

| | | |
|--------|--------------------|---|
| Iscpu: | CPU(s): | 4 |
| | Nombre del modelo: | Intel(R) Core(TM) i5-4460 CPU @ 3.20GHz |
| | Virtualización: | VT-x |
| | Caché L3: | 3072K |



| | |
|-----------|---|
| POPCOUNT: | for i in 0 g 1 2; do printf "__OPTIM%1c__%48s\n" \$i "" tr "" "=" rm popcount gcc popcount.c -o popcount -O\$i -D TEST=0 for j in \$(seq 0 10); do echo \$j; ./popcount done pr -11 -l 22 -w 80 done |
| | ignorar medición 0, repetir columna si alguna medición se sale demasiado de la media |

Prácticas de Estructura de Computadores
por Javier Fernández y Mancia Anguita
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| Optimización -O0 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | media |
|--------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| popcount1 (lenguaje C - for): | 81586 | 81482 | 82517 | 81602 | 81289 | 81395 | 80645 | 80694 | 80664 | 80682 | 81930 | 81290 |
| popcount2 (lenguaje C - while): | 45297 | 44327 | 49434 | 48127 | 47025 | 51056 | 54643 | 46596 | 46569 | 52153 | 44931 | 48486 |
| popcount3 (leng.ASM-body while 4i): | 12431 | 12341 | 12639 | 12449 | 12543 | 12199 | 12151 | 12177 | 12346 | 12187 | 12507 | 12354 |
| popcount4 (leng.ASM-body while 3i): | 11500 | 11334 | 11524 | 11499 | 12027 | 11320 | 11304 | 11314 | 11338 | 12080 | 11409 | 11515 |
| popcount5 (CS:APP2e 3.49-group 8b): | 22103 | 22288 | 22245 | 22336 | 21990 | 21932 | 21913 | 21931 | 21961 | 22694 | 22596 | 22189 |
| popcount6 (Wikipedia- naive - 32b): | 8447 | 8239 | 8215 | 8262 | 8219 | 8218 | 8214 | 8216 | 8223 | 8177 | 8276 | 8226 |
| popcount7 (Wikipedia- naive -128b): | 5253 | 5225 | 5542 | 5477 | 5025 | 5017 | 5021 | 5034 | 5021 | 5679 | 5055 | 5210 |
| popcount8 (asm SSE3 - pshufb 128b): | 1010 | 1791 | 1011 | 1283 | 1013 | 1013 | 1012 | 1011 | 1010 | 1607 | 1353 | 1210 |
| popcount9 (asm SSE4- popcount 32b): | 2844 | 2893 | 2853 | 2849 | 2844 | 2828 | 2852 | 2826 | 2840 | 2866 | 3565 | 2922 |
| popcount10 (asm SSE4- popcount128b): | 877 | 885 | 880 | 879 | 879 | 872 | 872 | 880 | 876 | 888 | 877 | 879 |

