**Operating System Project**

*“I confirm that I will keep the content of this project confidential. I confirm that I have not received any unauthorized assistance in preparing for or writing this project. I acknowledge that a mark of 0 may be assigned for copied/plagiarized work.”* Dalibor Loncarevic 104193468, Michel Piljic 104231607

**Implementation**

Note: Additional comments are provided in the program, some parts of the code have been omitted that we have deemed are trivial or do not require explaining.

*#define PAGES 256*

*#define PHY\_MEMORY 65536*

*#define TLB\_SIZE 16*

The following 3 definitions are used for constants in this program

*struct index {*

*int page;*

*int pageTable;*

*int timer;*

*};*

This is used to store each TLB entry, the timer keeps track of when was it last used, page is the logical memory while pageTable is the value in the table.

*int backingstore = open("BACKING\_STORE.bin", O\_RDONLY);*

*FILE \*inputs = fopen (argv[1],"r");*

Opens files for reading

*back = mmap(0, PHY\_MEMORY, PROT\_READ, MAP\_PRIVATE, backingstore, 0);*

the file BACKING\_STORE.bin will be mapped from 0 to 65536, which 256\*256. This access is only read only.

*for (i = 0; i < TLB\_SIZE; i++) {*

*TLB[i].page = -1;*

*TLB[i].pageTable = -1;*

*TLB[i].timer = 0;*

*}*

*for(i = 0; i < PAGES; i++) {*

*pageTable[i] = -1;*

*}*

Initializes all values in the page table and TLB table to -1 to indicate they are empty.

*while (fgets(inputer,sizeof(inputer), inputs) != NULL) {*

this loop runs until there is nothing left to read from the file

*input\_num = atoi(inputer);*

*addresses++;*

*virtual = input\_num & 0xFFFF;*

*offset = input\_num & 0xFF;*

*page = ((virtual & 0xFF00)>>8);*

First the input is converted to an integer and the address variable is incremented to indicate an address has been read. The first address returns only the first 16 bits of the input, giving us the virtual address. The offset only returns the first 8 bits of the address. Lastly, the page number is extracted by getting the leftmost 8 bits from the virtual variable giving us the page number.

*frame = tlb\_check(page);*

*if (frame == -1) {*

*frame = pageTable[page];*

*// if it found the entry in page table add to tlb*

*if (frame != -1) {*

*add\_tlb(page,pageTable[page]);*

*}*

*}*

First the program checks whether the address is in the tlb, if it is not, it checks the page table, if it succeeds, it adds that page and frame into the tlb.

*if (frame == -1) {*

*page\_faults++;*

*frame = free\_page;*

*free\_page++;*

*memcpy(memory + frame\*PAGES,back + page\*PAGES,PAGES);*

*pageTable[page] = frame;*

*add\_tlb(page,pageTable[page]);*

*}*

If both checks in TLB and page table have failed, it increments the page fault variable, sets frame equal to free page, then increments it to the next available page. Then it copies 256 bytes from the backing store into memory. The actual memory will be stored in the memory based on the frame \* 256 while it will be read from page \* 256.

*physical = frame << 8 | offset;*

*value = memory[frame \* PAGES + offset];*

The physical variable is the actual address. It is obtained by left shifting 8 bits and setting the 8 bits against the offset variable. The actual value stored is obtained by accesses the memory array based on the page number and offset. This is a signed value.

*printf("Virtual address: %d Physical Address: %d Value: %d\n",virtual, physical, value);*

*}*

Prints the results and this is the end of the while loop

*printf("Number of Translated Addresses = %d\n", addresses);*

*printf("Page Faults = %d\n", page\_faults);*

*printf("Page Fault rate = %.3f\n", (float)page\_faults/addresses);*

*printf("TLB Hits = %d\n", tlb\_hit);*

*printf("TLB Hit rate = %.3f\n", (float)tlb\_hit/addresses);*

*munmap(back, PHY\_MEMORY);*

*close (backingstore);*

*fclose (inputs);*

*return 0;*

*}*

This prints the statistics obtained from this sample run and closes all the files and un maps the backing store. The return 0 ends the program

*int tlb\_check (uint8\_t reference) {*

*int answer = -1;*

*for (int i=0; i<TLB\_SIZE; i++) {*

*if (reference == TLB[i].page) {*

*tlb\_hit++;*

*answer = TLB[i].pageTable;*

*TLB[i].timer = 0;*

*}*

*else {*

*TLB[i].timer++;*

*}*

*}*

*return answer;*

*}*

This following function checks if there is a TLB hit, it runs through the entire TLB table, if there is not, it increases the timer by 1. If there is a hit, it increments the tlb\_hit variable to indicate it has found the value, resets the timer and sets answer equal to the value in the pageTable. Then the function returns -1 if found or the value of the pagetable if found.

*void add\_tlb (uint8\_t page, int pageTable) {*

*int max = 0;*

*for (int i = 0; i < TLB\_SIZE; i++) {*

*if (TLB[i].page == -1) {*

*TLB[i].page = page;*

*TLB[i].pageTable = pageTable;*

*TLB[i].timer = 0;*

*return;*

*}*

*}*

*for (int i = 0; i < TLB\_SIZE; i++) {*

*if (TLB[i].timer > max) {*

*max = TLB[i].timer;*

*}*

*}*

*for (int i = 0; i < TLB\_SIZE; i++) {*

*if (max == TLB[i].timer) {*

*TLB[i].page = page;*

*TLB[i].pageTable = pageTable;*

*TLB[i].timer = 0;*

*return;*

*}*

*}*

*}*

This function first checks if any entries in the TLB are empty (-1). If they are, it places the values in them and terminates. If they are full, it runs through the TLB and finds the largest time. Once it does that, it runs through the TLB again and replaces the TLB entry with the timer that matches, then it terminates.

**Statistics**

Number of Translated Addresses = 1000

Page Faults = 244

Page Fault rate = 0.244

TLB Hits = 55

TLB Hit rate = 0.055

The page fault rate is very high since it is a demand paging system. In this scenario, the memory started empty which means that for every entry that was not in the page table it had to be loaded in. However, once it was loaded into the memory, it would be readily accessed since there was no need for page replacements. This means that initially, it would operate very slow but as more addresses were loaded into memory the efficiency improved.

