Communication Network-I

Project Report

CIDR CALCULATOR

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1. Introduction

For Communication Network-I bonus process, our group selected the project for developing CIDR Calculator.

Classless Inter-Domain Routing (CIDR) is a method for allocating IP addresses and routing Internet Protocol packets for this high demand world, where system are communicating over the internet want IP address to be assigned for identification. As the available IP address were rapidly depleting/exhausting and to slow the growth of routing tables on routers across the Internet, the Internet Engineering Task Force introduced CIDR in 1993 to replace the previous addressing architecture of classful network design in the Internet.

IP addresses are like the identification of systems over the communication network. It have two principal functionality - host/network interface identification and system location addressing. It consisting of two groups of bits in the address- the most significant bits are the network address/prefix, which identifies a whole network or subnet, and the least significant set forms the host identifier, which specifies a particular interface of a host on that network. This division is used as the basis of traffic routing between IP networks and for address allocation policies. CIDR is the most appropriate and efficient way of providing the above IP address and where have the properties of changing the length of the field from fixed to variable length.

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2. CIDR Notation

CIDR notation is a syntax for representing IP addresses and their associated routing prefix. It appends a slash character to the address and the decimal number of leading bits of the routing prefix, e.g., 192.168.0.1/24 for IPv4, and 2001:db8:0:/32 for IPv6. So CIDR provide 2^32 IP addresses for IPV4 and 2^128 IP addresses for IPV6.

The address may denote a single, distinct interface address or the beginning address of an entire network. The maximum size of the network is given by the number of addresses that are possible with the remaining, least-significant bits below the prefix. This is often called the host identifier. The number of addresses of a subnet defined by the prefix/mask and can be calculated as 2 in prefix/address size, in which the address size is 32 for IPv4 and 128 for IPv6.

Formula to find the Number of host or address based on CIDR prefix/mask size -
For IPv4--> [2 Power of (Address Size-CIDR Prefix Size)]- 2
For Ipv6--> 2 Power of (Address Size-CIDR Prefix Size)

For example, in IPv4, a prefix size for /24
Gives: 2^(32-24) = 2^8 = 256 addresses.
In which one address is used for network address and another for broadcast address in IPV4. So the IP address range available will be 256-2=254 in IPv4.

For example, in IPv6 a prefix size for /120
Gives: 2^(128-120) = 2^8 = 256 addresses available.

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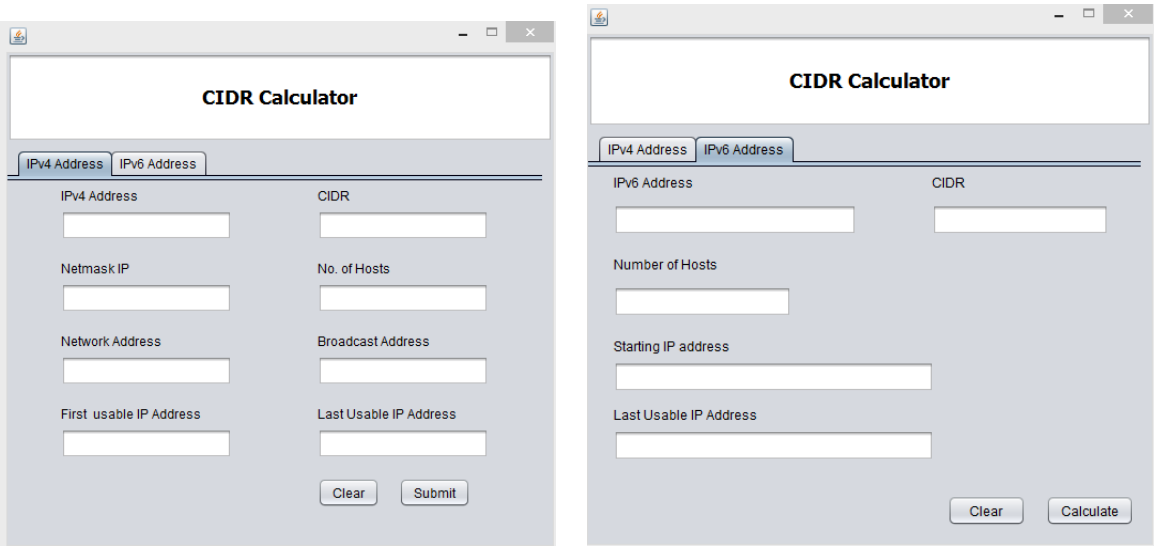
3. Code Realization

For the implementation of a visual representation from CIDR Calculator, we chose Java as developing platform, and used Swings for creating the User Interface Terminals. Below is the User Display of IPv4 and IPv6.



