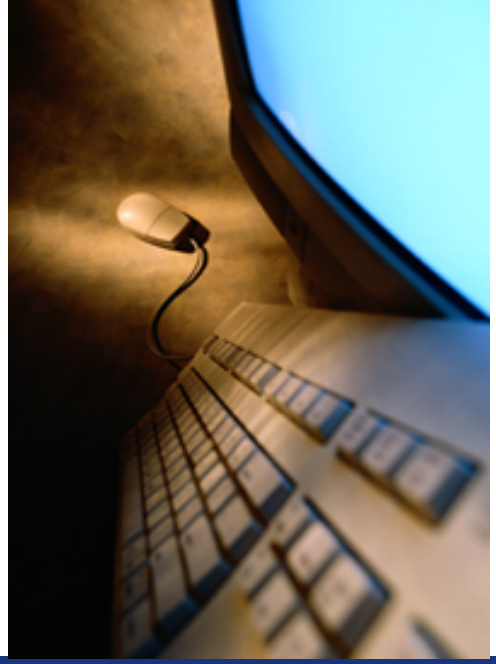
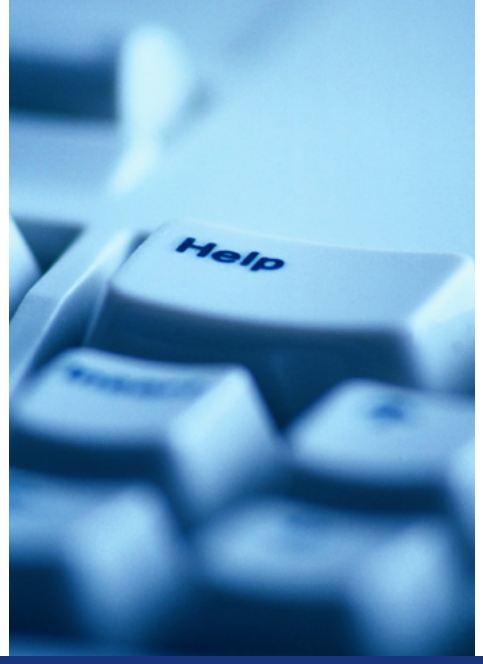

并行与分布式计算

Parallel & Distributed Computing

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Homework-2

1. 分别采用不同的算法（非分布式算法）例如一般算法、分治算法和Strassen算法等计算计算矩阵两个300x300的矩阵乘积，并通过Perf工具分别观察cache miss、CPI、 mem_load等性能指标。

2. Design an experiment (i.e., design and write programs and take measurements) to determine the memory bandwidth of your computer and to estimate the caches at various levels of the hierarchy. Use this experiment to estimate the bandwidth and L1 cache of your computer. Justify your answer. (Hint: To test bandwidth, you do not want reuse. To test cache size, you want reuse to see the effect of the cache and to increase this size until the reuse decreases sharply.)

（参考： https://www.e-learn.cn/topic/639863 ，https://stackoverflow.com/questions/48360238/how-can-the-l1-l2-l3-cpu-caches-be-turned-off-on-modern-x86-amd64-chips；关键寄存器:cr0，需要利用C和汇编的混合编程，选做）

3. Consider a memory system with a level 1 cache of 32 KB and DRAM of 512 MB with the processor operating at 1 GHz. The latency to L1 cache is one cycle and the latency to DRAM is 100 cycles. In each memory cycle, the processor fetches four words (cache line size is four words). What is the peak achievable performance of a dot product of two vectors? Note: Where necessary, assume an optimal cache placement policy.

```
/* dot product loop */
for (i = 0; i < dim; i++)
        dot_prod += a[i] * b[i];
```

4. Now consider the problem of multiplying a dense matrix with a vector using a two-loop dot-product formulation. The matrix is of dimension 4*K* x 4*K*. (Each row of the matrix takes 16 KB of storage.) What is the peak achievable performance of this technique using a two- loop dot-product based matrix-vector product?

```
/* matrix-vector product loop */
for (i = 0; i < dim; i++)
        for (j = 0; i < dim; j++)
                c[i] += a[i][j] * b[j];
```

Thank You !