

Suppose your array  $X$  is split across  $P$  processes:

Process  $i$  has  $n_i$  elements.

The local average on process  $i$  is:

$$\text{local\_avg}_i = \frac{1}{n_i} \sum_{j=1}^{n_i} X_j$$

To compute the global average:

$$\text{global\_avg} = \frac{\sum_{i=1}^P \sum_{j=1}^{n_i} X_j}{\sum_{i=1}^P n_i} = \frac{\sum_{i=1}^P (\text{local\_avg}_i \cdot n_i)}{\sum_{i=1}^P n_i}$$

Thus, each local average must be weighted by the number of elements in that process.