

Hexadecimal Number System

5.2.1

Hexadecimal and IPv6 Addresses

Now you know how to convert binary to decimal and decimal to binary. You need that skill to understand IPv4 addressing in your network. But you are just as likely to be using IPv6 addresses in your network. To understand IPv6 addresses, you must be able to convert hexadecimal to decimal and vice versa.

Just as decimal is a base ten number system, hexadecimal is a base sixteen system. The base sixteen number system uses the digits 0 to 9 and the letters A to F. The figure shows the equivalent decimal and hexadecimal values for binary 0000 to 1111.

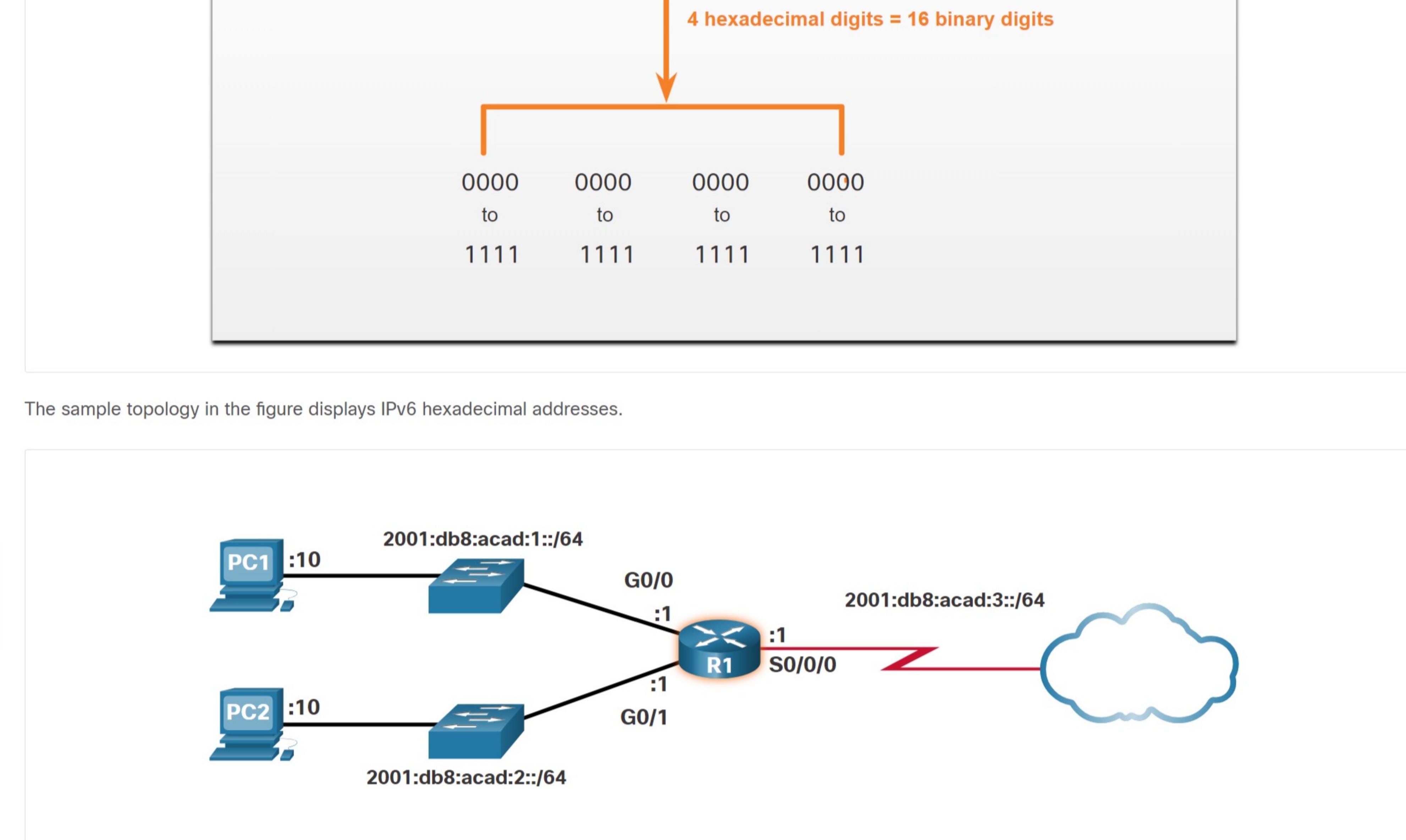
Decimal	Binary	Hexadecimal
0	0000	0
1	0001	1
2	0010	2
3	0011	3
4	0100	4
5	0101	5
6	0110	6
7	0111	7
8	1000	8
9	1001	9
10	1010	A
11	1011	B
12	1100	C
13	1101	D
14	1110	E
15	1111	F

Binary and hexadecimal work well together because it is easier to express a value as a single hexadecimal digit than as four binary bits.

