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Visualizing Change; Re-Defining the Role of the IPv6 Protocol Specification

Status of this Memo

Conventions

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Abstract

This paper attempts an exploration of the reasons that supports or offers a viable justification for an IP Addressing Protocol which must be Manually Configured using HEX Notation. I mean, why use HEX Numbers, and why not use an Integer?

"Progress and Growth is often met with a resistance comparable to a revolution, or civil war. In fact, it is my belief that the resistance to Change is brought about by an inherent fear of the Loss of the Social and Behavioral Structures, which are inherently linked with the Survival of the Tribe or Community being effected by Change. Notwithstanding their voice of concern, these Primitive notions can not sustain any viable bases, or argument in opposition. However, because Primitive is the current, and only mindset, Change has not resulted in Progress, nor become beneficial for all mankind. In other words, if Change results in a Progressive Growth, which is not superfluous or ersatz, and can benefit the survival for all humanity, then all of humanity should benefit. (E.T.)"

Introduction: Impact of the IPv6 Protocol Specification

There is an extensive learning curve when it comes to the adjustment that is necessary for using HEX Notation. No. I am not referring just to the IT professionals, but to the consumer as well. In other words, the logical justification for using a natural name for a naming convention, which represents the Decimal Notation specifying a 32 Bit IP Address, instead of numbers, was based upon the rationalization that familiar was better, and it was easier to remember. Hence, easier to deal with! Now there is a new challenge, because the consumer as well as the IT Professional will need a Calculator and Conversion Table, just to work with HEX Numbers. And this says nothing of the where's and How's, which are the key issues when there is a problem, specifically a problem involving communication, or where maintaining the Network Connection is a high priority.

Sure, without any doubts, hindsight reveals, know one anticipated the growth that the Computer Industry and the use of the Internet, has made over the past few decades. However, the question is whether or not this growth was instantaneous, or gradual.? Because only then could one begin some analysis using a Time Scaling, to determine whether or not the appropriate methods and decisions were made to either prevent or circumvent the onslaught of this 'Flooding of Use Problem'. And while this might appear as unwarranted criticism, one need only a moment to reflect upon the financial budget and the size of my research staff vs. that of any of the Governments or Corporations who now command the Industry and the Standards by which we are forced to adhere. In other words, why can't everyone participate in the Change, which imposes a profound effect upon our daily lives. Or why must any individual be forced to suffer, because they are in disagreement with the status quo. Needless to say, this is not about pretending to be or become some person noted in history, nor exclaiming some foolish right to be better than someone, because whether you are right or wrong it will eventually show in the work and accomplishments that command the attention of the public.

Nevertheless, I believe there is a better approach to this dilemma, in which we do not have to suffer from the loss of simplicity. And this solution does necessarily not mean the elimination of the IPv6 Protocol either.

Chapter I: Examining the Task and the Comparison of The Binary, The Integer, and The HEX Numbers

There is at least one assumption, which seems unquestionably clear; Any New application for an IP Address from Internic would result in the assignment of an IP Address defined by the IPv6 Protocol Specification. So one can conclude, that the Network Engineer must either convert an existing IP Address into the HEX specification defined by the IPv6 Protocol, or the Network Addressing Scheme using the Hex notation be configured without the need for conversion. In either case, the task, depending upon the size of the Network, can range from difficult to daunting, because the HEX notation is not familiar, and will, from time to time, require translation. In other words, if you can not imagine the difficulty, then observe the Translation given in Table 1A.

