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IAFI CONTRIBUTION

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Title: The economic impact of transition from IPv4 to IPv6.

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Abstract:

IPv4 stands for Internet Protocol version 4. It is the fourth version of the Internet Protocol (IP), which is the set of rules that govern how computers communicate with each other on the internet. IPv4 addresses are 32-bit integers that are used to uniquely identify devices on the internet. IPv4 addresses are typically written in a dotted decimal format, such as 192.168.1.1. Each of the four numbers in the address can range from 0 to 255, for a total of 2^32, or about 4.3 billion, possible addresses.IPv4 addresses are divided into three classes: Class A, Class B, and Class C. Class A addresses are used for large networks, Class B addresses are used for medium-sized networks, and Class C addresses are used for small networks.

IPv4 is the most widely used version of IP, but it is running out of addresses. The transition to IPv6, the next version of IP, is underway. IPv6 addresses are 128 bits long, which provides a much larger address space. It is estimated that the IPv4 address space will be exhausted by 2038.

IPv6 stands for Internet Protocol version 6. It is the next generation of the Internet Protocol (IP), which is the set of rules that govern how computers communicate with each other on the internet. IPv6 addresses are 128 bits long, which provides a much larger address space than IPv4, the current version of IP. IPv6 addresses are typically written in a hexadecimal format, such as 2001:0db8:0000:0000:0000:0000:0000:0001. Each of the eight hexadecimal numbers in the address can range from 0 to 255, for a total of 2^128, or about 340 undecillion (10^36) possible addresses.

IAFI through this contribution, highlighted the challenges faced by industry in transition from IPv4 to IPv6 and its economic impact and proposed to have a regional Technical report.

Advantage of IPv4:

IPv4 has proved as most reliable and efficient protocol that has been used to power the internet for many years. Main reasons of its popularity are:

a. Most important reason of popularity of the IPv4 is that it is widely supported by most of the devices and networks.
b. Second important reason is it is relatively simple to implement.
c. In addition to above, IPv4 is relatively efficient in terms of bandwidth usage.

Limitations of IPv4:

Lot many new devices are getting connected to internet and due to technological development, use of IoT devices in new and innovative ways is exponentially increasing. After wide-spread development of 5G and Wi-Fi, connecting IoT devices to the internet became very easy than before. So, millions of IoT devices will be added to internet for wider range of applications in coming years. Considering above, there are following limitations.

a. It has a limited address space.
b. It is not as secure as IPv6.
c. It is not as efficient in terms of routing as IPv6.

Advantage of IPv6 over IPv4:

IPv6 offers following advantages over IPv4.

a. A much larger address space - IPv6 has a much larger address space than IPv4, means that there will be no shortage of IP addresses for the foreseeable future.
b. Improved security features- IPv6 includes number of new security features that can help to protect networks from cyber-attacks.
c. Enhanced performance - IPv6 can improve the speed and reliability of network communications.
d. Support for more efficient routing - IPv6 can support more efficient routing, which can help to reduce congestion on the internet.
e. Built-in support for Quality of Service (QoS) - IPv6 includes built-in support for QoS, which can help to ensure that critical traffic is prioritized over less important traffic.
f. Support for multicasting: IPv6 supports multicasting, which can be used to send messages to a group of devices. This is useful for IoT devices, as it can be used to send updates to a large number of devices at the same time.

Challenges in transition from IPv4 to IPv6:

