How to Write an IPv6 Address: Format and Shortening Rules

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In short: An IPv6 address is made of 8 groups separated by colons (:), and each group is 16 bits written as 4 hexadecimal digits. You can shorten it by removing leading zeros in each group, and by replacing one run of all-zero groups with a double colon (::).

The full format

An IPv6 address is 128 bits long. It is written as 8 groups of 4 hexadecimal digits (0-9 and a-f), separated by colons. For example:

```
2001:0db8:0000:0000:0000:ff00:0042:8329
```

Rule 1: remove leading zeros

In each group you can drop the zeros at the start. The address above becomes:

```
2001:db8:0:0:0:ff00:42:8329
```

Rule 2: replace consecutive zero groups with ::

One run of groups that are all zero can be replaced with a double colon:

```
2001:db8::ff00:42:8329
```

You can use **::** only once in an address; otherwise it would be impossible to know how many groups each one replaces.

Common examples

- `::1` is the loopback address, the IPv6 version of 127.0.0.1.
- `::` means an unspecified address (all zeros).
- `fe80::/10` addresses are link-local, used only inside a local network.

Writing IPv6 in a URL

Because colons are also used for ports, put an IPv6 address in square brackets in a URL: `http://[2001:db8::1]:8080/`.

What does /64 mean?

The number after the slash is the prefix length: `2001:db8::/64` means the first 64 bits identify the network and the remaining 64 bits identify devices in it.

Want to understand how the two versions compare? Read IPv4 vs IPv6: key differences.

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