

# A VLSM Address Management Method for Variable IP Subnetting

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**Abstract.** IPv6 have been examining at the next IP address standard. But IPv4 have to be used for a while by the following reasons: tremendous cost and efforts for converting to IPv6. One of the serious problems of the IPv4 addressing structure is the fact that is a shortage of IP addresses. The address shortage is derived by lots of unused addresses during IP distribution and IP subnetting design. We propose an effective subnet IP address calculation method on VLSM. Also, with the proposed subnet IP address management method, a web based subnet address management system is introduced. The web-based subnet IP management system offers convenience in VLSM-based subnetting. The proposed VLSM calculation method can give a simple and effective IP management.

## 1 Introduction

The Internet is growing at an incredible rate. Every system that is connected to the Internet requires an IP address, which can uniquely be identified as individual system. The IP address on a computer must be unique on a world-wide basis and duplicates are not allowed. By the shortage of IPv4 addresses, IPv6 have been derived and is examining at the next IP address standard [1]. But, to convert IPv4 address to IPv6 for all world wide Internet nodes need tremendous cost and efforts [2, 3]. That is why IPv4 is currently used at the standard IP address of Internet and will be used for a while.

The IPv4 address system showed only a few problems during the early years of the Internet, but its weaknesses began to emerge as the Internet grew at a very fast rate. One of prominent problems of the current IP address system is the fact that many addresses are wasted during allocation of IP addresses. Some research results in this field are Virtual IP, CIDR, VLSM, etc.[12, 13, 14, 15], and a long term solution to overcome problems is the next-generation Internet address system, IPv6, which was proposed by the IETF [4].

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In 1985, the Subnet concept had been announced from the ‘RFC 950, Internet Standard Subnetting Procedure’ in order to solve the problems of IP address shortage [5]. The advantage of subnetting is that network traffic load can be reduced and structuring the internal network into multi-level hierarchy can increase security. The Subnet is realized through the Subnet Mask. In general, a network is divided into equal-sized subnets using a single subnet mask. When a single subnet mask is used, the number of hosts that can be attached for each subnet becomes equal. In this case, the difference between the number of IP addresses allocated and the number of actually used ones on the subnets becomes the number of wasted ones.

As another solution, VLSM(Variable Length Subnet Mask) address allocation was proposed in 1987 at the IETF with RFC 1009 [6]. Using multiple subnet masks, it reduces the waste of address space by generating different-sized subnets in proportion to the proper number of connected hosts to the subnet. However, because VLSM uses multiple subnet masks, the subnetting process is very complicated and management of subnet IP address is difficult. Many managers tend to avoid the use of VLSM due to its complicate management and enormous efforts.

In this paper, a straight forward VLSM calculation method and efficient VLSM subnet IP address management method is proposed. A prototype web-based subnet management system is designed and implemented.

## 2 IP Address Allocation

In order to exchange messages over the Internet, each host must be identified by a unique IP address. Inside at a LAN, allocated IP addresses by NIC must be managed by subnetting.

### 2.1 IPv4 Address Systems and Address Class

Currently, the Internet is mainly using the IPv4 address system and an IP address can be divided into the network identifier(netid) and the host identifier(hostid). The network identifier represents the network to which a particular computer belongs to and the host identifier represents each host or router within the network.

IP address is classified by 5 classes, A, B and C classes as the network identifier and D, E classes for special purposes. The class-based two-level address architecture has faced many problems with the rapid growth of the Internet. Class B address is almost completely exhausted. There are not many organizations which can efficiently use the 16 million class A addresses. The C class network, which can support 256 IP addresses, is too small.

CIDR was proposed in the early 1990's and developed in September of 1993, CIDR was distributed through RFC 1517, 1518, 1519 and 1520. CIDR cooperates with bit masks. The number of bits that designates the network and the number of bits that designates the host may be different according to the length of the address prefix. The length of the prefix can be determined by the address class or using CIDR(Classless Inter-Domain Routing). RFC 1878 lists the 32 possible prefix values [7].