TABLE 1A

DECIMAL	BINARY	Hexadecimal
0	0000	0X00
1	0001	0X01
2	0010	0X02
3	0011	0X03
4	0100	0X04
5	0101	0X05
6	0110	0X06
7	0111	0X07
8	1000	0X08
9	1001	0X09
10	1010	0X0A
11	1011	0X0B
12	1100	0X0C
13	1101	0X0D
14	1110	0X0E
15	1111	0X0F

The examination of TABLE 1A, coupled with an understanding of Assembler Programming, Machine Language, and Electronics, would lead to an inquiry of the rational justification for use of HEX Notation. Especially since, the Decimal and HEX notations are just different representations for the same numerical value. Furthermore, since the only way to transmit information electronically is using Binary notation, the use of HEX seems more of a deception to disguise the lack of thought and preparation in the design of an adequate IP Addressing Scheme. Nevertheless, whatever the case may or may not be, the popular trend in the Computer Industry today is clearly to lessen the complexities and burden encompassing its use. So, why should we use HEX Notation, especially since this becomes an additional burden, which add complexities to the use of a Networked Computer.

Chapter II: Viewing the Structure of the Formats for the IP Headers, and Questioning What's Really On

First and foremost, it should be pointed out that the whole concept of the IPv6 Protocol and its HEX representation is confusing, to say the very least. And further acknowledged, that there is deep concern regarding the mathematics and the logical continuity of this Specification, because there is absolutely No Mathematical Methods which can be used to logically derive this HEX specification and the 'Decimal Representation', which is actually presented. In other words, while this Protocol Specification is defined in terms of HEX Notation, everything else, which represents its Graphical Depiction, is defining a 'Decimal Translation' similar to the IPv4 Specification, which has been proven mathematically, to be incorrect. The reasoning, one would suppose, is because its graphical representation depicts the Binary Notation used to transport this data Electronically. But still, this does explain the mathematical problems, which are an inherent part of this protocol.

Nevertheless, the questions are; Which is it? Is it HEX Notation, or Is it Decimal Notation? Or – Since there is absolutely difference between the different expressions, and what they represent. Does it really matter, which one is used; Decimal or HEX? Needless to say, even if it is, or eventually becomes HEX Notation, there would definitely be a variation in the Size of the Header, which would depend upon the value of the HEX string that represents the actual IP Address. That is, not unless there exist a Pre-Defined size for the Header, regardless of the value IP Address the HEX String Represents. Still, even if this were the case, I have found discrepancies here as well.

Nevertheless, I quite sure, that if a vote were taken regarding the preferred method for IP Address representation, as given by Figures '1' and '2', everyone would prefer the Decimal Representation, which is given by figure '2'.

Fig. 1

FE01:000005F1:003B19:0001E40:04FE1:0001104:0000000000000001:00000441

Fig. 2

65025:1521:1529:7744:20449:4356:1:1089

In other words, while there is a draft for eliminating the padding of the IP Address with Zero's, which is written in HEX notation, there is not a current RFC defining this specification. Which, by the way, is not a problem when using the Decimal representation. However, asides from the inherent Mathematical and Logical problems with the IPv6 Protocol, one can't help but wonder, if the excess of the IP Addresses provided by the 128 BIT IP Addressing format will actually solve the addressing problem without abuse, thus reproducing the problem it was intended to solve. Needless to say, any visual inspection of the IP Header, when compared to that of IPv4, noting Figures '3' and '4', would cause one to question the overkill, or the current need for so many additional IP Addresses. Especially since, direct Appliance access through the Internet, without an intervening application is an unlikely security compromise, which means product identification and addressing should be no different than the specification required for the Network Cards in current use today.