TLB hit rate is rather low. We had used an LRU replacement policy where the TLB with the highest value on the timer was replaced. Due to the random distribution of the given addresses, this is not an accurate simulation of a real-life scenario since there are processes that demand memory much more often than in this case scenario. Like the page table, it starts off empty at first and then must be populated. Due to the random distribution of this address sample, the incoming addresses did not follow an order, leading to many TLB replacements that lowered performance to only 0.055.

**Input/output**

(all results are in finalproject.txt)

loncare@bravo:~/Operating System Project$ cc project.c

loncare@bravo:~/Operating System Project$ ./a.out addresses.txt

Virtual address: 16916 Physical Address: 20 Value: 0

Virtual address: 62493 Physical Address: 285 Value: 0

Virtual address: 30198 Physical Address: 758 Value: 29

Virtual address: 53683 Physical Address: 947 Value: 108

Virtual address: 40185 Physical Address: 1273 Value: 0

Virtual address: 28781 Physical Address: 1389 Value: 0

Virtual address: 24462 Physical Address: 1678 Value: 23

Virtual address: 48399 Physical Address: 1807 Value: 67

Virtual address: 64815 Physical Address: 2095 Value: 75

Virtual address: 18295 Physical Address: 2423 Value: -35

Virtual address: 12218 Physical Address: 2746 Value: 11

Virtual address: 22760 Physical Address: 3048 Value: 0

Virtual address: 57982 Physical Address: 3198 Value: 56

Virtual address: 27966 Physical Address: 3390 Value: 27

Virtual address: 54894 Physical Address: 3694 Value: 53

Virtual address: 38929 Physical Address: 3857 Value: 0

Virtual address: 32865 Physical Address: 4193 Value: 0

Virtual address: 64243 Physical Address: 4595 Value: -68

Virtual address: 2315 Physical Address: 4619 Value: 66

Virtual address: 64454 Physical Address: 5062 Value: 62

Virtual address: 55041 Physical Address: 5121 Value: 0

Virtual address: 18633 Physical Address: 5577 Value: 0

Virtual address: 14557 Physical Address: 5853 Value: 0

Virtual address: 61006 Physical Address: 5966 Value: 59

Virtual address: 62615 Physical Address: 407 Value: 37

Virtual address: 7591 Physical Address: 6311 Value: 105

Virtual address: 64747 Physical Address: 6635 Value: 58

Virtual address: 6727 Physical Address: 6727 Value: -111

Virtual address: 32315 Physical Address: 6971 Value: -114

Virtual address: 60645 Physical Address: 7397 Value: 0

Virtual address: 6308 Physical Address: 7588 Value: 0

Virtual address: 45688 Physical Address: 7800 Value: 0

Virtual address: 969 Physical Address: 8137 Value: 0

Virtual address: 40891 Physical Address: 8379 Value: -18

Virtual address: 49294 Physical Address: 8590 Value: 48

Virtual address: 41118 Physical Address: 8862 Value: 40

Virtual address: 21395 Physical Address: 9107 Value: -28

Virtual address: 6091 Physical Address: 9419 Value: -14

Virtual address: 32541 Physical Address: 9501 Value: 0

Virtual address: 17665 Physical Address: 9729 Value: 0

Virtual address: 3784 Physical Address: 10184 Value: 0

Virtual address: 28718 Physical Address: 1326 Value: 28

Virtual address: 59240 Physical Address: 10344 Value: 0

Virtual address: 40178 Physical Address: 1266 Value: 39

Virtual address: 60086 Physical Address: 10678 Value: 58

Virtual address: 42252 Physical Address: 10764 Value: 0

Virtual address: 44770 Physical Address: 11234 Value: 43

Virtual address: 22514 Physical Address: 11506 Value: 21

Virtual address: 3067 Physical Address: 11771 Value: -2

Virtual address: 15757 Physical Address: 11917 Value: 0

Virtual address: 31649 Physical Address: 12193 Value: 0

Virtual address: 10842 Physical Address: 12378 Value: 10

Virtual address: 43765 Physical Address: 12789 Value: 0

Virtual address: 33405 Physical Address: 12925 Value: 0

Virtual address: 44954 Physical Address: 13210 Value: 43

Virtual address: 56657 Physical Address: 13393 Value: 0

Virtual address: 5003 Physical Address: 13707 Value: -30

Virtual address: 50227 Physical Address: 13875 Value: 12

Virtual address: 19358 Physical Address: 14238 Value: 18

Virtual address: 36529 Physical Address: 14513 Value: 0

Virtual address: 10392 Physical Address: 14744 Value: 0

Virtual address: 58882 Physical Address: 14850 Value: 57

Virtual address: 5129 Physical Address: 15113 Value: 0

Virtual address: 58554 Physical Address: 15546 Value: 57

Virtual address: 58584 Physical Address: 15576 Value: 0

Virtual address: 27444 Physical Address: 15668 Value: 0

Virtual address: 58982 Physical Address: 14950 Value: 57

Virtual address: 51476 Physical Address: 15892 Value: 0

Virtual address: 6796 Physical Address: 6796 Value: 0

Virtual address: 21311 Physical Address: 9023 Value: -49

Virtual address: 30705 Physical Address: 16369 Value: 0

Virtual address: 28964 Physical Address: 16420 Value: 0

Virtual address: 41003 Physical Address: 8747 Value: 10

Virtual address: 20259 Physical Address: 16675 Value: -56

Virtual address: 57857 Physical Address: 3073 Value: 0

Virtual address: 63258 Physical Address: 16922 Value: 61

Virtual address: 36374 Physical Address: 14358 Value: 35

Virtual address: 692 Physical Address: 17332 Value: 0

Virtual address: 43121 Physical Address: 17521 Value: 0

Virtual address: 48128 Physical Address: 17664 Value: 0

Virtual address: 34561 Physical Address: 17921 Value: 0

Virtual address: 49213 Physical Address: 8509 Value: 0

Virtual address: 36922 Physical Address: 18234 Value: 36

Virtual address: 59162 Physical Address: 10266 Value: 57

