Solutions Unclear as Our Internet Addresses Run Out

By Peter Kowalke
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The world is running out of Internet addresses and plans to create more are bogged down in disputes and complications. No end seems to be in sight for this long-running saga.

Predictions of an Internet address apocalypse – where billions of newly-manufactured connected devices are unable to go online for want of recognizable addresses – have failed to materialize so far. But serious questions have arisen about the future of Internet addresses and how organizations can help replace the current system.

Every device must have a so-called Internet Protocol (IP) address so it can communicate with other devices on the web. A protocol is a computer language, a way for devices to communicate with each other. The World Wide Web has been built using Internet Protocol Version 4, also known as IPv4.

But all possible addresses have been used up. RIPE, the European Internet registry, has warned several times that this would happen, most recently just last month. The body is recycling old addresses which are being handed back by organizations that aren't using them.

IPv6: trillions of addresses

The reason for the problem is that IPv4 uses a 32-bit scheme, which offers about 4.3 billion addresses. When it was created in 1983 by a team led by Vint Cerf, the father of the Internet, many technologists expected IPv4 to be enough for the number of devices on the web.

It soon became clear, however, that with much of the world's population having several devices, more addresses would be needed. A replacement system, IPv6, was developed and launched in 2012. IPv6 uses a 128-bit system, offering an incredible 340 trillion addresses.

But adoption is slow. Only 24% of internet traffic is accounted for by the IPv6 scheme while the rest uses IPv4.

The reluctance of organizations and manufacturers to switch to the new system is partly due to the complexities of making the shift. IPv6 requires a reworking of an organization's Internet architecture – a bit like learning to speak a new language.

This is because IPv6 is not backwards compatible with IPv4, so it requires an updated system. Implementing this architecture may mean shutting down the network for a day or two. The implications are significant -- stopping production at your factory or switching off your e-commerce service, for example.

Security concerns

Switching to a new IP language also raises cyber security fears. New security protocols must be introduced that are appropriate for IPv6. And the process of switching from one system to another

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worries IT departments, too, as any glitches could lead to mistakes and leave data exposed.

With staffing levels in IT departments and cyber security teams under pressure, concerns have also been voiced that many organizations lack personnel with sufficient knowledge and experience to make the switch.

Another problem lies with the Internet Service Providers themselves, who allow internet traffic to flow through their networks.

The cable TV and telecom companies that carry traffic on the Internet tend to make what the industry calls "peer" arrangements, with each company allowing competitors' traffic to flow through their networks at no cost. Thus, a large ISP will have roughly the same amount of data going through its system as it pushes data through a rival's system.

But it's more problematic with smaller internet providers using IPv6. In their case, the peer arrangements usually break down because a mismatch flares between the amount of traffic flowing between a large ISP and a smaller one.

What's really needed is concerted and centralized action from governments and international organizations alike to force the industry to switch to IPv6 and strongly incentivize everyone to use the new protocol.

The US government has been trying to shift to the new protocol in its departments and has encouraged other organizations to do so. In Asia, a strong shift to IPv6 has occurred, but there has been little pressure from European governments.

And the United Nations' internet body, the International Telecommunications Union, released plans last year to encourage a shift to IPv6, only to hear strong pushback from Internet engineers. One said the plan is "utterly, utterly broken" while others said it is "fundamentally flawed."

Without a coherent plan, peak IPv4 could be reached sooner rather than later. Governments and those responsible for managing the Internet must act now to drive the move to IPv6 and free up trillions of new Internet addresses. Otherwise, decision-makers must be prepared to face the inevitable consequences.

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