An **Internet Protocol Version 6** (**IPv6)** address is a numerical label that is used to identify a network interface of a computer or a network node participating in an IPv6 computer network and for locating it in the network.

IPv6 addresses have a size of 128 bits. An IPv6 address is represented as eight groups of four hexadecimal digits, each group representing 16 bits (two octets, a group sometimes also called a hextet). The groups are separated by colons (:).

An example of an IPv6 address is:
2001:0db8:85a3:0000:0000:8a2e:0370:7334

The hexadecimal digits are case-insensitive, but IETF recommendations suggest the use of lower case letters.

In an attempt to simplify IPv6 addresses, the standards provide flexibility in their representation. However, this also complicates several common operations: searching for a specific address in a text file or stream, and comparing two addresses to determine their equivalence.

To mitigate these problems, a canonical format is defined for rendering IPv6 addresses in text:

- Representations are shortened as much as possible. The longest sequence of consecutive all-zero fields is replaced with double-colon. If there are multiple longest runs of all-zero fields, then it is the leftmost that is compressed.

  For example, *2001:db8:0:0:1:0:0:1* is rendered as *2001:db8::1:0:0:1*.

- Leading zeros in each 16-bit field are suppressed. Any all-zero field that is explicitly presented is rendered as *0*.

  For example, *2001:0db8::0001:0000* is rendered as *2001:db8::1:0*.

- "::" is not used to shorten just a single 0 field.

  For example, *2001:db8:0:0:0:0:2:1* is shortened to *2001:db8::2:1*,
  but *2001:db8:0000:1:1:1:1:1* is rendered as *2001:db8:0:1:1:1:1:1*.

The localhost (loopback) address *0:0:0:0:0:0:0:1* is reduced to *::1*.
The IPv6 unspecified address *0:0:0:0:0:0:0:0* is reduced to *::*.

Remark:
You may read the notes and/or watch part-2 of my YouTube video
https://youtu.be/YLHNVtJDmqE
to get a better understanding in the processing of char array.