Navigating Cable's IPv6 Transition

EXECUTIVE SUMMARY

The clock is rapidly ticking down for Internet Protocol version 4 (IPv4), the Internet's longtime communications protocol. With the number of broadband subscribers steadily expanding, the number of IP-enabled devices exploding and the number of IP-enabled services soaring, the Internet is quickly running out of available IPv4 addresses.

Excerpt 1: Dwindling IPv4 Addresses

Indeed, two of the world's five Regional Internet Registries – the ones covering Europe and the Asia/Pacific region – have already tapped into their last IPv4 address blocks and have no more new IPv4 addresses to distribute. The North American registry is expected to exhaust its supply of IPv4 addresses in the next year or so, followed by Latin America and Africa. So, even though IPv4 has not disappeared from the Internet yet (and will likely not disappear anytime soon), it is time for cable operators and other broadband service providers to say goodbye to IPv4 and say hello to the successor Internet addressing standard, IPv6.

Due to the looming shortage of IPv4 addresses, many cable operators and other broadband service providers around the globe have been working to upgrade from IPv4 to the much broader IPv6 protocol for years. Led in the U.S. by major MSOs Comcast, Time Warner Cable and Cox Communications, some cable providers are even starting to roll out IPv6 to significant numbers of their customers. But other service providers are lagging well behind the pace set by these IPv6 leaders, tempting the fates as the number of available IPv4 addresses starts dwindling down to a precious few.

The advantages of upgrading from IPv4 to IPv6 are abundantly clear. The newer, broader IPv6 protocol has far more IP addresses than the 30-year-old IPv4 protocol. IPv6 also eliminates the primary need for the network address translation (NAT) techniques that have been used for years to stretch the IPv4 address roster. Moreover, IPv6 greatly simplifies the address assignment process now used for IPv4, while simplifying the network renumbering process as well.

But the big problem with IPv6 is that it is technically incompatible with IPv4, which means that service providers can't use one protocol version to communicate with the other. Further, cable operators must support their tens of millions of existing broadband subscribers with legacy IPv4-only equipment. Finally, various ISPs, including cable operators, will undoubtedly upgrade to IPv6 at different times and different rates, potentially causing communication problems between the various broadband networks.

As a result, cable operators must take a careful migration approach that fosters the peaceful coexistence of these two conflicting protocols. Specifically, providers must weigh the use of such transition methods as Native Dual-Stack, NAT444, Dual-Stack Lite and IPv6 Rapid Deployment (6rd) to ease the IPv6 upgrade path, choosing the techniques or combination of technologies that will work best for them.

Navigating Cable's IPv6 Transition explores the technical and operational challenges for cable operators of upgrading to IPv6 while supporting IPv4 addresses for their existing cable broadband customers. The report examines the different technologies, techniques and tools that cable providers can use to support the coexistence of IPv4 and IPv6 and carry out the transition, drawing on insights from industry experts at CableLabs, Comcast, Time Warner Cable and Cox. It compares and contrasts the different transition methods and recommends ways to choose among the approaches. The report also spells out concrete, incremental steps that cable operators can take to start preparing for the IPv6 era immediately.

The report also explores the IPv6 transition efforts of CableLabs and the three biggest U.S. MSOs and profiles the leading equipment and software providers in the cable IPv6 space. Click here for the full list of included vendors.

The transition from IPv4 to IPv6 presents a number of challenges for cable operators, just as it does for other broadband service providers. In this section, we'll address the major upgrade obstacles for MSOs. The excerpt below provides a summary of the operational challenges of the IPv6 transition.
Excerpt 2: Some Major IPv6 Challenges for Cable

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<tr>
<th>CHALLENGE</th>
<th>EXPLANATION</th>
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<tr>
<td>Technical incompatibility</td>
<td>IPv6 is not backward compatible with IPv4, so IPv4-enabled devices can't run on IPv6 Web servers</td>
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<tr>
<td>CPE availability</td>
<td>Most older CE devices are only IPv4-enabled, so they can't be accessed by IPv6 servers</td>
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<tr>
<td>Content availability</td>
<td>Most websites do not have IPv6-enabled content, so IPv6 content still accounts for just a tiny sliver of overall Web traffic</td>
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<tr>
<td>IPv4 coexistence</td>
<td>Most cable subscribers still have IPv4-enabled equipment and use IPv4-only websites, so cable operators must support both communications protocols for an indefinite time</td>
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<tr>
<td>IP address prefix delegation</td>
<td>CMTS devices must learn how to distribute large blocks (prefixes) of IP addresses via DHCP, while the DHCP servers must learn how large a block to hand out</td>
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Source: Heavy Reading

Report Scope & Structure

Navigating the Cable IPv6 Transition is structured as follows:

Section I is an introduction to the report, with complete report key findings.

Section II spells out the benefits offered by the IPv6 protocol. It explains why cable operators should start making the transition to the new protocol immediately, if they haven't started already, and the potential perils if they do not.

Section III runs through the major challenges cable operators face as they try to take the leap to IPv6. It highlights many of the technical and operational changers that operators must carry out.

Section IV examines the five main IPv6 transition methods available to cable operators and other broadband service providers. It compares and contrasts the different transition approaches.

Section V recommends the transition approaches that cable providers should consider the most. It discusses when each method makes sense and suggests steps that other major market players, such as CE makers, should take.

Section VI focuses on how cable operators can get started on the IPv6 transition effort. It spells out concrete, incremental steps that providers can take.

Section VII looks at the cable industry’s early transition efforts. Specifically, it delves into what CableLabs and the three biggest U.S. MSOs – Comcast, Time Warner Cable and Cox Communications – are doing on the IPv6 transition front.

Section VIII offers profiles of the leading equipment and software providers in the cable IPv6 space. It runs through the products and solutions that each vendor is promoting.

Section IX provides a short conclusion wrapping up the report's main points. It highlights the moves that cable operators should make to prepare for the IPv6 era.

Navigating the Cable IPv6 Transition is published in PDF format.