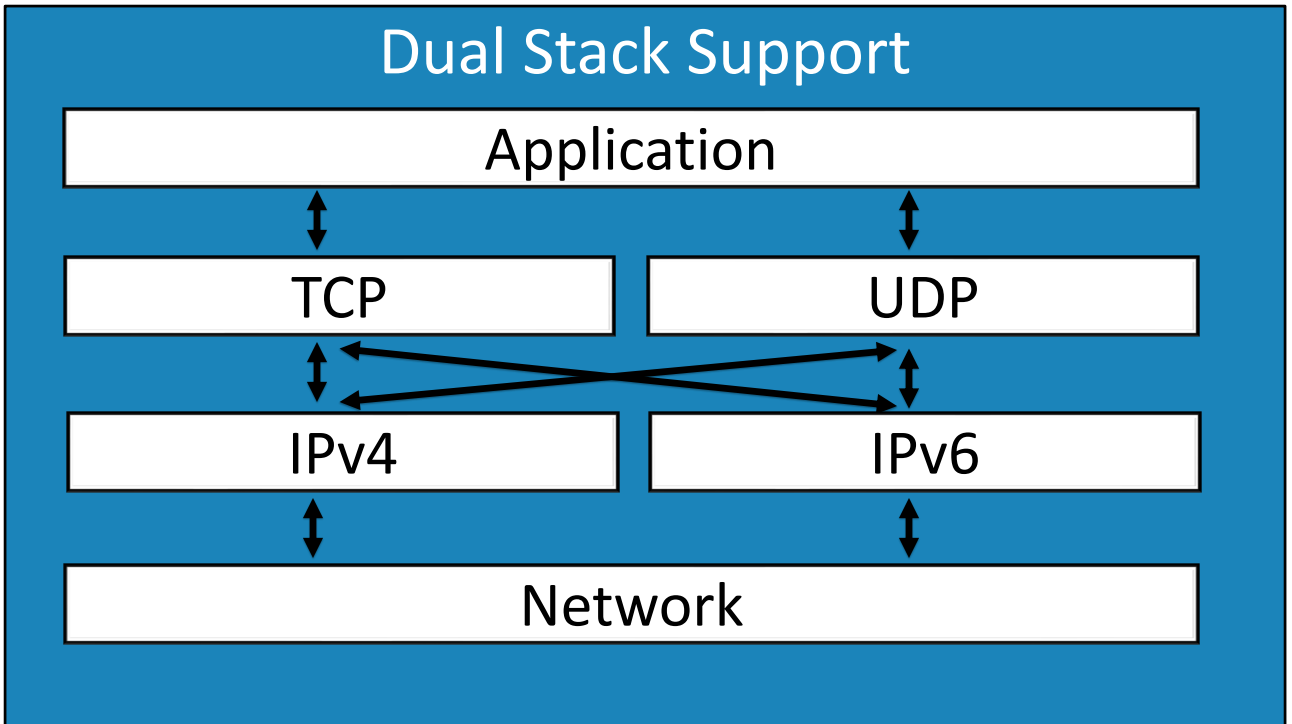
05:40 On an IPv6 enabled computer and network, you can ping a site to see it supports IPv6. Google and Facebook website is currently IPv6 compatible while Microsoft is not. In Windows Vista and above, Windows will attempt to use IPv6 first and then IPv4. Thus, you don't need to worry if the site supports IPv6 or not, Windows will determine this for you.

06:35 The ping command supports the -4 and -6 switch. This will force the ping command to use IPv4 or IPv6. In the case of Microsoft, when the -6 switch is used the command will fail as IPv6 is not supported.

07:20 Before you network can use IPv6, your router needs to be enabled to do so. Even if the router has IPv6 enabled, by default this option may be switched off. Different routers will have different admin tools. In the case of the router using in this demonstration, in order to have IPv6 start being used, the router needed to first have it enabled.

08:30 To access IPv6, ensure that your ISP supports it and it is enabled on your router. Not all routers support IPv6. Affordable IPv6 routers only started selling on the market in 2010. Now days, most routers support IPv6, however it is still possible to purchase a router that does not support IPv6. Sometimes a firmware update may be available to upgrade your router to support IPv6.

Dual Stack Support



09:08 A device that has both the IPv4 and IPv6 protocols configured is referred to as dual stack. IPv4 and IPv6 have use different types of packets so traffic from both can be sent on the same network without one interfering with the other. An application can decide if it wants to use a IPv4 or IPv6 connect. The application can also choose just to open a connection and let the operating system decide which to use. Windows Vista and above will automatically try IPv6 first and then use IPv4 if IPv6 is not available.

Node Types



10:05 When combining IPv6 and IPv4 together it is important to understand node types. If a device only support IPv4 then it is an IPv4 node. If a device is IPv6 node it is an IPv6 node. If a device supports both it is IPv4 and IPv6. This becomes important when combining networks together. When transition technology is being used, the transition technology may use and IPv4 network to join to IPv6 networks together. Also, if VPN's are used, a VPN may only support IPv4 and thus IPv6 is no longer available.

IPv6 Ready

- ISP IPv6 ready
- Router IPv6 ready
 - Router configured for IPv6
- Destination IPv6 ready
- Windows/Linux support use of both protocols
 - Dual stack

11:00 If you want to start using IPv6 are number of things need to be support. First, the ISP you are using needs to support IPv6. Not all ISP support IPv6 and the ones that do may not support it in your area. The router that you use to access the internet needs to support IPv6. Remember that by default some routers will have IPv6 disabled by default. Most routers on the market nowadays support IPv6, however you can still purchase ones that do not. Next, the destination you are trying to connect to needs to support IPv6. A lot of sites now support IPv6 but not all. Once you have IPv6 up and running, operating system like Windows and Linux support dual stack. Dual stack allows IPv4 and IPv6 to run on the same computer.