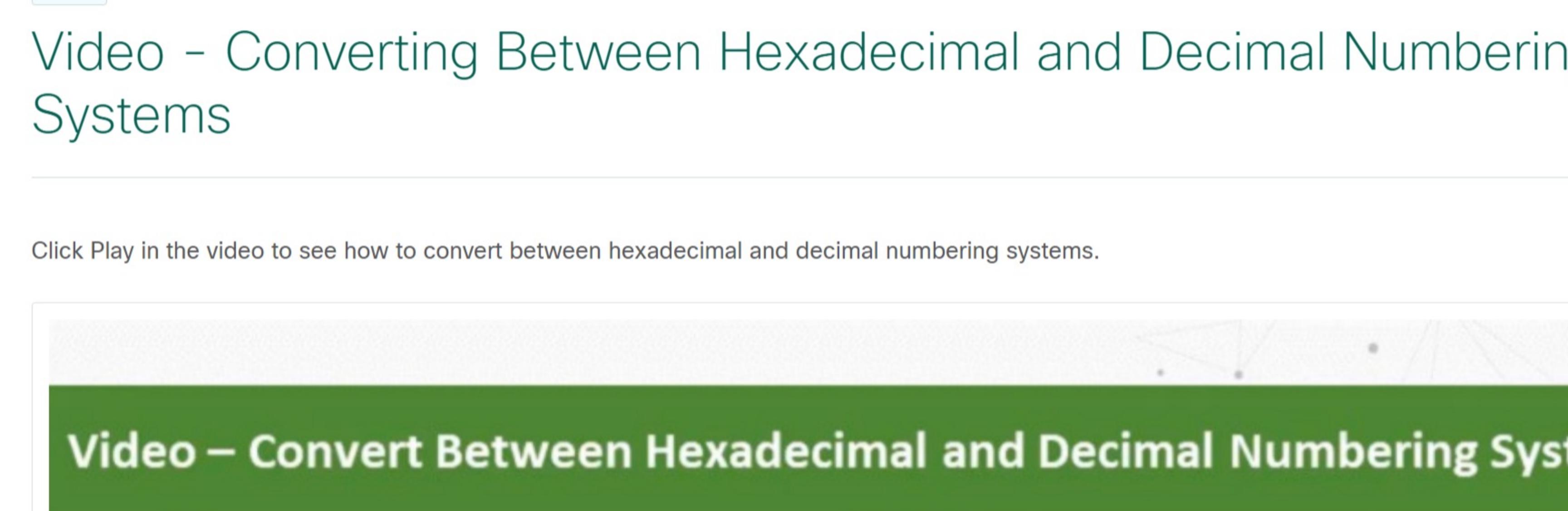
The hexadecimal numbering system is used in networking to represent IP Version 6 addresses and Ethernet MAC addresses.

IPv6 addresses are 128 bits in length and every 4 bits is represented by a single hexadecimal digit; for a total of 32 hexadecimal values. IPv6 addresses are not case-sensitive and can be written in either lowercase or uppercase.

As shown in the figure, the preferred format for writing an IPv6 address is `x:x:x:x:x:x:x:x`, with each "x" consisting of four hexadecimal values. When referring to 8 bits of an IPv4 address we use the term octet. In IPv6, a hexet is the unofficial term used to refer to a segment of 16 bits or four hexadecimal values. Each "x" is a single hexet, 16 bits, or four hexadecimal digits.



The sample topology in the figure displays IPv6 hexadecimal addresses.



Video – Converting Between Hexadecimal and Decimal Numbering Systems

Click Play in the video to see how to convert between hexadecimal and decimal numbering systems.

Video – Convert Between Hexadecimal and Decimal Numbering Systems

This video will cover the following:

- Characteristics of the Hexadecimal System
- Convert from Hexadecimal to Decimal
- Convert from Decimal to Hexadecimal

Decimal to Hexadecimal Conversions

Converting decimal numbers to hexadecimal values is straightforward. Follow the steps listed:

- Convert the decimal number to 8-bit binary strings.
- Divide the binary strings in groups of four starting from the rightmost position.
- Convert each four binary numbers into their equivalent hexadecimal digit.

The example provides the steps for converting 168 to hexadecimal.

For example, 168 converted into hex using the three-step process.

- 168 in binary is 10101000.
- 10101000 in two groups of four binary digits is 1010 and 1000.
- 1010 is hex A and 1000 is hex 8.

Answer: 168 is A8 in hexadecimal.

Hexadecimal to Decimal Conversion

Converting hexadecimal numbers to decimal values is also straightforward. Follow the steps listed:

- Convert the hexadecimal number to 4-bit binary strings.
- Create 8-bit binary grouping starting from the rightmost position.
- Convert each 8-bit binary grouping into their equivalent decimal digit.

This example provides the steps for converting D2 to decimal.

- D2 in 4-bit binary strings is 1101 and 0010.
- 11010010 in an 8-bit grouping is 11010010.
- 11010010 in binary is equivalent to 210 in decimal.

Answer: D2 in hexadecimal is 210 in decimal.

Check Your Understanding – Hexadecimal Number System

Check your understanding of hexadecimal number system by choosing the correct answer to the following questions.

- Which is the hexadecimal equivalent of 202?

- B10
 BA
 C10
 CA

- Which is the hexadecimal equivalent of 254?

- EA
 ED
 FA
 FE

- Which is the decimal equivalent of A9?

- 168
 169
 170
 171

- Which of the following is the decimal equivalent of 7D?

- 124
 125
 126
 127

Check

Show Me

Reset