In IPV4 and IPV6 terminal one has to fill the respective IP address and the CIDR prefix size vale, and on hitting calculate button, the respective fields like Netmask IP, Number of Host, Network address, Broadcast Address and the IP address range values are populated based on the above equation implemented in these respective java class.

We have created CalculateCIDR.java, IPv4Implementation.java and IPv6Implementation.java where the IP address calculation of IPv4 and Ipv6 respectively happens.

CalculateCIDR.java-

This is our main class, where our project execution starts. In this we dealt with the input validation check and on validating any one of the IPv4 or IPv6 implementation methods are called for the input and output format conversions and helps in finding the required output attributes value for IPv4 and IPv6 Implementation java class

IPv4Implementation.java -

The IP address and CIDR prefix value of IPv4 are taken as String input. We convert the input into 32 bit decimal format and find the values for Netmask IP, Network address, Broadcast Address, First Usable IP Address and Last Usable IP Address. And the Number of Host is calculated on the CIDR prefix size using the idea of above formula specified in the document.

IPv6Implemenation.java -

The process is same as of IPv4Implementation.java, but gets IPv6 IP format address and CIDR as String Input. Were conversion of String input to hexadecimal format is been coded and the output, Number of Hosts and the Range Starting IP address-Last Usable IP address are calculated.

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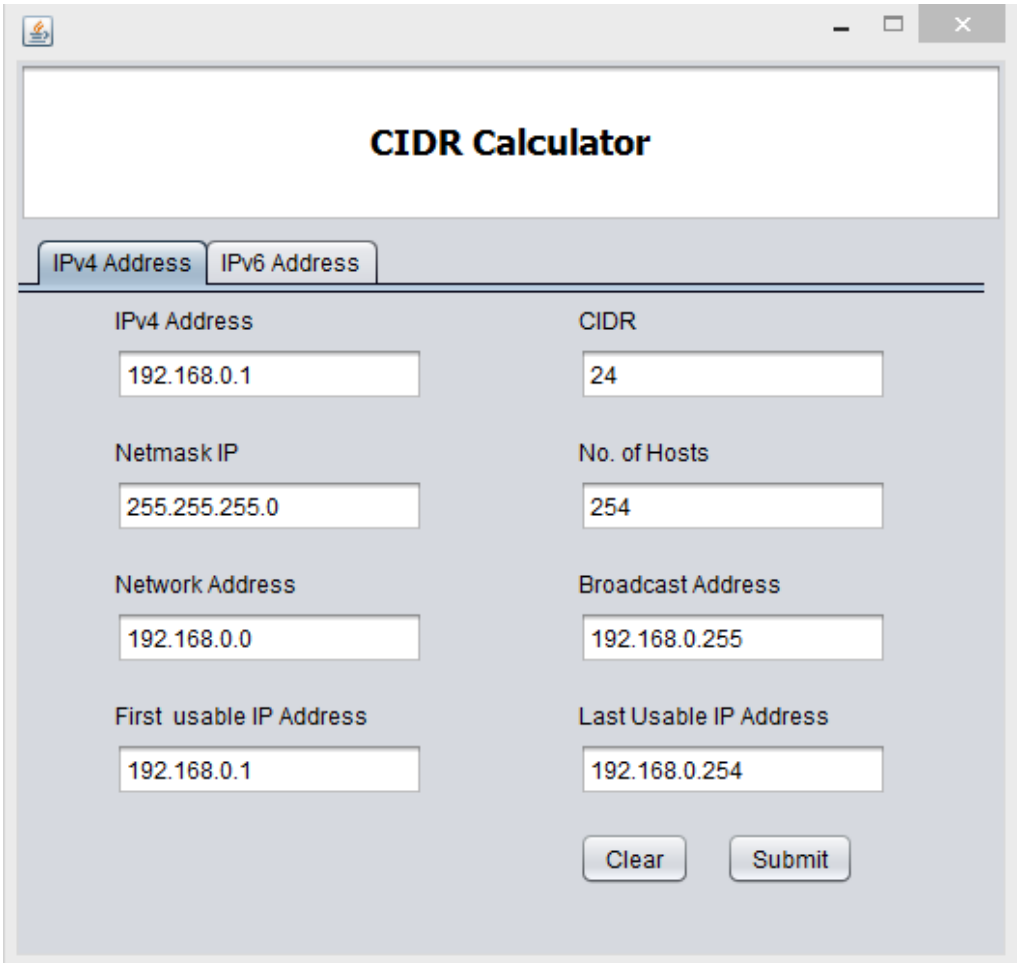
4. Example

