

IPv4 Issues

12.1.1

Need for IPv6

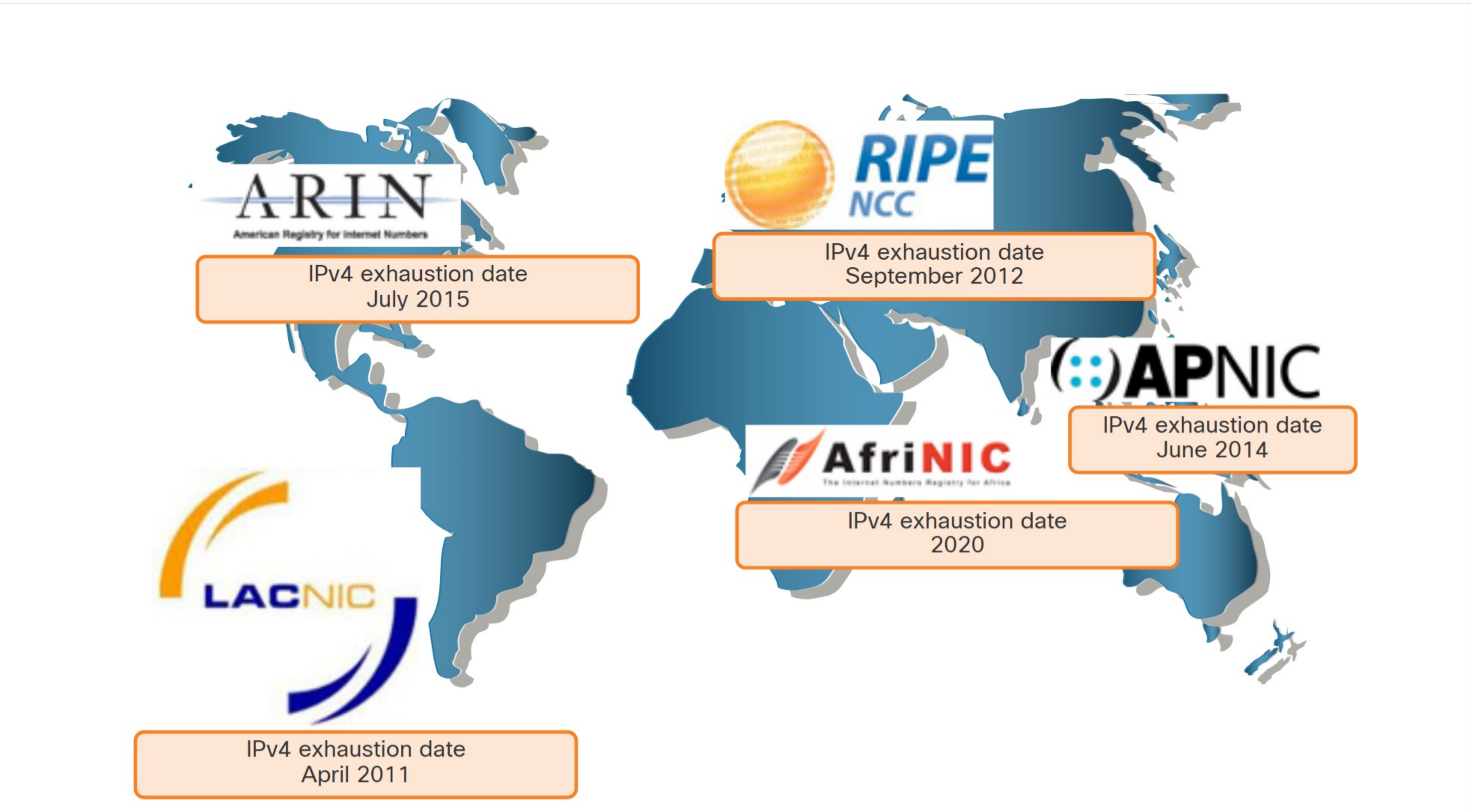
You already know that IPv4 is running out of addresses. That is why you need to learn about IPv6.

IPv6 is designed to be the successor to IPv4. IPv6 has a larger 128-bit address space, providing 340 undecillion (i.e., 340 followed by 36 zeroes) possible addresses. However, IPv6 is more than just larger addresses.

When the IETF began its development of a successor to IPv4, it used this opportunity to fix the limitations of IPv4 and include enhancements. One example is Internet Control Message Protocol version 6 (ICMPv6), which includes address resolution and address autoconfiguration not found in ICMP for IPv4 (ICMPv4).

The depletion of IPv4 address space has been the motivating factor for moving to IPv6. As Africa, Asia and other areas of the world become more connected to the internet, there are not enough IPv4 addresses to accommodate this growth. As shown in the figure, all five RIRs have run out of IPv4 addresses.

RIR IPv4 Exhaustion Dates



IPv4 has a theoretical maximum of 4.3 billion addresses. Private addresses in combination with Network Address Translation (NAT) have been instrumental in slowing the depletion of IPv4 address space. However, NAT is problematic for many applications, creates latency, and has limitations that severely impede peer-to-peer communications.

With the ever-increasing number of mobile devices, mobile providers have been leading the way with the transition to IPv6. The top two mobile providers in the United States report that over 90% of their traffic is over IPv6.

Most top ISPs and content providers such as YouTube, Facebook, and NetFlix, have also made the transition. Many companies like Microsoft, Facebook, and LinkedIn are transitioning to IPv6-only internally. In 2018, broadband ISP Comcast reported a deployment of over 65% and British Sky Broadcasting over 86%.

