NHR FAU

FAU Friedrich-Alexander-Universität Erlangen-Nürnberg

Programming Techniques for Supercomputers Tutorial

Erlangen National High Performance Computing Center

Department of Computer Science

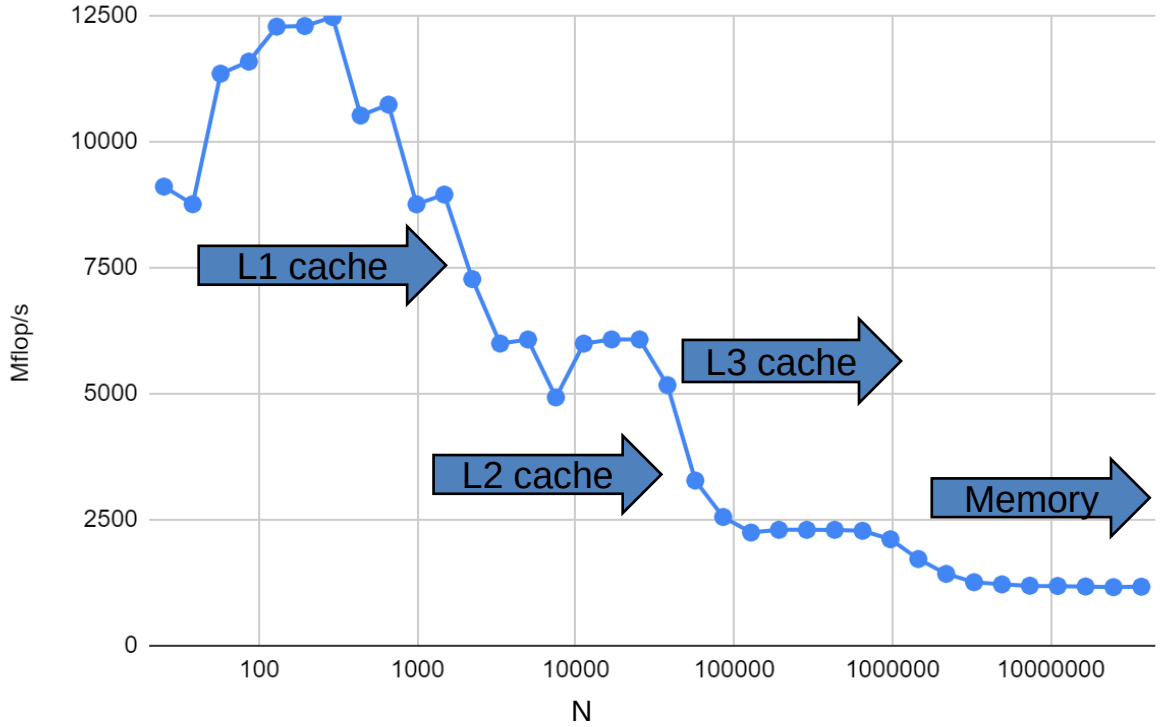
FAU Erlangen-Nürnberg

Sommersemester 2024

Assignment 2 – Task 1

Loop Kernel Benchmarking

a) STREAM Triad



icx compiler

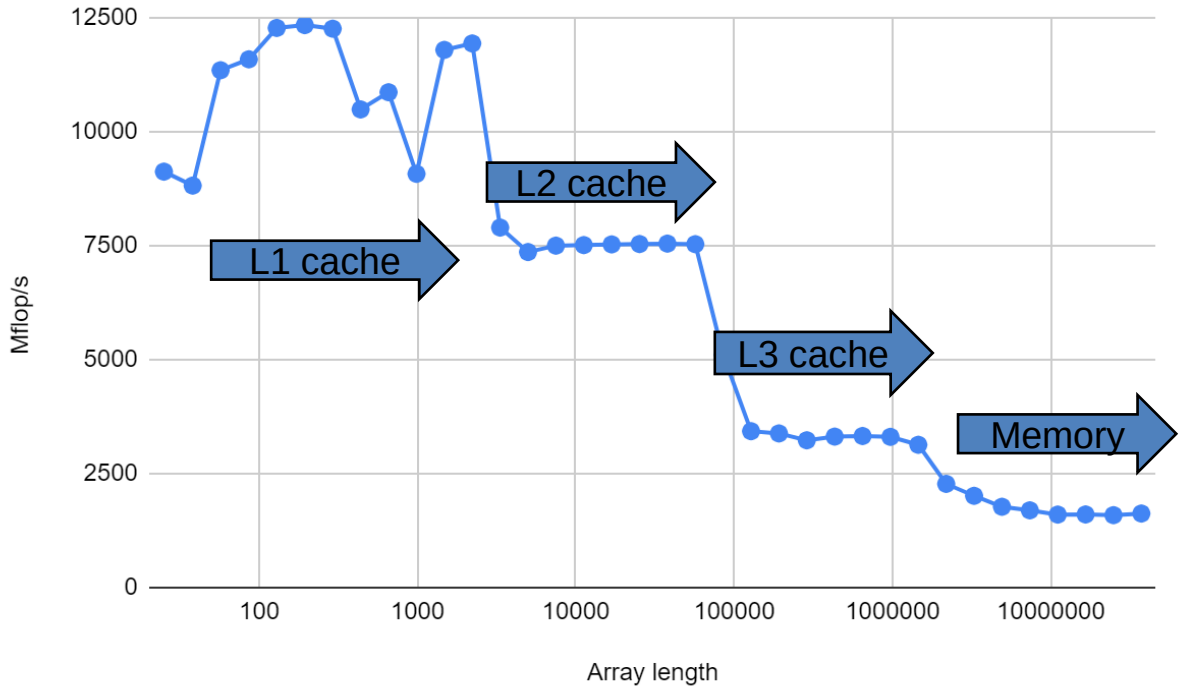
```
-O3 -xHost -fno-alias
```

L1 cache: 48 KiB
L2 cache: 1.25 MiB
L3 cache: 54 MiB

Assignment 2 – Task 1

Loop Kernel Benchmarking

a) DAXPY



icx compiler

```
-O3 -xHost -fno-alias
```

L1 cache: 48 KiB