Virtual address: 50552 Physical Address: 18552 Value: 0

Virtual address: 17866 Physical Address: 9930 Value: 17

Virtual address: 18145 Physical Address: 18913 Value: 0

Virtual address: 3884 Physical Address: 18988 Value: 0

Virtual address: 54388 Physical Address: 19316 Value: 0

Virtual address: 42932 Physical Address: 19636 Value: 0

Virtual address: 46919 Physical Address: 19783 Value: -47

Virtual address: 58892 Physical Address: 14860 Value: 0

Virtual address: 8620 Physical Address: 20140 Value: 0

Virtual address: 38336 Physical Address: 20416 Value: 0

Virtual address: 64357 Physical Address: 4965 Value: 0

Virtual address: 23387 Physical Address: 20571 Value: -42

Virtual address: 42632 Physical Address: 20872 Value: 0

Virtual address: 15913 Physical Address: 21033 Value: 0

Virtual address: 15679 Physical Address: 11839 Value: 79

Virtual address: 22501 Physical Address: 11493 Value: 0

Virtual address: 37540 Physical Address: 21412 Value: 0

Virtual address: 5527 Physical Address: 21655 Value: 101

Virtual address: 63921 Physical Address: 21937 Value: 0

Virtual address: 62716 Physical Address: 508 Value: 0

Virtual address: 32874 Physical Address: 4202 Value: 32

Virtual address: 64390 Physical Address: 4998 Value: 62

Virtual address: 63101 Physical Address: 22141 Value: 0

Virtual address: 61802 Physical Address: 22378 Value: 60

Virtual address: 19648 Physical Address: 22720 Value: 0

Virtual address: 29031 Physical Address: 16487 Value: 89

Virtual address: 44981 Physical Address: 13237 Value: 0

Virtual address: 28092 Physical Address: 3516 Value: 0

Virtual address: 9448 Physical Address: 23016 Value: 0

Virtual address: 44744 Physical Address: 11208 Value: 0

Virtual address: 61496 Physical Address: 23096 Value: 0

Virtual address: 31453 Physical Address: 23517 Value: 0

Virtual address: 60746 Physical Address: 23626 Value: 59

Virtual address: 12199 Physical Address: 2727 Value: -23

Virtual address: 62255 Physical Address: 23855 Value: -53

Virtual address: 21793 Physical Address: 24097 Value: 0

Virtual address: 26544 Physical Address: 24496 Value: 0

Virtual address: 14964 Physical Address: 24692 Value: 0

Virtual address: 41462 Physical Address: 25078 Value: 40

Virtual address: 56089 Physical Address: 25113 Value: 0

Virtual address: 52038 Physical Address: 25414 Value: 50

Virtual address: 47982 Physical Address: 25710 Value: 46

Virtual address: 59484 Physical Address: 25948 Value: 0

Virtual address: 50924 Physical Address: 26348 Value: 0

Virtual address: 6942 Physical Address: 26398 Value: 6

Virtual address: 34998 Physical Address: 26806 Value: 34

Virtual address: 27069 Physical Address: 27069 Value: 0

Virtual address: 51926 Physical Address: 27350 Value: 50

Virtual address: 60645 Physical Address: 7397 Value: 0

Virtual address: 43181 Physical Address: 17581 Value: 0

Virtual address: 10559 Physical Address: 27455 Value: 79

Virtual address: 4664 Physical Address: 27704 Value: 0

Virtual address: 28578 Physical Address: 28066 Value: 27

Virtual address: 59516 Physical Address: 25980 Value: 0

Virtual address: 38912 Physical Address: 3840 Value: 0

Virtual address: 63562 Physical Address: 28234 Value: 62

Virtual address: 64846 Physical Address: 2126 Value: 63

Virtual address: 62938 Physical Address: 28634 Value: 61

Virtual address: 27194 Physical Address: 28730 Value: 26

Virtual address: 28804 Physical Address: 1412 Value: 0

Virtual address: 61703 Physical Address: 22279 Value: 65

Virtual address: 10998 Physical Address: 12534 Value: 10

Virtual address: 6596 Physical Address: 29124 Value: 0

Virtual address: 37721 Physical Address: 29273 Value: 0

Virtual address: 43430 Physical Address: 29606 Value: 42

Virtual address: 22692 Physical Address: 2980 Value: 0

Virtual address: 62971 Physical Address: 28667 Value: 126

Virtual address: 47125 Physical Address: 29717 Value: 0

Virtual address: 52521 Physical Address: 29993 Value: 0

Virtual address: 34646 Physical Address: 18006 Value: 33

Virtual address: 32889 Physical Address: 4217 Value: 0

Virtual address: 13055 Physical Address: 30463 Value: -65

Virtual address: 65416 Physical Address: 30600 Value: 0

Virtual address: 62869 Physical Address: 28565 Value: 0

Virtual address: 57314 Physical Address: 30946 Value: 55

Virtual address: 12659 Physical Address: 31091 Value: 92

Virtual address: 14052 Physical Address: 31460 Value: 0

Virtual address: 32956 Physical Address: 4284 Value: 0

Virtual address: 49273 Physical Address: 8569 Value: 0

Virtual address: 50352 Physical Address: 14000 Value: 0

Virtual address: 49737 Physical Address: 31561 Value: 0

Virtual address: 15555 Physical Address: 31939 Value: 48

Virtual address: 47475 Physical Address: 32115 Value: 92

Virtual address: 15328 Physical Address: 32480 Value: 0

Virtual address: 34621 Physical Address: 17981 Value: 0

Virtual address: 51365 Physical Address: 32677 Value: 0

Virtual address: 32820 Physical Address: 4148 Value: 0

Virtual address: 48855 Physical Address: 32983 Value: -75

Virtual address: 12224 Physical Address: 2752 Value: 0

Virtual address: 2035 Physical Address: 33267 Value: -4

Virtual address: 60539 Physical Address: 7291 Value: 30

Virtual address: 14595 Physical Address: 33283 Value: 64

Virtual address: 13853 Physical Address: 31261 Value: 0

Virtual address: 24143 Physical Address: 33615 Value: -109

Virtual address: 15216 Physical Address: 32368 Value: 0

Virtual address: 8113 Physical Address: 33969 Value: 0

Virtual address: 22640 Physical Address: 2928 Value: 0

