PCC.I/RES. 100 (IX-06) [1]

INTERNET PROTOCOL VERSION 6 (IPV6) SPECIFICATION

The IX Meeting of the Permanent Consultative Committee I: Telecommunications,

CONSIDERING:

a) That there is a consensus that new forms of communication are fundamentally transforming the way in which people, communities, businesses and governments interact with each other;

b) That IPv6 could help to eradicate a potential digital gap between the info-rich and info-poor countries, as occurred with IPv4, with the consequences of generating development and new business opportunities for the local community;

c) That Resolution PCC.I/RES. 83 (VII-05) instructs the Working Group on Standards Coordination to work on the preparation of a Standards Coordination Document on IPv6 standards,

RECOGNIZING:

a) That IPv6 provides the basis for continued technical innovation in communications technologies;

b) That IPv6 has been developed in the Internet Engineering Task Force (IETF) to replace mainly to solve the problem of lack of address space for the increasing demand of IP services;

c) That most future wired and wireless telecommunication and multimedia services will be transported over IP, and that IPv6 has mandatory security and mobility, built-in QoS, and more scaleable routing and robustness than IPv4,

RESOLVES:

To endorse IETF RFC 2460 "Internet Protocol version 6 (IPv6) Specification with no deletions, additions or modifications; and

RECOMMENDS:

That the Rapporteur Group on Standards Coordination continues to monitor the IETF IPv6 developments and determines its applicability for the Americas as this work evolves.

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1 Document CCP.I-TEL/doc. 943/06

ANNEX TO RESOLUTION PCC.I/RES. 100 (IX-06)

STANDARDS COORDINATION DOCUMENT
INTERNET PROTOCOL VERSION 6 (IPV6) SPECIFICATION

1. EXECUTIVE SUMMARY

The Working Group on Standards Coordination (WGSC) has addressed IP based technologies as part of its studies of standards for Next Generation Networks (NGN), Services, Signaling, and Operations as they relate to the service access needs of the Americas. Part of this activity has included monitoring the work of the IETF.

The Internet Protocol version 6 (IPv6), described in RFC 2460, was created as a replacement of the current IP version 4 (IPv4), described in RFC 791, mainly due to the limited number of addresses that IPv4 can offer. Besides a 128-bit wide address range, the TCP-UDP/IPv6 protocol suite provides additional features such as mandatory security and mobility, ease of administration and auto-configuration features, built-in QoS, and more scaleable routing and robustness.

At the Eighth Meeting of PCC.I (Santo Domingo; May 2006), the PCC.I Assembly instructed the Working Group on Standards Coordination to develop a Standards Coordination Document (SCD) on IPv6. Therefore, this SCD presents now IETF RFC 2460 to PCC.I for its endorsement for the region of the Americas.

2. BACKGROUND

Internet Protocol version 6 (IPv6), started standardization as a replacement of the current IP version 4 (IPv4), described in RFC 791 (Standard), due to the depletion of the limited number of IPv4 addresses foreseen already in the 1990's. Up until present time, various techniques such as Classless Inter-Domain Routing (CIDR), Network Address Translation (NAT), and Multi Protocol Label switching (MPLS) have managed to delay this depletion. The IETF Internet Next Generation (IPNG) working group developed IPv6, RFC 2460 (Draft Standard).

The current Internet Protocol IPv4, supports up to 4 billion addresses with 32-bit address space. While 4 billion is a lot bigger than the currently estimated 2.5 billion addresses in use by several hundred million Internet users, in practice IPv4 supports a much lower number. That is because addresses are not used efficiently. They are allocated in regional blocks, and there is an over supply in some areas of the world and other areas (e.g., Asia, Europe and Latin America) are close to running out of addresses. At the current rate of 60% efficiency, IP addresses will run out some time in the future.IPv6 128-bit address format allows for 340,232,366,920,938,463,374,607,431,768,211,456 IP addresses (340 duodecillion), enough to award one to every grain of sand on earth. Figure 1 depicts the IPv6 header format.