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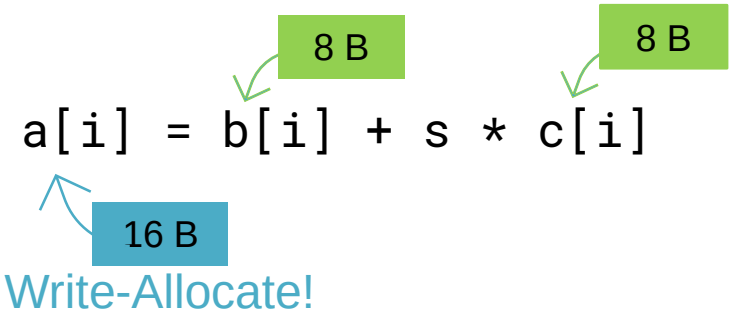
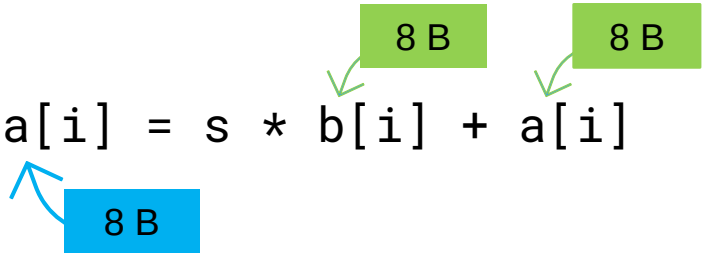
c)

STREAM Triad:



32 B/it

DAXPY:



24 B/it

Assignment 2 – Task 2

Latency and bandwidth

$b_s = 150\ \mathrm{GB/s}$
$T_l = 120\ \mathrm{ns}$

a) N = 4096 byte

Hockney Model: $T = T_l + \frac{V}{b} = 120 \times 10^{-9}\mathrm{s} + \frac{4096\ B}{150 \times 10^9 B/s} = \mathbf{147\ ns}$

b) $B_{\mathrm{eff}} = b_s/2$ with $B_{\mathrm{eff}} = \frac{V}{B}$ ➔ $B_{1/2} = T_l b_s$

c) $V = 128B$

$P = 1 + \frac{T_l}{V/b} = 1 + \frac{120\ ns}{128B/150\ GB/s} = 141.625$ ➔ **142** prefetches needed

≈ 18.2 kB in-flight