Virtual address: 32978 Physical Address: 4306 Value: 32

Virtual address: 39151 Physical Address: 4079 Value: 59

Virtual address: 19520 Physical Address: 22592 Value: 0

Virtual address: 58141 Physical Address: 34077 Value: 0

Virtual address: 63959 Physical Address: 21975 Value: 117

Virtual address: 53040 Physical Address: 34352 Value: 0

Virtual address: 55842 Physical Address: 34594 Value: 54

Virtual address: 585 Physical Address: 17225 Value: 0

Virtual address: 51229 Physical Address: 32541 Value: 0

Virtual address: 64181 Physical Address: 4533 Value: 0

Virtual address: 54879 Physical Address: 3679 Value: -105

Virtual address: 28210 Physical Address: 34866 Value: 27

Virtual address: 10268 Physical Address: 14620 Value: 0

Virtual address: 15395 Physical Address: 31779 Value: 8

Virtual address: 12884 Physical Address: 30292 Value: 0

Virtual address: 2149 Physical Address: 35173 Value: 0

Virtual address: 53483 Physical Address: 35563 Value: 58

Virtual address: 59606 Physical Address: 26070 Value: 58

Virtual address: 14981 Physical Address: 24709 Value: 0

Virtual address: 36672 Physical Address: 35648 Value: 0

Virtual address: 23197 Physical Address: 35997 Value: 0

Virtual address: 36518 Physical Address: 14502 Value: 35

Virtual address: 13361 Physical Address: 36145 Value: 0

Virtual address: 19810 Physical Address: 36450 Value: 19

Virtual address: 25955 Physical Address: 36707 Value: 88

Virtual address: 62678 Physical Address: 470 Value: 61

Virtual address: 26021 Physical Address: 36773 Value: 0

Virtual address: 29409 Physical Address: 37089 Value: 0

Virtual address: 38111 Physical Address: 37343 Value: 55

Virtual address: 58573 Physical Address: 15565 Value: 0

Virtual address: 56840 Physical Address: 37384 Value: 0

Virtual address: 41306 Physical Address: 24922 Value: 40

Virtual address: 54426 Physical Address: 19354 Value: 53

Virtual address: 3617 Physical Address: 10017 Value: 0

Virtual address: 50652 Physical Address: 18652 Value: 0

Virtual address: 41452 Physical Address: 25068 Value: 0

Virtual address: 20241 Physical Address: 16657 Value: 0

Virtual address: 31723 Physical Address: 12267 Value: -6

Virtual address: 53747 Physical Address: 1011 Value: 124

Virtual address: 28550 Physical Address: 28038 Value: 27

Virtual address: 23402 Physical Address: 20586 Value: 22

Virtual address: 21205 Physical Address: 37845 Value: 0

Virtual address: 56181 Physical Address: 25205 Value: 0

Virtual address: 57470 Physical Address: 38014 Value: 56

Virtual address: 39933 Physical Address: 38397 Value: 0

Virtual address: 34964 Physical Address: 26772 Value: 0

Virtual address: 24781 Physical Address: 38605 Value: 0

Virtual address: 41747 Physical Address: 38675 Value: -60

Virtual address: 62564 Physical Address: 356 Value: 0

Virtual address: 58461 Physical Address: 15453 Value: 0

Virtual address: 20858 Physical Address: 39034 Value: 20

Virtual address: 49301 Physical Address: 8597 Value: 0

Virtual address: 40572 Physical Address: 39292 Value: 0

Virtual address: 23840 Physical Address: 39456 Value: 0

Virtual address: 35278 Physical Address: 39886 Value: 34

Virtual address: 62905 Physical Address: 28601 Value: 0

Virtual address: 56650 Physical Address: 13386 Value: 55

Virtual address: 11149 Physical Address: 40077 Value: 0

Virtual address: 38920 Physical Address: 3848 Value: 0

Virtual address: 23430 Physical Address: 20614 Value: 22

Virtual address: 57592 Physical Address: 38136 Value: 0

Virtual address: 3080 Physical Address: 40200 Value: 0

Virtual address: 6677 Physical Address: 6677 Value: 0

Virtual address: 50704 Physical Address: 26128 Value: 0

Virtual address: 51883 Physical Address: 27307 Value: -86

Virtual address: 62799 Physical Address: 28495 Value: 83

Virtual address: 20188 Physical Address: 40668 Value: 0

Virtual address: 1245 Physical Address: 40925 Value: 0

Virtual address: 12220 Physical Address: 2748 Value: 0

Virtual address: 17602 Physical Address: 41154 Value: 17

Virtual address: 28609 Physical Address: 28097 Value: 0

Virtual address: 42694 Physical Address: 20934 Value: 41

Virtual address: 29826 Physical Address: 41346 Value: 29

Virtual address: 13827 Physical Address: 31235 Value: -128

Virtual address: 27336 Physical Address: 28872 Value: 0

Virtual address: 53343 Physical Address: 35423 Value: 23

Virtual address: 11533 Physical Address: 41485 Value: 0

Virtual address: 41713 Physical Address: 41969 Value: 0

Virtual address: 33890 Physical Address: 42082 Value: 33

Virtual address: 4894 Physical Address: 13598 Value: 4

Virtual address: 57599 Physical Address: 38143 Value: 63

Virtual address: 3870 Physical Address: 18974 Value: 3

Virtual address: 58622 Physical Address: 15614 Value: 57

Virtual address: 29780 Physical Address: 41300 Value: 0

Virtual address: 62553 Physical Address: 345 Value: 0

Virtual address: 2303 Physical Address: 35327 Value: 63

Virtual address: 51915 Physical Address: 27339 Value: -78

Virtual address: 6251 Physical Address: 7531 Value: 26

Virtual address: 38107 Physical Address: 37339 Value: 54

Virtual address: 59325 Physical Address: 10429 Value: 0

Virtual address: 61295 Physical Address: 42351 Value: -37

Virtual address: 26699 Physical Address: 42571 Value: 18

Virtual address: 51188 Physical Address: 42996 Value: 0

Virtual address: 59519 Physical Address: 25983 Value: 31

Virtual address: 7345 Physical Address: 43185 Value: 0

Virtual address: 20325 Physical Address: 16741 Value: 0

Virtual address: 39633 Physical Address: 43473 Value: 0