For IPv4 IP address range calculation -

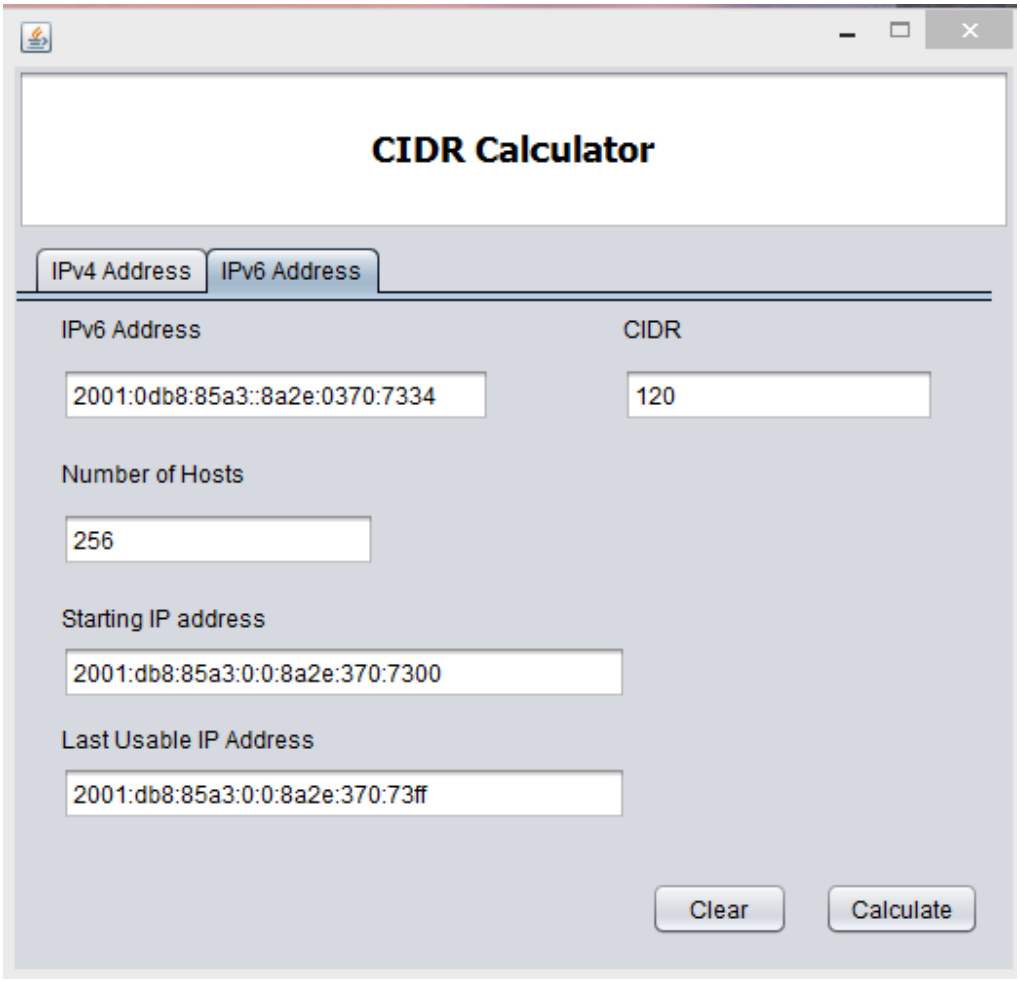
Considered IP - 192.168.0.1 and CIDR prefix - 24 and on clicking Submit button, we get the below result.



Number of Host = [2^(32-24)]-2= 256-2 = 254 IP Address available over the network and other fields values are populated. To check for other IP's we can use Clear button to refresh the UI and can use.

For IPv6 IP address range calculation -

Considered IP - 2001:db8:85a3:0:0:8a2e:370:73ff and CIDR prefix - 120 and on clicking Submit button, we get the below result.



Number of Host = 2^(128-120) = 256 IP Address available over the network and other fields values are populated. To check for other IP's we can use Clear button to refresh the UI and can use.

Above are example consider to show the IPV4 and IPV6 CIDR calculation, which display the value available number of host and the start and end range of these IP address. It's a very user friendly as its one button click to get the result and to refresh the UI, no need for a user to restart the application all from the start.

5. References

1. https://en.wikipedia.org/wiki/Classless_Inter-Domain_Routing
2. http://searchnetworking.techtarget.com/definition/CIDR
3. http://infocenter.guardiandigital.com/manuals/IDDS/node9.html