FAQs on the IPv6 Transition

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1) What is IPv4?

All of the traffic on the Internet today uses a protocol known as "IPv4," or Internet Protocol version 4. For example, IPv4 is used to route traffic between a personal computer connected to the Internet and an Internet web site. The IPv4 protocol has the capability to provide a unique address to approximately 4.3 billion devices on the Internet. This may seem like a lot, however, as has been reported, the IPv4 address space has been almost entirely been allocated, and Internet Protocol version 6 (IPv6) will be replacing it.

2) What is IPv6?

Internet Protocol version 6 (IPv6), published in 1998, uses a 128-bit addressing scheme that multiplies the pool of available addresses exponentially. Even taking into account projections for proliferation of IP-connected devices in decades to come, it will provide enough addresses to fulfill the world's needs indefinitely. IPv6 can address 340 undecillion (36 zeroes) but is not backward compatible with IPv4. IPv6 offers enough addresses for every atom on the surface of the earth.

3) What is causing the increasing attention to IP addressing technology?

The Internet Assigned Numbers Authority (IANA) organization is responsible for providing IP addresses (typically in large blocks) to the regional Internet registries (RIRs) around the world, which in turn provide addresses (typically in somewhat smaller blocks) to ISPs. It is projected that IANA will run out of IPv4 address blocks in the February 2011 time frame. And, it is expected that the RIRs will hand out all of their IPv4 addresses by the fourth quarter of this year or in early 2012 at the latest. The rate of IPv4 address depletion is dependent on the rate at which the ISPs request IPv4 address blocks. With the rapid growth of broadband service and of Internet connected devices (PCs, smart phones, tablets, and connected TVs or Blu-ray players), the rate of depletion of IPv4 addresses has increased in recent years. As a result, ISPs who get their addresses from the RIRs will then be unable to obtain additional new IPv4 addresses. Although it will vary from one ISP to another, many ISPs may run out of IPv4 addresses over the next six months to two years. It is important to remember that the Internet will continue to work when new IPv4 addresses are no longer available for ISPs. However, IPv6 addresses will be required for continued growth of Internet users and connected devices.

4) After all addresses have been distributed, can IPv4 addresses still be used?

Service providers can continue to use their existing IPv4 address space, even after exhaustion. Many customers who currently use public IPv4 addresses will be able to continue to use them.

5) How will the Internet transition from IPv4 to IPv6?

Because IPv4 and IPv6 addresses are not compatible, the best solution to resolve this problem is to have all parties across the Internet transition from IPv4 to IPv6 so that they are all using the same addressing scheme. This includes participation from content providers and web sites, ISPs, Internet backbone providers, equipment vendors, as well as consumers – in other words, all parties of the entire Internet "ecosystem." To do this requires educating the entire community on how to transition to IPv6. This will take several years, and will require the cooperation of everyone in Internet ecosystem. Fortunately, this is not like the Y2K problem where all impacted equipment had to be "fixed" by a date certain. There may be some impact to some applications under certain circumstances, but the Internet will keep working.

6) What is the preferred technology for ISPs, CE vendors and website publishers to adopt?

To address this question, cable operators are now working to implement IPv6 across their broadband networks, knowing that IPv6 will offer customers the best quality of experience over time. This will essentially be a "parallel" path that will co-exist along with the existing IPv4 path that they provide today known as a native dual-stack solution. In this solution both IPv6 and IPv4 traffic passes over the same networks between devices supporting both technologies. However, much of today's consumer equipment and some older personal computer operating systems only support IPv4. Thus, a pure IPv6 solution is not feasible in the near-term. Although some of the most popular websites such as Google and Facebook have been leaders in IPv6 technology, only a small number of content providers and web sites on the Internet support IPv6 traffic. To help evangelize the transition, on June 8, 2011, "World IPv6 Day" will take place to encourage all parties to the Internet to "test drive" IPv6 for a 24 hour period.

7) Will today's CE devices and applications need to be replaced?

Not all devices and applications will need to be replaced. Some vendors have been proactive in providing IPv6 capable CE devices over the last several years including Apple, Linksys/Cisco, and D-Link, among others. Recent versions of operating systems powering many computers and CE devices have already or will shortly provide upgrade paths such as Windows, Apple's MAC OS X and iOS, Linux, and Google's Android. Although some manufacturers have been proactive, many manufacturers are still not shipping products supporting IPv6. Some may view the transition as an opportunity for consumers to refresh their technology.