Virtual address: 1562 Physical Address: 43546 Value: 1

Virtual address: 7580 Physical Address: 6300 Value: 0

Virtual address: 8170 Physical Address: 34026 Value: 7

Virtual address: 62256 Physical Address: 23856 Value: 0

Virtual address: 35823 Physical Address: 44015 Value: -5

Virtual address: 27790 Physical Address: 44174 Value: 27

Virtual address: 13191 Physical Address: 44423 Value: -31

Virtual address: 9772 Physical Address: 44588 Value: 0

Virtual address: 7477 Physical Address: 6197 Value: 0

Virtual address: 44455 Physical Address: 44967 Value: 105

Virtual address: 59546 Physical Address: 26010 Value: 58

Virtual address: 49347 Physical Address: 8643 Value: 48

Virtual address: 36539 Physical Address: 14523 Value: -82

Virtual address: 12453 Physical Address: 45221 Value: 0

Virtual address: 49640 Physical Address: 45544 Value: 0

Virtual address: 28290 Physical Address: 34946 Value: 27

Virtual address: 44817 Physical Address: 13073 Value: 0

Virtual address: 8565 Physical Address: 20085 Value: 0

Virtual address: 16399 Physical Address: 45583 Value: 3

Virtual address: 41934 Physical Address: 38862 Value: 40

Virtual address: 45457 Physical Address: 45969 Value: 0

Virtual address: 33856 Physical Address: 42048 Value: 0

Virtual address: 19498 Physical Address: 22570 Value: 19

Virtual address: 17661 Physical Address: 41213 Value: 0

Virtual address: 63829 Physical Address: 21845 Value: 0

Virtual address: 42034 Physical Address: 46130 Value: 41

Virtual address: 28928 Physical Address: 16384 Value: 0

Virtual address: 30711 Physical Address: 16375 Value: -3

Virtual address: 8800 Physical Address: 46432 Value: 0

Virtual address: 52335 Physical Address: 46703 Value: 27

Virtual address: 38775 Physical Address: 46967 Value: -35

Virtual address: 52704 Physical Address: 30176 Value: 0

Virtual address: 24380 Physical Address: 1596 Value: 0

Virtual address: 19602 Physical Address: 22674 Value: 19

Virtual address: 57998 Physical Address: 3214 Value: 56

Virtual address: 2919 Physical Address: 11623 Value: -39

Virtual address: 8362 Physical Address: 47274 Value: 8

Virtual address: 17884 Physical Address: 9948 Value: 0

Virtual address: 45737 Physical Address: 7849 Value: 0

Virtual address: 47894 Physical Address: 25622 Value: 46

Virtual address: 59667 Physical Address: 47379 Value: 68

Virtual address: 10385 Physical Address: 14737 Value: 0

Virtual address: 52782 Physical Address: 47662 Value: 51

Virtual address: 64416 Physical Address: 5024 Value: 0

Virtual address: 40946 Physical Address: 8434 Value: 39

Virtual address: 16778 Physical Address: 48010 Value: 16

Virtual address: 27159 Physical Address: 28695 Value: -123

Virtual address: 24324 Physical Address: 1540 Value: 0

Virtual address: 32450 Physical Address: 7106 Value: 31

Virtual address: 9108 Physical Address: 48276 Value: 0

Virtual address: 65305 Physical Address: 30489 Value: 0

Virtual address: 19575 Physical Address: 22647 Value: 29

Virtual address: 11117 Physical Address: 40045 Value: 0

Virtual address: 65170 Physical Address: 48530 Value: 63

Virtual address: 58013 Physical Address: 3229 Value: 0

Virtual address: 61676 Physical Address: 23276 Value: 0

Virtual address: 63510 Physical Address: 28182 Value: 62

Virtual address: 17458 Physical Address: 41010 Value: 17

Virtual address: 54675 Physical Address: 48787 Value: 100

Virtual address: 1713 Physical Address: 43697 Value: 0

Virtual address: 55105 Physical Address: 5185 Value: 0

Virtual address: 65321 Physical Address: 30505 Value: 0

Virtual address: 45278 Physical Address: 49118 Value: 44

Virtual address: 26256 Physical Address: 49296 Value: 0

Virtual address: 64198 Physical Address: 4550 Value: 62

Virtual address: 29441 Physical Address: 49409 Value: 0

Virtual address: 1928 Physical Address: 33160 Value: 0

Virtual address: 39425 Physical Address: 43265 Value: 0

Virtual address: 32000 Physical Address: 49664 Value: 0

Virtual address: 28549 Physical Address: 28037 Value: 0

Virtual address: 46295 Physical Address: 50135 Value: 53

Virtual address: 22772 Physical Address: 3060 Value: 0

Virtual address: 58228 Physical Address: 34164 Value: 0

Virtual address: 63525 Physical Address: 28197 Value: 0

Virtual address: 32602 Physical Address: 9562 Value: 31

Virtual address: 46195 Physical Address: 50035 Value: 28

Virtual address: 55849 Physical Address: 34601 Value: 0

Virtual address: 46454 Physical Address: 50294 Value: 45

Virtual address: 7487 Physical Address: 6207 Value: 79

Virtual address: 33879 Physical Address: 42071 Value: 21

Virtual address: 42004 Physical Address: 46100 Value: 0

Virtual address: 8599 Physical Address: 20119 Value: 101

Virtual address: 18641 Physical Address: 5585 Value: 0

Virtual address: 49015 Physical Address: 50551 Value: -35

Virtual address: 26830 Physical Address: 42702 Value: 26

Virtual address: 34754 Physical Address: 18114 Value: 33

Virtual address: 14668 Physical Address: 33356 Value: 0

Virtual address: 38362 Physical Address: 20442 Value: 37

Virtual address: 38791 Physical Address: 46983 Value: -31

Virtual address: 4171 Physical Address: 50763 Value: 18

Virtual address: 45975 Physical Address: 51095 Value: -27

Virtual address: 14623 Physical Address: 33311 Value: 71

Virtual address: 62393 Physical Address: 23993 Value: 0

Virtual address: 64658 Physical Address: 6546 Value: 63

Virtual address: 10963 Physical Address: 12499 Value: -76

Virtual address: 9058 Physical Address: 48226 Value: 8

