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"e-Nations, The Internet for all"

Introduction:

The IPv6 robust address space available permits nodes, homes, and devices, as typical Internet use models, to have greater than one address, and of different scopes, for different reasons. Using this advantage of IPv6, the author(s) provide a view of address allocation, where we compare the ratio of address space per country and population depicting 1 to 5 addresses per consumer.

Certainly few of the original IP protocol designers envisaged the "*e-turmoil"* of the end of the 20th century and the quick adoption of the Internet Protocol (IP) as THE application convergence layer in many industry segments outside from its historic IT environment.

Today, despite the recent economy turndown, worldwide Internet economy is a reality. As an example, data from Forrester Research shows projection for the European Union from the 2001 figure of €77 billion to €2.2 trillion in 2006. Growing adoption of the Internet by consumers – also referred as Internet users – drives several markets such as home devices, mobile wireless equipment, transportation,

media and others to introduce a new generation of products that embed the IP protocol.

Although a business model and its acceptance by the society may still need to be defined for many of these products, it is anticipated that with global connectivity, which is different from global access to the network, a network may want to keep some privacy. This is a foundation for Business to Business (B-to-B), Business to Consumer (B-to-C) and Consumer to Consumer (C-to-C) services and its inherent evolution to push the services towards the edge of the network, where a particular device needs to be reached, served or monitored. It must be also noticed that recent deployment of new broadband access technologies such as Ethernet-to-The-Home, WiFi, and SDSL, enable symmetric communications from end users sites.

"*In 2005, all Sony products will be IPv6-enabled*"

Mario Tokoro

Corporate Executive Vice President,

Co-CTO and President of Network & Software Technology Centre at Sony Corporation

Reference: February 12th, 2003 http://www.ipv6style.jp/en/interviews/20030212/index.shtml

Before any large scale's adoption and deployment can begin and be successful, an evaluation of the Internet capacity to support the model is clearly mandatory. But, it must be acknowledged that any major change will take years to achieve. So considering 5-10 years as potential schedule to an update, it is not too soon to begin in CY2004.

Endless debates have already been published regarding the number of global IPv4 addresses that are either dependent of the proponents' view of allocated/unallocated, used/unused, with/without H-Ratio address space, but so far most if not all of these addresses were consumed by the IT industry. Strict allocation control of the IPv4 address space is the current accepted behaviour, but this does not look at an innovative model to enable every country without distinction of its population or economy to become a member of the e-Nation.

Today, only an Internet "client-to-server" architecture, where the primary assumption is that an end-user only gets connected when accessing the network, allows Internet Services Providers to provision access with a ratio superior to 1:1 [generally from 1:2 to 1:15], which can be deployed on a large scale. This is clearly not the model that the electronic consumers, mobile wireless phones and automobile industries who are considering IPv6 for their devices and applications. To serve all these equipments, "server-to-client" and "peer-to-peer" models for use must be affordable to anyone.

A different look at the today's IPv4 address space assignment, different from the unique technical and IT-minded, may consider other criteria such as per country delegation versus population, requirements to reach mass-market and future growth of the population. The goal of this paper is to collect accurate numbers about the

current status of the 221 /8 IPv4 networks and provide a different vision about the allocation.

Looking at the Numbers

- According to the United Nation 2002 revision report, the earth population is estimated to 6,3 billion. Even without considering the H-ratio, the IPv4 address space 32 bit address space is inadequate to support 1/3 of the population. Dependent on the country you live in, one could not name the Internet an open model?

- U.N. report expects the population to increase by 2.6 billion during the next 47 years, from 6.3 billion in 2002 to 8.9 billion in 2050. The Internet architecture has to cope with the evolution of the population. But once again, with the H-ratio the IPv4 address space can't address 50% of the population. Is that an issue? Once again, it depends of the country you live in.

- Earth population is growing by 79 million human per year. Internet user's growth ratio must consider the evolution of the population as well.

- A technology is considered as reaching a *mass-market* size when its penetration rate reaches at least 20%. From the study, only 36 countries have reached this stage out of 208, 4 others being near this threshold. Given this assumption, it means that IPv4 has not reached mass market deployment. Since, only 17.3% of the countries have substantially adopted IPv4, and those countries represent less than 15% of the total global population.

- In 2003, 71 countries out of 208 have an IPv4 global address space assignment ratio of 1 or more addresses, and not using the H-ratio per Internet User. Although IPv4 global address space is available from the Registry, it looks like already 139 countries have to deploy Network Address Translation (NAT) to satisfy the needs of their population. This statistic does not imply the countries with enough addresses are not deploying NAT.

- IP as an application convergence layer has a clear impact on the way addresses are required. Several statements were made regarding the need of at least 5 or more IP address per user to match the projected equipment needs for IPv6 e.g. Mobile phone, TV, digital camera, car, and associated services for deployment. If only 5 addresses per home are considered, in CY2003, only 5 countries have enough IPv4 global address assignment to enable such use of the Internet Protocol. This projection does not even consider the H-ratio, which will increase the ratio value to build operational Internet infrastructures by an order of magnitude. In any case, just looking at a ratio of 1/1 or 5/1 is far from the real numbers.

- To illustrate the previous section, let's conside the Public Mobile wireless industry as example. Today, GSM and other digital technologies have reached more than 1.2 billion subscribers over the world. Next generation 3G Telephony and Multimedia networks of wireless devices embed an IP stack to enable Internet applications and services to become mobile. If we only consider 50% of the current subscriber's population, it requires an additional 37 /8 network to offer an always-on capability. As the next generations of devices will tend to support several data link technologies,

e.g. WLAN + Cellular, taking benefit of Mobile IPv6 to allow roaming between them, 2 IPv6 addresses as Home Address + Care of Address per devices must be provisioned, increasing the /8 requirements to 74. This is without considering the additional subscribers forecast, the infrastructure to be deployed. or a potential 100% subscribers adoption.

Conclusion

The success of the Internet Protocol (IP) is built on an open and global model. Internet economy is a reality that smoothly reaches all nations around the world and none want to be isolated, even the less developed nations as they clearly see a chance to improve their economy and education. IPv6 is a stable protocol that can sustain the growth of the Internet to enable a global ***e-Nation***. The Internet Protocol version 4 or version 6 have no political or ***balkanisation*** rules in its definition. IP technologies have to evolve to accommodate new challenges posed by these numbers; this will take several years to be achieved, but the author(s) see IPv6 as the best proposal to serve the future generations of children that will grow up using the Internet.

About the The **North American IPv6 Task Force**

The **North American IPv6 Task Force** *(NAv6TF)* is a sub-chapter of the **IPv6 Forum** dedicated to the advancement and propagation of **IPv6** *(Internet Protocol, version 6)* in the North American continent. Comprised of individual, rather than corporate, membership the NAv6TF mission is to provide technical leadership and innovative thought for the successful integration of IPv6 into all facets of networking and telecommunications infrastructure, present and future. Through its continued facilitation of technical and business case whitepapers, IPv6-centric conferences, IPv6 test and interoperability events, and collaboration with IPv6 task forces from around the globe, the NAv6TF will strive to be the guiding force for IPv6 adoption in the U.S. and Canada. http://www.nav6tf.org/index.html