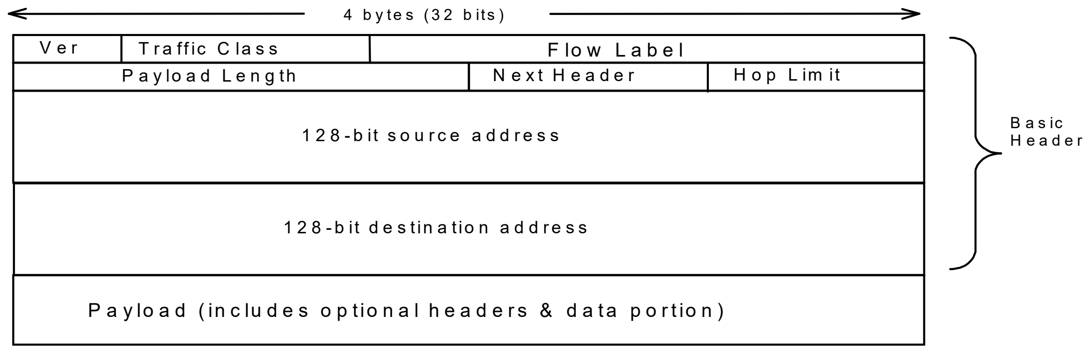

Figure 1 – IPv6 Header Format

Besides a 128-bit wide address range, the TCP-UDP/IPv6 protocol suite provides additional features such as mandatory security and mobility, ease of administration and auto-configuration features, built-in QoS, and more scaleable routing and robustness to mention a few. Many of these have been retrofitted in IPv4 with various limitations and decreased functionality.

Wireless will have the greatest impact on IP. The forthcoming 3G will make much greater use of IP than the previous generations of cellular radio. Until now, IP has been used as an add-on to cellular networks, in a not too distant future, cellular networks will be data oriented, as voice will be treated as another IP session within the network. The development of new radio protocols such as 802.11B (Wireless Ethernet) plus new wired serial interfaces such as IEEE 1394 (Firewire) will provide the opportunity for consumer products to require an IP address to connect to the net.

IPv6 Addressing

The IPv6 addressing architecture is described in RFC 2373. The advantage of the IPv6 addressing architecture over the IPv4 one is mainly the length of the address. While IPv4 32-bit addresses can be divided into two or three variable parts (the network identifier, the node identifier and sometimes the subnet identifier); the IPv6 128-bit addresses can support different fields within the address.

IPv6 Address Representation

There are three conventional forms for representing IPv6 addresses as text strings. The preferred form is x:x:x:x:x:x:x:x, where the 'x's are the hexadecimal values of the eight 16-bit pieces of the address, however certain styles of IPv6 addresses may contain long strings of zero bits that can be represented by "::". The third alternative is a mixed environment of IPv4 and IPv6 such as x: x:x:x:x:x:d.d.d.d, where the 'x's are the hexadecimal values of the six high-order 16-bit pieces of the address, and the 'd's are the decimal values of the four low-order 8-bit pieces of the address (standard IPv4 representation).

IPv6 Address Types

There are three types of addresses in IPv6 (unicast, anycast and multicast) and all of them are assigned to interfaces, not to nodes:

Unicast addresses specify a single IPv6 interface. A node can have more than one IPv6 network interface. Unicast addresses can be viewed as 128-bit field that identifies one particular interface. However, the data in the address field can be parsed out into smaller pieces of information, although all that information when put together will result in a 128-bit field that identifies a node's interface.

Anycast addresses are IPv6 addresses that are assigned to one or more network interfaces (typically belonging to different nodes), with the property that a packet sent to an anycast address is routed to the "nearest" interface having that address, according to the routing protocols' measure of distance. Multiple nodes may be sharing the same anycast address, like a multicast address. However only one of those nodes can expect to receive a datagram sent to the anycast address.

Multicast addresses, like broadcast addresses, are used in local networks like Ethernet, where all nodes can sense all transmissions on wire. However, IP multicast is more complicated because all packets are not forwarded to all nodes in the network; instead, the packets are only forwarded to members of the multicast group. When a node subscribes to a multicast address, it announces that it wants to become a member and any local router will subscribe on behalf of that node.

3. CONCLUSIONS

The Working Group on Technology recommends that CITEL PCC.I endorses IETF RFC 2460 "Internet Protocol version 6 (IPv6) Specification with no deletions, additions or modifications.

4. FUTURE WORK

The Rapporteur Group on Standards Coordination will continue to monitor the progress of the Internet Protocol and its capabilities, particularly of IPv6, since this protocol will benefit CITEL Members State as to stay competitive in the delivery of telecom and multimedia services in this very fast-evolving technical world.

5. RESOURCE DOCUMENTS

[1] IETF RFC 2460, Internet Protocol Version 6 (IPv6) specification, December 1998.

[2] Technical Notebook on "Next Generation Networks – Standards Overview CCP.I-TEL/doc.0776, May 2006.

[3] CCP.I/doc.1262/01, "The Protocol labelled IPv6"

[4] CCP.I/doc.1382/01, "IPv6 Addressing"