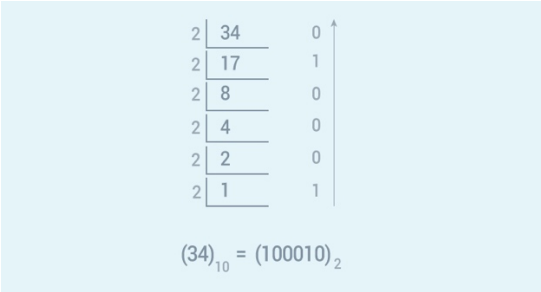
COMP9121 Week 1 Review of Basic Concepts

1. Binary/decimal/hexadecimal numbers, bit and byte

A binary number is a number expressed in the base-2 numeral system or binary numeral system, which uses only two symbols: "0" (zero) and "1" (one). In the binary system, each digit represents an increasing power of 2, with the rightmost digit representing 2^0, the next representing 2^1, then 2^2, and so on.

$100101_2 = [\,(\mathbf{1}) \times 2^5\,] + [\,(\mathbf{0}) \times 2^4\,] + [\,(\mathbf{0}) \times 2^3\,] + [\,(\mathbf{1}) \times 2^2\,] + [\,(\mathbf{0}) \times 2^1\,] + [\,(\mathbf{1}) \times 2^0\,] = 37_{10}$

To convert from a base-10 integer to its base-2 (binary) equivalent, the number is divided by two. The remainder is the least-significant bit. The quotient is again divided by two; its remainder becomes the next least significant bit. This process repeats until a quotient of one is reached.



A hexadecimal number is expressed in the base-16 numeral system. The mapping to binary or decimal number is as follows.

0hex	= 0dec	=	0	0	0	0
1hex	= 1dec	=	0	0	0	1
2hex	= 2dec	=	0	0	1	0
3hex	= 3dec	=	0	0	1	1
4hex	= 4dec	=	0	1	0	0
5hex	= 5dec	=	0	1	0	1
6hex	= 6dec	=	0	1	1	0
7hex	= 7dec	=	0	1	1	1
8hex	= 8dec	=	1	0	0	0
9hex	= 9dec	=	1	0	0	1
Ahex	= 10dec	=	1	0	1	0
Bhex	= 11dec	=	1	0	1	1
Chex	= 12dec	=	1	1	0	0
Dhex	= 13dec	=	1	1	0	1
Ehex	= 14dec	=	1	1	1	0
Fhex	= 15dec	=	1	1	1	1

Try by yourself

Convert $(FFFF)_{hex}$ to Decimal and binary

Bit: one binary number
Byte: 8 bits, two hex numbers.

The following shows a packet captured by Wireshark, what is the size of the packet?

```
b8 ee 0e 69 85 f4 88 e9  fe 85 1d 22 08 00 45 00
00 28 90 c5 00 00 40 06  aa ea c0 a8 00 08 c0 e5
bd 8a d5 f9 01 bb 97 48  c5 77 5b 50 80 76 50 10
08 00 58 78 00 00
```

2. Basic probability
We transmit 1 byte data from the sender to the receiver, each bit is flipped by the channel with probability 0.1 independently. What is the probability that there are exactly 2 bits flipped?

3. Traceroute to sydney.edu.au.
Which hop shows the router in your home?
Which hop shows sydney.edu.au? What is the IP address of sydney.edu.au?