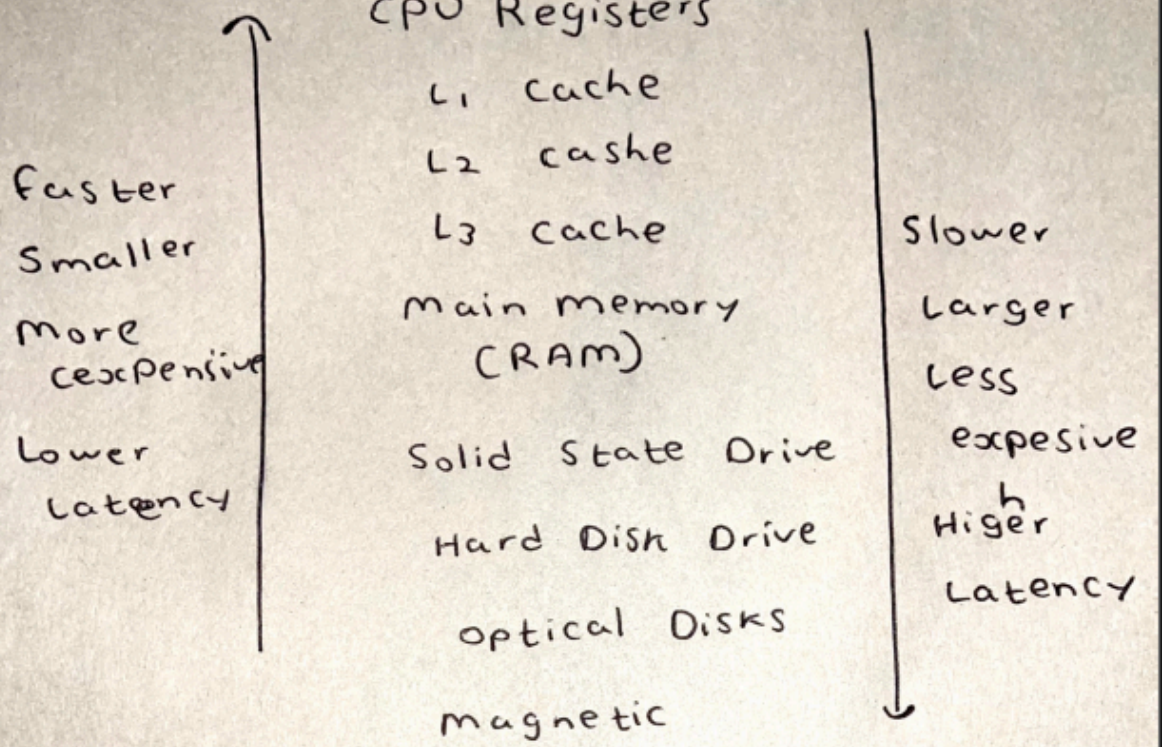

How memory Higherarchy optimizes Systems performance

* caching
* Locality explitation
* Data transfer
* Hit Rate Optimization.

02)101101

Position 1 (2^0): $p_1 = 1$
Position 2 (2^1): $p_2 = 0$
Position 3: $d_1 = 1$
Position 4 (2^2): $p_3 = 1$
Position 5: $d_2 = 0$
Position 6: $d_3 = 1$
Position 7: $d_4 = 1$
p_1 checks positions 1,3,5,7: 1+1+0+1 = 3 (odd)
p_2 checks positions 2,3,6,7: 0+1+1+1 = 3 (odd)
p_3 checks positions 4,5,6,7: 1+0+1+1 = 3 (odd)

All parity checks fail, which is unusual. Let's calculate the error position: Error position = 1×1 + 2×1 + 4×1 = 7

The bit in position 7 (d_4) has an error.

The correct value should be 0 instead of 1.

03)1100101

Position 1 (2^0): $p_1 = 1$
Position 2 (2^1): $p_2 = 1$
Position 3: $d_1 = 0$
Position 4 (2^2): $p_3 = 0$
Position 5: $d_2 = 1$
Position 6: $d_3 = 0$
Position 7: $d_4 = 1$
p_1 checks positions 1,3,5,7: 1+0+1+1 = 3 (odd)
p_2 checks positions 2,3,6,7: 1+0+0+1 = 2 (even)
p_3 checks positions 4,5,6,7: 0+1+0+1 = 2 (even)

Error position = 1×1 + 2×0 + 4×0 = 1

The bit in position 1 (p_1) has an error.

The correct value should be 0 instead of 1.

04)1110000

Position 1 (2^0): $p_1 = 1$
Position 2 (2^1): $p_2 = 1$
Position 3: $d_1 = 1$
Position 4 (2^2): $p_3 = 0$
Position 5: $d_2 = 0$
Position 6: $d_3 = 0$
Position 7: $d_4 = 0$
p_1 checks positions 1,3,5,7: 1+1+0+0 = 2 (even)
p_2 checks positions 2,3,6,7: 1+1+0+0 = 2 (even)
p_3 checks positions 4,5,6,7: 0+0+0+0 = 0 (even)

All parity checks pass, so the received code word is correct.

05)1001010

Position 1 (2^0): $p_1 = 1$
Position 2 (2^1): $p_2 = 0$
Position 3: $d_1 = 0$
Position 4 (2^2): $p_3 = 1$
Position 5: $d_2 = 0$
Position 6: $d_3 = 1$
Position 7: $d_4 = 0$
p_1 checks positions 1,3,5,7: 1+0+0+0 = 1 (odd)
p_2 checks positions 2,3,6,7: 0+0+1+0 = 1 (odd)
p_3 checks positions 4,5,6,7: 1+0+1+0 = 2 (even)

Error position = 1×1 + 2×1 + 4×0 = 3

The bit in position 3 (d_1) has an error.

The correct value should be 1 instead of 0.

06)0111101

Position 1 (2^0): $p_1 = 0$
Position 2 (2^1): $p_2 = 1$
Position 3: $d_1 = 1$
Position 4 (2^2): $p_3 = 1$
Position 5: $d_2 = 1$
Position 6: $d_3 = 0$
Position 7: $d_4 = 1$
p_1 checks positions 1,3,5,7: 0+1+1+1 = 3 (odd)
p_2 checks positions 2,3,6,7: 1+1+0+1 = 3 (odd)
p_3 checks positions 4,5,6,7: 1+1+0+1 = 3 (odd)

Error position = 1×1 + 2×1 + 4×1 = 7

The bit in position 7 (d_4) has an error.

The correct value should be 0 instead of 1.

07)0111101

Position 1 (2^0): $p_1 = 0$
Position 2 (2^1): $p_2 = 1$
Position 3: $d_1 = 1$
Position 4 (2^2): $p_3 = 1$
Position 5: $d_2 = 1$
Position 6: $d_3 = 0$
Position 7: $d_4 = 1$
p_1 checks positions 1,3,5,7: 0+1+1+1 = 3 (odd)
p_2 checks positions 2,3,6,7: 1+1+0+1 = 3 (odd)

p_3 checks positions 4,5,6,7: 1+1+0+1 = 3 (odd)

Error position = (1×1) + (2×1) + (4×1) = 1 + 2 + 4 = 7

Therefore, the bit in position 7 (d_4) has an error.

The correct value should be 0 instead of 1.