

Iso-Power-Efficiency

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For many applications, speedup saturates and parallel efficiency decreases if the problem size is held fixed while increasing the number of processors. For some problems, it is possible to maintain a fixed parallel efficiency by increasing both the problem size and the number of processing elements. The rate at which the problem size must increase to maintain constant efficiency for a given rate of increase of the number of processors is given by the iso-efficiency function (Grama 1993). We have developed a new scalability function called iso-power-efficiency that determines the rate at which the problem size must increase to maintain constant efficiency for a given rate of increase of the application's power budget. For a given power budget, an application can choose to use a larger number of processors running at lower power. As shown in Patki (2013), speedup can often be obtained within a given power budget by such overprovisioning.