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Using Multiple Precisions in the GMRES Linear Solver

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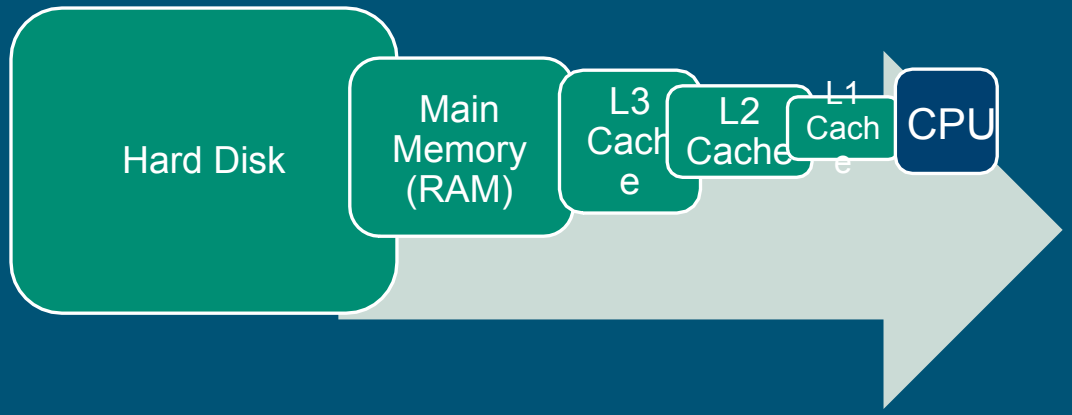
Number Pi (3,1415926535….) in multiple

Double precision	0100000000001001001000011111101101010100010001000010110100011000
Single precision	01000000010010010000111111011011
Half precision	0100001001001000



- Algorithms need to take advantage of low-precision hardware capabilities!

Algorithm 1 Iterative Refinement with GMRES Error Correction

1: $r_0 = b - Ax_0$ [double]
2: **for** $i = 1, 2, \ldots$ until convergence: **do**
3: Use GMRES(m) to solve $Au_i = r_i$ for correction u_i [single]
4: $x_{i+1} = x_i + u_i$ [double]
5: $r_{i+1} = b - Ax_{i+1}$ [double]
6: **end for**