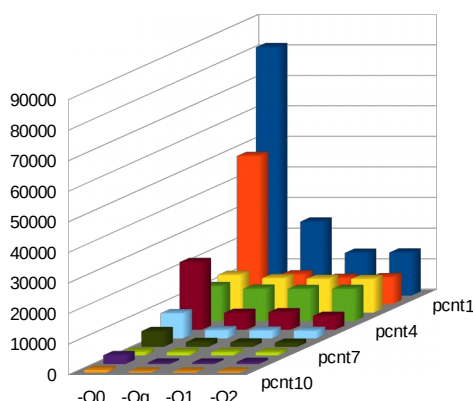
| Optimización -Og | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | media |
|--------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| popcount1 (lenguaje C - for): | 24781 | 23952 | 25422 | 24212 | 24013 | 24091 | 25210 | 24161 | 23821 | 23855 | 23644 | 24238 |
| popcount2 (lenguaje C - while): | 11327 | 11166 | 9378 | 8832 | 9871 | 9871 | 10268 | 8835 | 9189 | 9170 | 10928 | 9751 |
| popcount3 (leng.ASM-body while 4i): | 11122 | 12117 | 11346 | 11247 | 11073 | 11333 | 11447 | 11263 | 11081 | 11239 | 11029 | 11318 |
| popcount4 (leng.ASM-body while 3i): | 10661 | 10845 | 10753 | 10688 | 10745 | 10504 | 10683 | 10649 | 10679 | 10719 | 10435 | 10670 |
| popcount5 (CS:APP2e 3.49-group 8b): | 5477 | 5955 | 5510 | 5448 | 5506 | 5860 | 5463 | 5442 | 5462 | 5719 | 5431 | 5580 |
| popcount6 (Wikipedia- naive - 32b): | 2563 | 2570 | 2557 | 2596 | 3251 | 2732 | 2556 | 2589 | 2828 | 2795 | 2557 | 2703 |
| popcount7 (Wikipedia- naive -128b): | 2178 | 1514 | 1515 | 1507 | 1950 | 1512 | 1515 | 1515 | 2252 | 1508 | 1509 | 1630 |
| popcount8 (asm SSE3 - pshufb 128b): | 1898 | 1015 | 1052 | 1013 | 1012 | 1011 | 1041 | 1012 | 1208 | 1011 | 1012 | 1039 |
| popcount9 (asm SSE4- popcount 32b): | 723 | 509 | 508 | 509 | 519 | 508 | 506 | 514 | 509 | 508 | 508 | 510 |
| popcount10 (asm SSE4- popcount128b): | 360 | 360 | 359 | 413 | 360 | 360 | 359 | 407 | 361 | 368 | 359 | 371 |

| Optimización -O1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | media |
|--------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| popcount1 (lenguaje C - for): | 15178 | 13982 | 13979 | 13947 | 13932 | 14057 | 13936 | 14348 | 13990 | 13965 | 13994 | 14013 |
| popcount2 (lenguaje C - while): | 8715 | 8552 | 8568 | 8564 | 8551 | 8556 | 8558 | 8810 | 8548 | 8556 | 8556 | 8582 |
| popcount3 (leng.ASM-body while 4i): | 11078 | 11024 | 11319 | 11056 | 11042 | 11038 | 11041 | 11140 | 11030 | 11044 | 11040 | 11077 |
| popcount4 (leng.ASM-body while 3i): | 10451 | 11646 | 10470 | 10441 | 10449 | 10433 | 10448 | 10563 | 10443 | 10463 | 10450 | 10581 |
| popcount5 (CS:APP2e 3.49-group 8b): | 5768 | 5772 | 5909 | 5771 | 5769 | 5770 | 5768 | 5776 | 5768 | 5772 | 5768 | 5784 |
| popcount6 (Wikipedia- naive - 32b): | 2769 | 2592 | 2588 | 2577 | 2580 | 2585 | 2580 | 2589 | 2579 | 2577 | 2581 | 2583 |
| popcount7 (Wikipedia- naive -128b): | 1478 | 1478 | 1481 | 1483 | 1481 | 1484 | 1480 | 1494 | 1478 | 1485 | 1479 | 1482 |
| popcount8 (asm SSE3 - pshufb 128b): | 1014 | 1012 | 1014 | 1012 | 1008 | 1013 | 1011 | 1732 | 1011 | 1011 | 1010 | 1083 |
| popcount9 (asm SSE4- popcount 32b): | 515 | 627 | 508 | 509 | 536 | 507 | 507 | 508 | 507 | 506 | 507 | 522 |
| popcount10 (asm SSE4- popcount128b): | 359 | 440 | 358 | 360 | 365 | 357 | 362 | 361 | 358 | 358 | 362 | 368 |

