

# Solving poisson equation

Solving the Poisson's equation discretized on the  $[0,1] \times [0,1]$  domain using the finite difference method and a Jacobi's iterative solver.

$$\Delta u = f(x, y) = 2 * (x * x - x + y * y - y)$$

- ▶  $u$  equal 0 on the boudaries.
- ▶ The exact solution is  $u = x * y * (x - 1) * (y - 1)$

The  $u$  value is :

- ▶  $coef(1) = (0.5 * hx * hx * hy * hy) / (hx * hx + hy * hy)$
- ▶  $coef(2) = 1. / (hx * hx)$
- ▶  $coef(3) = 1. / (hy * hy)$
- ▶  $u(i, j)(n + 1) = coef(1) * (coef(2) * (u(i + 1, j) + u(i - 1, j)) + coef(3) * (u(i, j + 1) + u(i, j - 1)) - f(i, j))$

On each process, we need to:

1. Split up the domain
2. Find our 4 neighbors
3. Exchange the interface points
4. Calculate  $u$

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- ▶ The green color represent the interior cells.
- ▶ The black color represent the ghost cells.

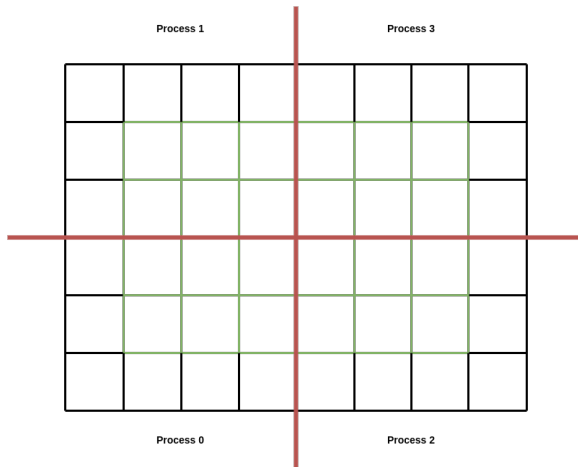


Figure: [6,4] domain divided into 4 sub-domains

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- ▶ The blue color represent the hello cells.

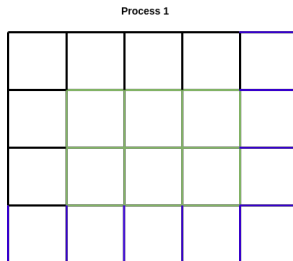


Figure: The local grid of Process 1