Internet of Things

The internet of today is significantly different than the internet of past decades. The internet of today is more than email, web pages, and file transfers between computers. The evolving internet is becoming an Internet of Things (IoT). No longer will the only devices accessing the internet be computers, tablets, and smartphones. The sensor-equipped, internet-ready devices of tomorrow will include everything from automobiles and biomedical devices, to household appliances and natural ecosystems.

With an increasing internet population, a limited IPv4 address space, issues with NAT and the IoT, the time has come to begin the transition to IPv6.

12.1.2

IPv4 and IPv6 Coexistence

There is no specific date to move to IPv6. Both IPv4 and IPv6 will coexist in the near future and the transition will take several years. The IETF has created various protocols and tools to help network administrators migrate their networks to IPv6. The migration techniques can be divided into three categories:

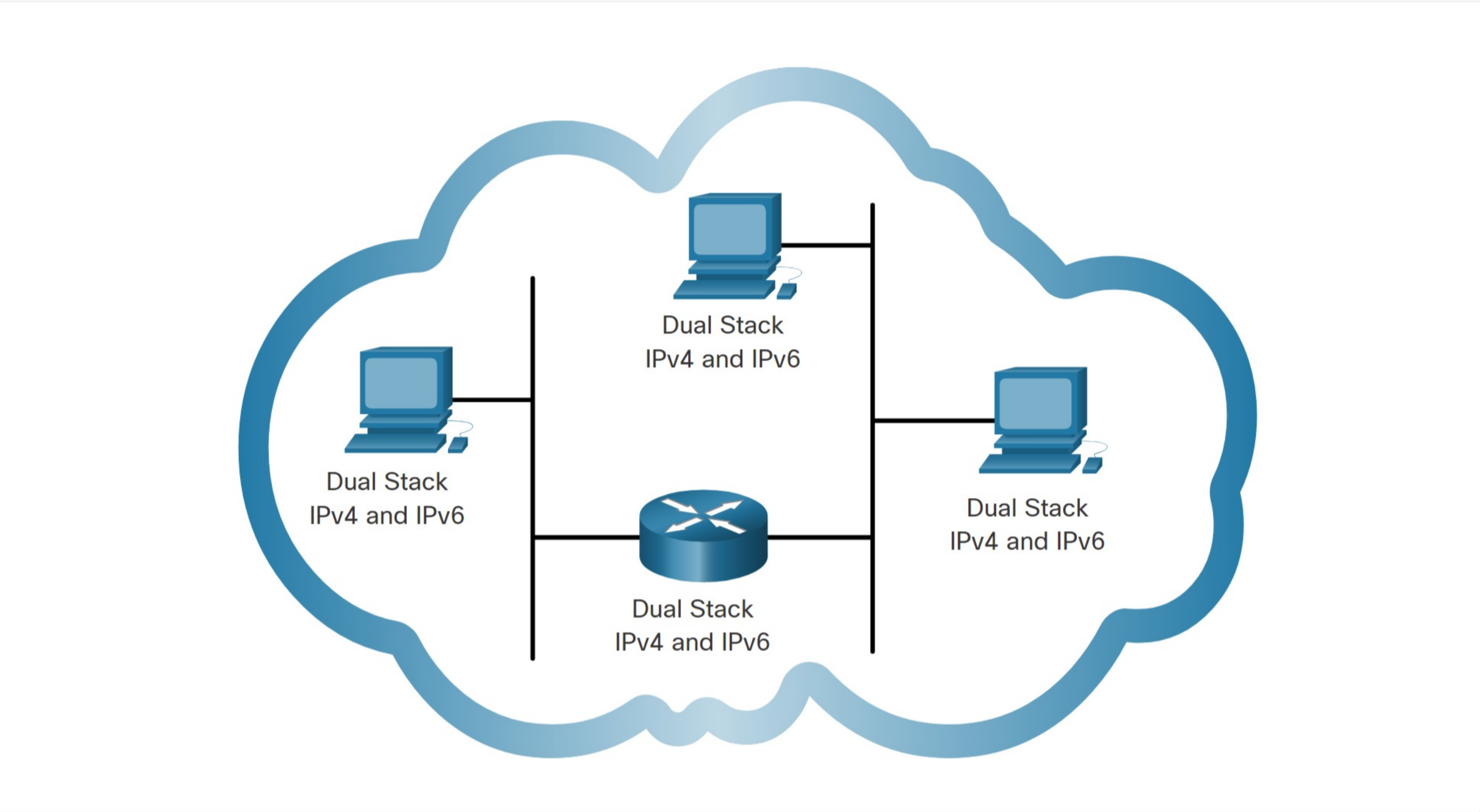
Click each button for more information.

Dual Stack

Tunneling

Translation

Dual stack allows IPv4 and IPv6 to coexist on the same network segment. Dual stack devices run both IPv4 and IPv6 protocol stacks simultaneously. Known as native IPv6, this means the customer network has an IPv6 connection to their ISP and is able to access content found on the internet over IPv6.



Note: Tunneling and translation are for transitioning to native IPv6 and should only be used where needed. The goal should be native IPv6 communications from source to destination.

12.1.3

Check Your Understanding - IPv4 Issues

Check your understanding of IPv4 issues by choosing the BEST answer to the following questions.

1. What is the most important motivating factor for moving to IPv6?

better performance with IPv6IPv6 addresses that are easier to work withbetter security with IPv6

depletion of IPv4 addresses

2. True or False: 4 out of 5 RIRs no longer have enough IPv4 addresses to allocate to customers on a regular basis.

True

False

3. Which of the following techniques use native IPv6 connectivity?

dual stack

tunneling

translation

all of the above

Check

Show Me

Reset

12.0 Introduction

IPv6 Address Representation 12.2