Virtual address: 51031 Physical Address: 42839 Value: -43

Virtual address: 32425 Physical Address: 7081 Value: 0

Virtual address: 45483 Physical Address: 45995 Value: 106

Virtual address: 44611 Physical Address: 11075 Value: -112

Virtual address: 63664 Physical Address: 28336 Value: 0

Virtual address: 54920 Physical Address: 3720 Value: 0

Virtual address: 7663 Physical Address: 6383 Value: 123

Virtual address: 56480 Physical Address: 51360 Value: 0

Virtual address: 1489 Physical Address: 51665 Value: 0

Virtual address: 28438 Physical Address: 27926 Value: 27

Virtual address: 65449 Physical Address: 30633 Value: 0

Virtual address: 12441 Physical Address: 45209 Value: 0

Virtual address: 58530 Physical Address: 15522 Value: 57

Virtual address: 63570 Physical Address: 28242 Value: 62

Virtual address: 26251 Physical Address: 49291 Value: -94

Virtual address: 15972 Physical Address: 21092 Value: 0

Virtual address: 35826 Physical Address: 44018 Value: 34

Virtual address: 5491 Physical Address: 21619 Value: 92

Virtual address: 54253 Physical Address: 51949 Value: 0

Virtual address: 49655 Physical Address: 45559 Value: 125

Virtual address: 5868 Physical Address: 52204 Value: 0

Virtual address: 20163 Physical Address: 40643 Value: -80

Virtual address: 51079 Physical Address: 42887 Value: -31

Virtual address: 21398 Physical Address: 9110 Value: 20

Virtual address: 32756 Physical Address: 9716 Value: 0

Virtual address: 64196 Physical Address: 4548 Value: 0

Virtual address: 43218 Physical Address: 17618 Value: 42

Virtual address: 21583 Physical Address: 52303 Value: 19

Virtual address: 25086 Physical Address: 52734 Value: 24

Virtual address: 45515 Physical Address: 46027 Value: 114

Virtual address: 12893 Physical Address: 30301 Value: 0

Virtual address: 22914 Physical Address: 52866 Value: 22

Virtual address: 58969 Physical Address: 14937 Value: 0

Virtual address: 20094 Physical Address: 40574 Value: 19

Virtual address: 13730 Physical Address: 53154 Value: 13

Virtual address: 44059 Physical Address: 53275 Value: 6

Virtual address: 28931 Physical Address: 16387 Value: 64

Virtual address: 13533 Physical Address: 36317 Value: 0

Virtual address: 33134 Physical Address: 53614 Value: 32

Virtual address: 28483 Physical Address: 27971 Value: -48

Virtual address: 1220 Physical Address: 40900 Value: 0

Virtual address: 38174 Physical Address: 20254 Value: 37

Virtual address: 53502 Physical Address: 35582 Value: 52

Virtual address: 43328 Physical Address: 29504 Value: 0

Virtual address: 4970 Physical Address: 13674 Value: 4

Virtual address: 8090 Physical Address: 33946 Value: 7

Virtual address: 2661 Physical Address: 53861 Value: 0

Virtual address: 53903 Physical Address: 54159 Value: -93

Virtual address: 11025 Physical Address: 39953 Value: 0

Virtual address: 26627 Physical Address: 42499 Value: 0

Virtual address: 18117 Physical Address: 18885 Value: 0

Virtual address: 14505 Physical Address: 5801 Value: 0

Virtual address: 61528 Physical Address: 23128 Value: 0

Virtual address: 20423 Physical Address: 16839 Value: -15

Virtual address: 26962 Physical Address: 26962 Value: 26

Virtual address: 36392 Physical Address: 14376 Value: 0

Virtual address: 11365 Physical Address: 54373 Value: 0

Virtual address: 50882 Physical Address: 26306 Value: 49

Virtual address: 41668 Physical Address: 41924 Value: 0

Virtual address: 30497 Physical Address: 16161 Value: 0

Virtual address: 36216 Physical Address: 54648 Value: 0

Virtual address: 5619 Physical Address: 21747 Value: 124

Virtual address: 36983 Physical Address: 18295 Value: 29

Virtual address: 59557 Physical Address: 26021 Value: 0

Virtual address: 36663 Physical Address: 35639 Value: -51

Virtual address: 36436 Physical Address: 14420 Value: 0

Virtual address: 37057 Physical Address: 18369 Value: 0

Virtual address: 23585 Physical Address: 54817 Value: 0

Virtual address: 58791 Physical Address: 55207 Value: 105

Virtual address: 46666 Physical Address: 55370 Value: 45

Virtual address: 64475 Physical Address: 5083 Value: -10

Virtual address: 21615 Physical Address: 52335 Value: 27

Virtual address: 41090 Physical Address: 8834 Value: 40

Virtual address: 1771 Physical Address: 43755 Value: -70

Virtual address: 47513 Physical Address: 32153 Value: 0

Virtual address: 39338 Physical Address: 55722 Value: 38

Virtual address: 1390 Physical Address: 51566 Value: 1

Virtual address: 38772 Physical Address: 46964 Value: 0

Virtual address: 58149 Physical Address: 34085 Value: 0

Virtual address: 7196 Physical Address: 43036 Value: 0

Virtual address: 9123 Physical Address: 48291 Value: -24

Virtual address: 7491 Physical Address: 6211 Value: 80

Virtual address: 62616 Physical Address: 408 Value: 0

Virtual address: 15436 Physical Address: 31820 Value: 0

Virtual address: 17491 Physical Address: 41043 Value: 20

Virtual address: 53656 Physical Address: 920 Value: 0

Virtual address: 26449 Physical Address: 24401 Value: 0

Virtual address: 34935 Physical Address: 26743 Value: 29

Virtual address: 19864 Physical Address: 36504 Value: 0

Virtual address: 51388 Physical Address: 32700 Value: 0

Virtual address: 15155 Physical Address: 32307 Value: -52

Virtual address: 64775 Physical Address: 2055 Value: 65

Virtual address: 47969 Physical Address: 25697 Value: 0

Virtual address: 16315 Physical Address: 55995 Value: -18

Virtual address: 1342 Physical Address: 51518 Value: 1

Virtual address: 51185 Physical Address: 42993 Value: 0

Virtual address: 6043 Physical Address: 9371 Value: -26