The transition from IPv4 to IPv6 is still in its early stages. IPv6 has been available since 1995, but it has not yet been widely adopted. ITU website for IPv6 (https://www.itu.int/en/ITU-T/ipv6/Pages/default.aspx as accessed on 26-08-2023) highlights that "the deployment of IPv6 has happened at much slower rate than many had expected" Major reasons for this are:

a. Lack of support from devices and networks: Many devices and networks do not yet support IPv6. This is a major barrier to adoption, as it means that devices and networks that do not support IPv6 cannot communicate with devices and networks that do.
b. Backward compatibility - Complete transition from IPv4 to IPv6 might not be possible because IPv6 is not backward compatible (like 5G backward compatible with 4G). This results in a situation where either a site is on IPv6 or it is not. Unlike other new technologies, which are typically backward compatible, IPv6 requires additional changes to the IPv4 system in order to work with IPv6.
c. Technical challenges: There are some technical challenges associated with the transition to IPv6. As IPv6 addresses are much longer than IPv4 addresses, it makes difficult to manage and configure IPv6 networks.
d. Lack of awareness: Many people are not aware of IPv6 or the benefits of transitioning to IPv6. This lack of awareness can also be a barrier to adoption, as people may not see the need to switch to IPv6 if they are not aware of the benefits.

Despite these challenges, there is some progress being made in the transition to IPv6. Many large organizations, such as Google and Amazon, have already begun to deploy IPv6. Additionally, the number of devices that support IPv6 is increasing, and the technical challenges associated with IPv6 are being addressed.

Economic impact of transition from IPv4 to IPv6:

Economic benefits regarding transition from IPV4 to IPV6:

a. Increased productivity, as businesses are able to connect more devices to the internet and take advantage of new applications and services.
b. Reduced costs, as businesses are able to save money on network infrastructure and security.
c. Increased innovation, as new businesses and applications are able to be developed on the IPv6 platform.

Potential economic challenges regarding transition from IPV4 to IPV6

a. The cost of upgrading networks and devices to support IPv6, so more investment is required in network infrastructure.
b. The disruption caused by the transition, as some devices and applications may not be compatible with IPv6.
c. The need for new software and applications that are designed for IPv6, so increased in the costs for businesses that need to develop new software and applications.

ITU mandate

With regard to international public policy issues pertaining to the Internet and the management of critical Internet resources ITU is mandated by the following Resolutions:

1. Plenipotentiaryry Resolutions 101, 102, 130, 133, 140, 174, 180, and 206
2. ITU Council Resolutions 1282 (Rev. 2008), 1305 (2009), 1336 (Modified 2015), 1344 (Modified 2015)
3. World Telecommunication Standardization Assembly (WTSA) Resolutions 47, 48, 50, 64, 69
4. World Telecommunication Development Conference (WTDC) Resolutions 20, 23, 30, 43, 63, 85.

Further, as per WTSA Resolution 64, ITU Members are encouraged to submit contributions on Resolution 64 implementation to ITU-T Study Group 2 and/or Study Group 3 . (Ref. https://www.itu.int/en/ITU-T/ipv6/Pages/default.aspx)

Conclusion:

Overall, the economic impact of the transition from IPv4 to IPv6 is likely to be mixed. There are both potential benefits and challenges, and the overall impact will depend on a number of factors, such as the pace of the transition and the level of investment in IPv6.In the short term, the transition to IPv6 is likely to have a relatively small economic impact. However, in the long term, the benefits of IPv6 could outweigh the costs, leading to a number of economic benefits for businesses and consumers.

The transition to IPv6 is already underway. Many large organizations have already begun to migrate to IPv6, and the trend is expected to continue.

But the transition to IPv6 is not without its challenges. Some devices and networks do not yet support IPv6, and there are some compatibility issues that need to be addressed. However, the long-term benefits of IPv6 are clear, and it is likely that IPv6 will eventually replace IPv4 as the standard for IP addressing on the internet. However, despite WTSA mandate the progress is slow and we do not have any independent document in public domain which documents the challenges, use cases and related economic and cost advantages in the long run for the Asia Oceania Region. Barring China there is no case study from the Asia Oceania Region(https://www.itu.int/en/ITU-T/ipv6/Pages/cstudies.aspx)

Accordingly, IAFI proposes a new work item for a technical report documenting the challenges, use cases and related economic and cost advantages for the Asia Oceania Region. Requisite A.13 justification for commencing a new non normative work item is enclosed.

IAFI urges Members in the region to support creation of this new work item and actively contribute to it.

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