IEEE Ploating Point Standard 754

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- $$FPNumber = Fraction \times Base^{Exponent}$$

Example: Decimal Numbers

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- 101_2

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- Shift left by one bit
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- To get back the initial number .... “ put back the 1 ”.

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To represent the “hidden 1” and the “Fraction” use the formula:

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Precision Formats: 32-bit

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- Single (32-bit) Precision Format (Occupies one four byte word)
  - S = 1
  - E = 8
  - F = 23

Precision Formats: 64-bit

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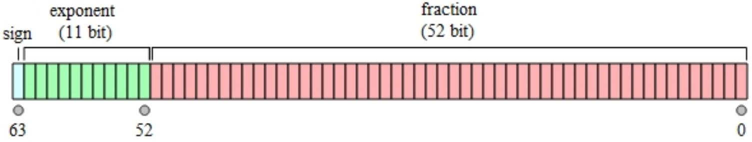
- Double (64-bit) Precision Format
  - S = 1
  - E = 11
  - F = 52



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- The bias is needed to represent a negative exponent without allocating a sign bit.

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2. Double Precision
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   - Smallest normalized value: 2^{-1022}

Examples ...

Illustrative examples follow ...

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- $$\overbrace{1}^{1Bits}\quad\overbrace{10000001}^{8Bits}\quad\overbrace{01\,\underbrace{000000000000000000000}_{21Bits}}^{23Bits}$$

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- $$1 \;\; 10000011 \;\; 11\underbrace{000000000000000000000}_{21\ Bits}$$

Example: 0.75_{10}

3. Given the Decimal Number: 0.75_{10}. Find the FPN representation in single precision notation (127 bias).

Read more: http://www.exploringbinary.com/binary-converter/

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- $0.75 \times 2 = 1.50$
- $0.50 \times 2 = 1.00$
- $0.00 \times 2 = 0.00$ $[stop]$

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- First let us find the binary equivalent of 0.75_{10} ...
- $0.75 \times 2 = 1.50$
- $0.50 \times 2 = 1.00$
- $0.00 \times 2 = 0.00$ [*stop*]
- Therefore, top–bottom .... the answer is: $(0.11)_2$

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- Therefore
- $$0 \;\; 01111110 \;\; 1\underbrace{0000000000000000000000}_{Bits\ 22}$$

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- Today FPU and CPU can be in the same chip

The FPU has 32 registers

- Q: How can we access the registers ?
- A: Use *ld* (Load) and *st* (Store) instructions,

```
ld      [%fp + 64], %f2
set     var, %o0
st      %f0, [%o0]
```

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