Virtual address: 21398 Physical Address: 9110 Value: 20

Virtual address: 3273 Physical Address: 40393 Value: 0

Virtual address: 9370 Physical Address: 22938 Value: 9

Virtual address: 35463 Physical Address: 56199 Value: -95

Virtual address: 28205 Physical Address: 34861 Value: 0

Virtual address: 2351 Physical Address: 4655 Value: 75

Virtual address: 28999 Physical Address: 16455 Value: 81

Virtual address: 47699 Physical Address: 56403 Value: -108

Virtual address: 46870 Physical Address: 19734 Value: 45

Virtual address: 22311 Physical Address: 11303 Value: -55

Virtual address: 22124 Physical Address: 56684 Value: 0

Virtual address: 22427 Physical Address: 11419 Value: -26

Virtual address: 49344 Physical Address: 8640 Value: 0

Virtual address: 23224 Physical Address: 36024 Value: 0

Virtual address: 5514 Physical Address: 21642 Value: 5

Virtual address: 20504 Physical Address: 56856 Value: 0

Virtual address: 376 Physical Address: 57208 Value: 0

Virtual address: 2014 Physical Address: 33246 Value: 1

Virtual address: 38700 Physical Address: 46892 Value: 0

Virtual address: 13098 Physical Address: 44330 Value: 12

Virtual address: 62435 Physical Address: 24035 Value: -8

Virtual address: 48046 Physical Address: 25774 Value: 46

Virtual address: 63464 Physical Address: 17128 Value: 0

Virtual address: 12798 Physical Address: 31230 Value: 12

Virtual address: 51178 Physical Address: 42986 Value: 49

Virtual address: 8627 Physical Address: 20147 Value: 108

Virtual address: 27083 Physical Address: 27083 Value: 114

Virtual address: 47198 Physical Address: 29790 Value: 46

Virtual address: 44021 Physical Address: 57589 Value: 0

Virtual address: 32792 Physical Address: 4120 Value: 0

Virtual address: 43996 Physical Address: 57564 Value: 0

Virtual address: 41126 Physical Address: 8870 Value: 40

Virtual address: 64244 Physical Address: 4596 Value: 0

Virtual address: 37047 Physical Address: 18359 Value: 45

Virtual address: 60281 Physical Address: 57721 Value: 0

Virtual address: 52904 Physical Address: 47784 Value: 0

Virtual address: 7768 Physical Address: 57944 Value: 0

Virtual address: 55359 Physical Address: 58175 Value: 15

Virtual address: 3230 Physical Address: 40350 Value: 3

Virtual address: 44813 Physical Address: 13069 Value: 0

Virtual address: 4116 Physical Address: 50708 Value: 0

Virtual address: 65222 Physical Address: 48582 Value: 63

Virtual address: 28083 Physical Address: 3507 Value: 108

Virtual address: 60660 Physical Address: 7412 Value: 0

Virtual address: 39 Physical Address: 58407 Value: 9

Virtual address: 328 Physical Address: 57160 Value: 0

Virtual address: 47868 Physical Address: 56572 Value: 0

Virtual address: 13009 Physical Address: 30417 Value: 0

Virtual address: 22378 Physical Address: 11370 Value: 21

Virtual address: 39304 Physical Address: 55688 Value: 0

Virtual address: 11171 Physical Address: 40099 Value: -24

Virtual address: 8079 Physical Address: 33935 Value: -29

Virtual address: 52879 Physical Address: 47759 Value: -93

Virtual address: 5123 Physical Address: 15107 Value: 0

Virtual address: 4356 Physical Address: 58628 Value: 0

Virtual address: 45745 Physical Address: 7857 Value: 0

Virtual address: 32952 Physical Address: 4280 Value: 0

Virtual address: 4657 Physical Address: 27697 Value: 0

Virtual address: 24142 Physical Address: 33614 Value: 23

Virtual address: 23319 Physical Address: 20503 Value: -59

Virtual address: 13607 Physical Address: 53031 Value: 73

Virtual address: 46304 Physical Address: 50144 Value: 0

Virtual address: 17677 Physical Address: 9741 Value: 0

Virtual address: 59691 Physical Address: 47403 Value: 74

Virtual address: 50967 Physical Address: 42775 Value: -59

Virtual address: 7817 Physical Address: 57993 Value: 0

Virtual address: 8545 Physical Address: 20065 Value: 0

Virtual address: 55297 Physical Address: 58113 Value: 0

Virtual address: 52954 Physical Address: 47834 Value: 51

Virtual address: 39720 Physical Address: 38184 Value: 0

Virtual address: 18455 Physical Address: 5399 Value: 5

Virtual address: 30349 Physical Address: 59021 Value: 0

Virtual address: 63270 Physical Address: 16934 Value: 61

Virtual address: 27156 Physical Address: 28692 Value: 0

Virtual address: 20614 Physical Address: 56966 Value: 20

Virtual address: 19372 Physical Address: 14252 Value: 0

Virtual address: 48689 Physical Address: 32817 Value: 0

Virtual address: 49386 Physical Address: 8682 Value: 48

Virtual address: 50584 Physical Address: 18584 Value: 0

Virtual address: 51936 Physical Address: 27360 Value: 0

Virtual address: 34705 Physical Address: 18065 Value: 0

Virtual address: 13653 Physical Address: 53077 Value: 0

Virtual address: 50077 Physical Address: 59293 Value: 0

Virtual address: 54518 Physical Address: 19446 Value: 53

Virtual address: 41482 Physical Address: 41738 Value: 40

Virtual address: 4169 Physical Address: 50761 Value: 0

Virtual address: 36118 Physical Address: 54550 Value: 35

Virtual address: 9584 Physical Address: 59504 Value: 0

Virtual address: 18490 Physical Address: 5434 Value: 18

Virtual address: 55420 Physical Address: 58236 Value: 0

Virtual address: 5708 Physical Address: 52044 Value: 0

Virtual address: 23506 Physical Address: 20690 Value: 22

Virtual address: 15391 Physical Address: 31775 Value: 7

Virtual address: 36368 Physical Address: 14352 Value: 0

Virtual address: 38976 Physical Address: 3904 Value: 0

Virtual address: 50406 Physical Address: 14054 Value: 49

Virtual address: 49236 Physical Address: 8532 Value: 0

