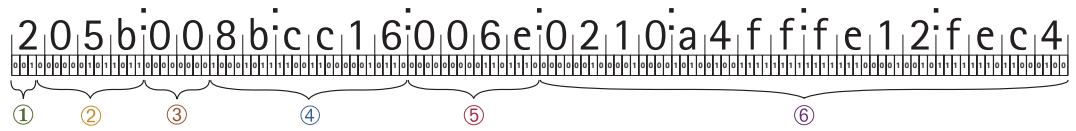




www.internet2.edu

205b:8b:cc16:6e:210:a4ff:fe12:fec4



Anatomy of an IPv6 Address

Original concept by Maria Morris, Indiana University

① Format Prefix (FP) = 001

The prefix 001 indicates that this is an Aggregatable Global Unicast Address.

② Top-Level Aggregation Identifier (TLA) = 0 000 0101 1011 (0x005b)

The TLA is the top level in the IPv6 routing hierarchy. Every router without a default route has a routing table entry for each active TLA.

③ Reserved for Future Use

This field is reserved for possible expansion of the TLA and NLA and should be set to zero.

④ Next-Level Aggregation Identifier

(NLA) = 1000 1011 1100 1100 0001 0110 (0x8bcc16)

The NLA is used by a service provider with a TLA to create an addressing hierarchy for individual organizations.

⑤ Site-Level Aggregation Identifier

(SLA) = 0000 0000 0110 1110 (0x006e)

The SLA is used by an organization to create a local addressing hierarchy and subnets.

⑥ Interface Identifier

(EUI-64) = MAC Address: 00:10:a4:12:fe:c4

The Interface ID must be in EUI-64 format as described in Appendix A of RFC 2373. This EUI-64 ID contains a MAC address because the global bit is set and the middle 16 bits are 0xfffe.

Number of Addresses in IPv4:	4,294,967,296
Population of Earth (2001):	6,170,000,000
Number of Addresses in IPv6:	340,282,366,920,938,463,463,374,607,431,768,211,456

IPv6

<http://ipv6.internet2.edu/>

IPv6 is the next version of the Internet Protocol, the data packaging and routing standard on which the Internet is based. The current version is IPv4; IPv5 was experimental and was never widely deployed.

IPv6 offers several improvements over IPv4. Most importantly, with 128-bit Internet addresses instead of the 32-bit addresses of IPv4, IPv6 vastly increases the **number of addresses** available—from about 4 billion to about 340 trillion trillion trillion.

Given the continued rapid growth of the Internet, ensuring an abundance of addresses is crucial. The proliferation of wired and (especially) wireless devices means that in the near future not one or two, but many addresses will be required for each person who uses the Internet. The techniques currently employed to cope with the shortage of IPv4 addresses are reaching their limits, and many of these techniques—such as temporary address assignment and network address

translation—compromise engineering principles fundamental to the Internet's success, thus jeopardizing its future growth.

IPv6 also incorporates several other improvements. Packets—the many small packages which IP creates to send data over the Internet—store **header information** and **optional attributes** more efficiently. IPv6 provides better support for **quality of service**, enabling routers to treat packets differently in accordance with the needs of the applications generating them. IPv6 also offers better **security**. Together with abundant Internet addresses, these improvements will pave the way for a huge range of new applications—everything from wireless videoconferencing to Internet-enabled refrigerators.

The main challenge confronting IPv6 now is *transition*. IPv6 machines are being added to the network and configured so they can communicate with both IPv4- and IPv6-speaking machines. As always with networking projects of great size and complexity, new problems are being uncovered along the way. The universities, businesses, and government research labs of the Internet2 community are taking a leading role in identifying and solving these problems.