Older equipment such as early generation Wi-Fi routers and firewalls are still active in most home networks, will not support IPv6, and should be replaced. Until subscriber devices and Internet content are both upgraded to support IPv6, Internet service providers will be required to offer IPv4 service, even when they cannot acquire sufficient IPv4 address space to support their customer base.

8) Is the cable industry infrastructure ready to support IPv6?

CableLabs, with the support of its members and the vendor community, has been proactively updating its specifications since 2004 to support this technology. The DOCSIS® 3.0 high-speed data specification now enjoying widening adoption among cable providers has supported IPv6 addressing from the start, while also allowing for IPv4 compatibility. Backward compatibility also is written into the preceding DOCSIS 2.0 specification, which accommodates the IPv6 protocol through upgraded (3.0-compliant) cable modem termination systems. Likewise, PacketCable™ 2.0, which is just reaching the market, includes support for IPv6. CableLabs has ongoing interoperability and certification programs to work with vendors to ensure they can support its members with effective solutions for the transition. In fact, with Comcast engineering leading the way early on – many of CableLabs members have been primary contributors to IETF standards and best practice development – providing leadership that positions the industry and Internet for a successful transition.

Cable Operators have been working diligently to prepare their networks and operations staff for the transition and have been recognized as leaders in this effort. http://www.networkworld.com/news/2010/102810-cable-ipv6.html

9) Once the RIRs run out of IPv4 addresses, what options exist for obtaining new addresses?

Most ISPs will request new allocations from the RIRs after the IANA exhaustion based on forecasted growth needs. These grants will provide for some growth after the RIRs have exhausted all allocations. Some ISPs may have large IP address blocks granted from the very early Internet allocations. Additional addresses can be reclaimed by upgrading portions of their network to IPv6 and re-using the IPv4 addresses from the upgraded area for new growth. Although most ISPs have only requested the IP addresses they need per the RIR policies, some address blocks may be obtained by economizing the use of addresses from the data center infrastructure. Therefore, the exact IPv4 exhaustion date will vary by service provider.

Regional Registries such as ARIN (American Registry for Internet Numbers) have updated policies to allow for transfer of IPv4 address between owners. These policies will enable service providers to purchase and sell address blocks or obtain re-assignment of address blocks through corporate acquisitions. This will allow for efficient use across the industry.

As described above, cable operators have been preparing the latest DOCSIS and PacketCable technologies for IPv6 for years. As a result of this preparation, cable operators will be able to re-claim IPv4 addresses from cable modems, voice devices, and set-top-boxes to use for consumer devices that cannot support IPv6. Operators expect that these strategies will allow them to continue to support older IPv4 through the transition. If the introduction and adoption of new IPv6 compatible consumer electronic devices is slow and the demand for IPv4 is greater than what can be re-claimed or obtained in the open market, the Internet ecosystem has some contingency technologies based on IETF standards.

10) How are the core network infrastructure vendors doing in their IPv6 support?

As noted above, vendors complying with CableLabs' DOCSIS 3.0 and PacketCable specifications will support IPv6. Moreover, many cable infrastructure vendors provide upgrade paths or newer technology to ensure networks can function with IPv4 and IPv6. Testing by network engineers is still ongoing with continual refinement of upgrades and performance enhancement. Beyond cable, all networks will need to be upgraded to ensure seamless consumer experience.

Technologies such as 6RD, a mechanism to facilitate IPv6 rapid deployment across IPv4 infrastructures of Internet service providers, will allow ISPs to offer IPv6 subscriber services over older infrastructure that supports only IPv4.

11) Who are IANA and ARIN being mentioned in the press related to IPv6 transition?

The Internet Assigned Numbers Authority (IANA) is responsible for handing out IP addresses to the regional Internet registries (RIRs) around the world, who in turn hand out addresses to ISPs. The RIRs include

Acronym	Full Name	Region
AfriNIC	African Network Information Centre	Africa
ARIN	American Registry for Internet Numbers	United States, Canada, and several parts of the Caribbean
APNIC	Asia-Pacific Network Information Centre	Asia, Australia, New Zealand, and neighboring countries
LACNIC	Latin America and Caribbean Network Information Centre	Latin America and parts of the Caribbean
RIPE NCC	Réseaux IP Européens Network Coordination Center	Europe, Middle East, and Central Asia