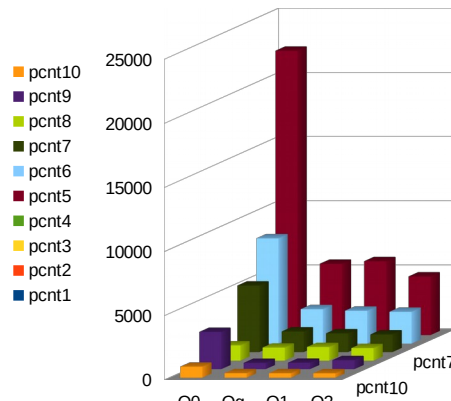
| Optimización -O2 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | media |
|--------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| popcount1 (lenguaje C - for): | 15054 | 14013 | 14083 | 14157 | 14042 | 14667 | 14028 | 14047 | 14037 | 14025 | 14041 | 14114 |
| popcount2 (lenguaje C - while): | 8803 | 8603 | 8580 | 8576 | 8626 | 8802 | 8742 | 9005 | 8586 | 8640 | 10020 | 8818 |
| popcount3 (leng.ASM-body while 4i): | 11175 | 10996 | 11252 | 10967 | 10988 | 10964 | 10986 | 11362 | 11002 | 10960 | 10946 | 11042 |
| popcount4 (leng.ASM-body while 3i): | 10423 | 10743 | 12253 | 10379 | 10384 | 10387 | 10388 | 10504 | 10390 | 10393 | 10376 | 10620 |
| popcount5 (CS:APP2e 3.49-group 8b): | 4797 | 4589 | 4656 | 4581 | 4581 | 4582 | 4582 | 4592 | 4581 | 4580 | 4584 | 4591 |
| popcount6 (Wikipedia- naive - 32b): | 2494 | 2491 | 2495 | 2493 | 2492 | 2511 | 2493 | 2538 | 2491 | 2493 | 2491 | 2499 |
| popcount7 (Wikipedia- naive -128b): | 1393 | 1423 | 1393 | 1393 | 1392 | 1394 | 1394 | 1407 | 1395 | 1397 | 1400 | 1399 |
| popcount8 (asm SSE3 - pshufb 128b): | 984 | 999 | 972 | 1007 | 998 | 1009 | 997 | 993 | 999 | 1001 | 998 | 997 |
| popcount9 (asm SSE4- popcount 32b): | 696 | 701 | 758 | 699 | 860 | 696 | 698 | 696 | 695 | 714 | 695 | 721 |
| popcount10 (asm SSE4- popcount128b): | 359 | 359 | 367 | 359 | 358 | 359 | 358 | 360 | 358 | 363 | 359 | 360 |

| POPCOUNT: | -O0 | -Og | -O1 | -O2 | Ganancias: | -O0 | -Og | -O1 | -O2 | Comentario |
|-----------|-------|-------|-------|-------|------------|-----|-------|-------|-------|---------------------------------------|
| pcnt1 | 81290 | 24238 | 14013 | 14114 | pcnt1 | | | 1,00 | | comparado con el for más rápido |
| pcnt2 | 48486 | 9751 | 8582 | 8818 | pcnt2 | | 1,44 | | | el while es un 70% más rápido |
| pcnt3 | 12354 | 11318 | 11077 | 11042 | pcnt3 | | | 1,27 | | ASM se queda en un 35% |
| pcnt4 | 11515 | 10670 | 10581 | 10620 | pcnt4 | | | 1,32 | | o en un 43% |
| pcnt5 | 22189 | 5580 | 5784 | 4591 | pcnt5 | | | | 3,05 | sumar en grupos 8b sale 3x más rápido |
| pcnt6 | 8226 | 2703 | 2583 | 2499 | pcnt6 | | | | 5,61 | sumar en árbol 6x |
| pcnt7 | 5210 | 1630 | 1482 | 1399 | pcnt7 | | | | 10,02 | lectura 128b sube a 10x |
| pcnt8 | 1210 | 1039 | 1083 | 997 | pcnt8 | | | | 14,05 | SSSE3 sube a 35x más rápido |
| pcnt9 | 2922 | 510 | 522 | 721 | pcnt9 | | | | 19,43 | SSE4 sólo 30x por leer 32b |
| pcnt10 | 879 | 371 | 368 | 360 | pcnt10 | | 37,81 | 38,07 | 38,93 | SSE4 128b sube a 44x |

bucles for/while



sumas en árbol



repertorio multimedia