Figure 3

IP Header for IPv4

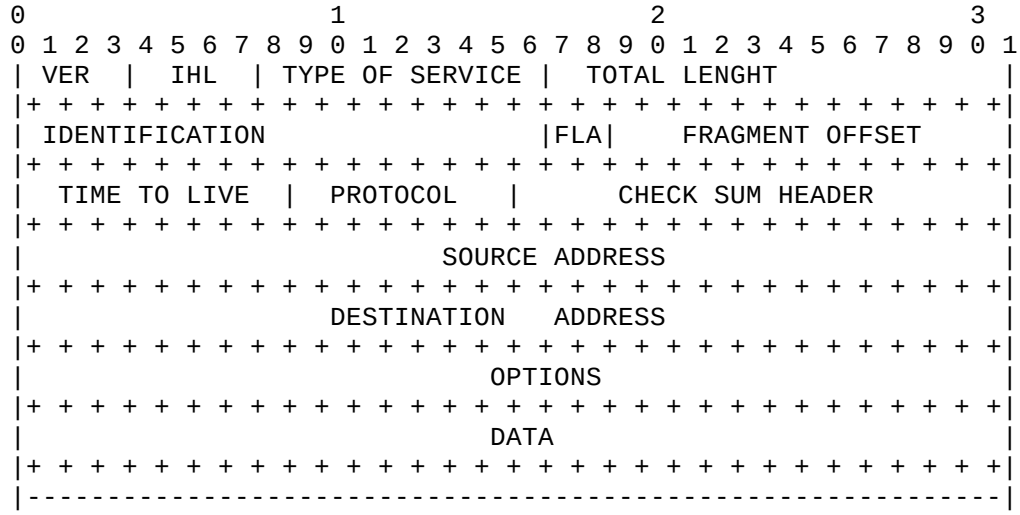
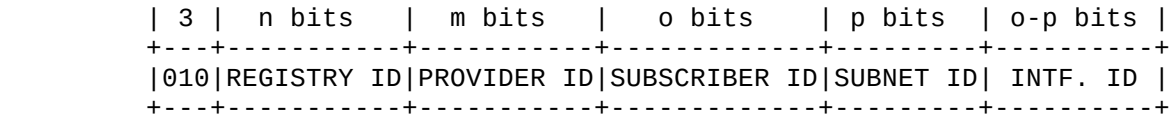
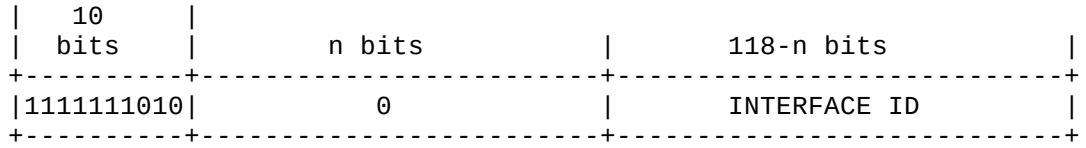


Figure 4
SCHEMATIC DESIGN OF THE IPv6 IP ADDRESS

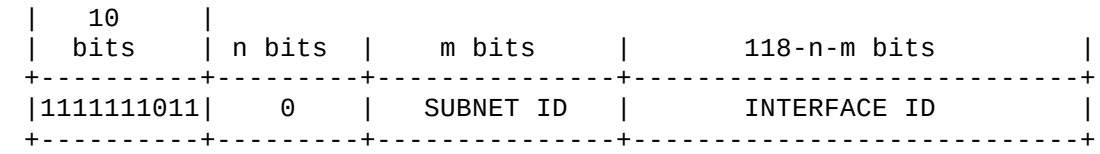
1. Provider Based Unicast Addresses



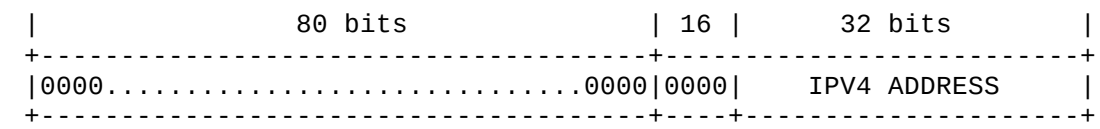
2. Local-Use Addresses
Link-Local-Use



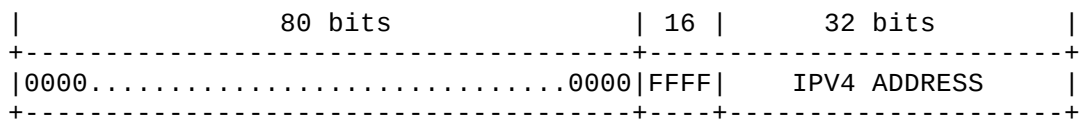
Site-Local-Use



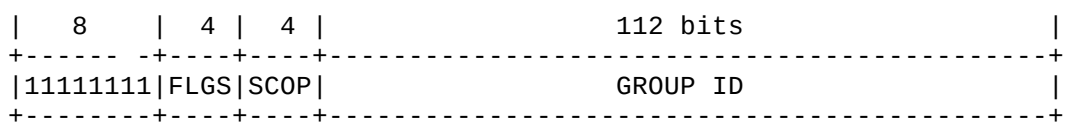
3. IPv6 Addresses with Embedded IPV4 Addresses
"IPv4-compatible IPv6 address"



"IPv4-mapped IPv6 address"



4. Multicast Addresses



Notwithstanding the burden of excess, note the difference between the Headers, which define the IPv4 and IPv6 protocols: And they call the IPv6 Protocol Specification Classless. Well, I do not know exactly which course in Logic the author of the IPv6 specification studied. But, the examination figure 4, clearly reveals the Class System designed for the IPv6 protocol, and the associated cost for an additional Network Card, if Multiple IP Addresses can not be assigned to ‘1’ Network Controller Card.

Needless to say, I can not be sure of the Whys, or what is really going on, because I fail to see any logical or mathematical justification regarding the use of HEX notation in an IP Addressing format. Especially since, it does not matter if either the Decimal of the HEX format is use, because they are both translated in Binary for Electrical or Digital Transmission.

Chapter III: Defining Exactly What is Really Needed

Aside from the need for continued study in Mathematics and Logic, the authors of the IPv6 protocol, Blundered Big Time. And this becomes even more apparent when it is Discovered that the Entire IP Address Range of the IPv6 IP Specification, Using the current Schematic Design for the IP Address, MATHEMATICALLY, CAN NOT UTILIZE ALL OF THE IP ADDRESSES ALLOCATED, OR SPECIFIED BY THE IPv6 PROTOCOL. In other words, the 3.4 x 10^38 IP Addresses that was determined to be the Calculated Total Number of Available IP Addresses in the IPv6 Protocol, is a Calculation that is Wrong, or Factually UNTRUE. And this is Evidenced, because there is a LIMITED NUMBER of IP Addresses, or Numerical Values, which use either HEX, Decimal, or Integer Notation, that CAN Be Represented in the Format Used by the Schematic which Represents an IPv6 IP Address. What this actually means, is that, the Starting Segments for the Schematic representing an IPv6 IP Address, has a Numerical Limit imposed for the SIZE of the Number which Can be Used in that Particular Section of the IP Address itself. In fact, everywhere, within the Schematic Representing a IPv6 IP Address, in which there Occurs a Numerical Size Specification, Limits the Choice for the Numbers that Can Be Represented. Which in turn Reduces the Size, Significantly, of the Total Number of Available IP Addresses which Can be used, or Derived, from the Total Number of Available IP Addresses, as Reported to Exist in the IPv6 Specification.

Notwithstanding the current trend in the Computer Market, which is directed toward Simplicity. The use of the IPv6 Specification is similar to using an Ox drawn plow in a time in which the computer is supposed to operate the entire farm, and work, would once again become the job for only the Scientist. Nevertheless, since most of the Venders have made changes necessary for the implementation of the IPv6 Specification, all is not lost, even though the Size of the Number of Available IP Addresses in the IPv6 Specification falls Extremely Short of the Reported Availability as would be derived from 3.4 x 10^38. In other words, since Redundancy seems the theme, we could write or adopt a Software Specification, controlled by the Operating System, which could provide not only the Decimal to HEX Translation, which would allow the use of familiar Numbers, but provide the Controls, as would be Necessary, to make Use of the Actual Number of Available IP, which is Actually Available in the IPv6 Specification. In essence, you would be giving the IT Professional, as well as the average consumer, the ease of use Industry has promised all of us.

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