Virtual address: 65035 Physical Address: 48395 Value: -126

Virtual address: 30120 Physical Address: 680 Value: 0

Virtual address: 62551 Physical Address: 343 Value: 21

Virtual address: 46809 Physical Address: 55513 Value: 0

Virtual address: 21687 Physical Address: 52407 Value: 45

Virtual address: 53839 Physical Address: 54095 Value: -109

Virtual address: 2098 Physical Address: 35122 Value: 2

Virtual address: 12364 Physical Address: 45132 Value: 0

Virtual address: 45366 Physical Address: 45878 Value: 44

Virtual address: 50437 Physical Address: 18437 Value: 0

Virtual address: 36675 Physical Address: 35651 Value: -48

Virtual address: 55382 Physical Address: 58198 Value: 54

Virtual address: 11846 Physical Address: 59718 Value: 11

Virtual address: 49127 Physical Address: 50663 Value: -7

Virtual address: 19900 Physical Address: 36540 Value: 0

Virtual address: 20554 Physical Address: 56906 Value: 20

Virtual address: 19219 Physical Address: 14099 Value: -60

Virtual address: 51483 Physical Address: 15899 Value: 70

Virtual address: 58090 Physical Address: 3306 Value: 56

Virtual address: 39074 Physical Address: 4002 Value: 38

Virtual address: 16060 Physical Address: 21180 Value: 0

Virtual address: 10447 Physical Address: 14799 Value: 51

Virtual address: 54169 Physical Address: 51865 Value: 0

Virtual address: 20634 Physical Address: 56986 Value: 20

Virtual address: 57555 Physical Address: 38099 Value: 52

Virtual address: 61210 Physical Address: 42266 Value: 59

Virtual address: 269 Physical Address: 57101 Value: 0

Virtual address: 33154 Physical Address: 53634 Value: 32

Virtual address: 64487 Physical Address: 5095 Value: -7

Virtual address: 61223 Physical Address: 42279 Value: -55

Virtual address: 47292 Physical Address: 29884 Value: 0

Virtual address: 21852 Physical Address: 24156 Value: 0

Virtual address: 5281 Physical Address: 15265 Value: 0

Virtual address: 45912 Physical Address: 51032 Value: 0

Virtual address: 32532 Physical Address: 9492 Value: 0

Virtual address: 63067 Physical Address: 22107 Value: -106

Virtual address: 41683 Physical Address: 41939 Value: -76

Virtual address: 20981 Physical Address: 39157 Value: 0

Virtual address: 33881 Physical Address: 42073 Value: 0

Virtual address: 41785 Physical Address: 38713 Value: 0

Virtual address: 4580 Physical Address: 58852 Value: 0

Virtual address: 41389 Physical Address: 25005 Value: 0

Virtual address: 28572 Physical Address: 28060 Value: 0

Virtual address: 782 Physical Address: 7950 Value: 0

Virtual address: 30273 Physical Address: 58945 Value: 0

Virtual address: 62267 Physical Address: 23867 Value: -50

Virtual address: 17922 Physical Address: 18690 Value: 17

Virtual address: 63238 Physical Address: 16902 Value: 61

Virtual address: 3308 Physical Address: 40428 Value: 0

Virtual address: 26545 Physical Address: 24497 Value: 0

Virtual address: 44395 Physical Address: 44907 Value: 90

Virtual address: 39120 Physical Address: 4048 Value: 0

Virtual address: 21706 Physical Address: 52426 Value: 21

Virtual address: 7144 Physical Address: 26600 Value: 0

Virtual address: 30244 Physical Address: 58916 Value: 0

Virtual address: 3725 Physical Address: 10125 Value: 0

Virtual address: 54632 Physical Address: 48744 Value: 0

Virtual address: 30574 Physical Address: 16238 Value: 29

Virtual address: 8473 Physical Address: 19993 Value: 0

Virtual address: 12386 Physical Address: 45154 Value: 12

Virtual address: 41114 Physical Address: 8858 Value: 40

Virtual address: 57930 Physical Address: 3146 Value: 56

Virtual address: 15341 Physical Address: 32493 Value: 0

Virtual address: 15598 Physical Address: 31982 Value: 15

Virtual address: 59922 Physical Address: 10514 Value: 58

Virtual address: 18226 Physical Address: 2354 Value: 17

Virtual address: 48162 Physical Address: 17698 Value: 47

Virtual address: 41250 Physical Address: 24866 Value: 40

Virtual address: 1512 Physical Address: 51688 Value: 0

Virtual address: 2546 Physical Address: 4850 Value: 2

Virtual address: 41682 Physical Address: 41938 Value: 40

Virtual address: 322 Physical Address: 57154 Value: 0

Virtual address: 880 Physical Address: 8048 Value: 0

Virtual address: 20891 Physical Address: 39067 Value: 102

Virtual address: 56604 Physical Address: 13340 Value: 0

Virtual address: 40166 Physical Address: 1254 Value: 39

Virtual address: 26791 Physical Address: 42663 Value: 41

Virtual address: 44560 Physical Address: 11024 Value: 0

Virtual address: 38698 Physical Address: 46890 Value: 37

Virtual address: 64127 Physical Address: 4479 Value: -97

Virtual address: 15028 Physical Address: 24756 Value: 0

Virtual address: 38669 Physical Address: 46861 Value: 0

Virtual address: 45637 Physical Address: 7749 Value: 0

Virtual address: 43151 Physical Address: 17551 Value: 35

Virtual address: 9465 Physical Address: 23033 Value: 0

Virtual address: 2498 Physical Address: 4802 Value: 2

Virtual address: 13978 Physical Address: 31386 Value: 13

Virtual address: 16326 Physical Address: 56006 Value: 15

Virtual address: 51442 Physical Address: 32754 Value: 50

Virtual address: 34845 Physical Address: 26653 Value: 0

Virtual address: 63667 Physical Address: 28339 Value: 44

Virtual address: 39370 Physical Address: 55754 Value: 38

Virtual address: 55671 Physical Address: 60023 Value: 93

Virtual address: 64496 Physical Address: 5104 Value: 0

Virtual address: 7767 Physical Address: 57943 Value: -107

Virtual address: 6283 Physical Address: 7563 Value: 34

Virtual address: 55884 Physical Address: 34636 Value: 0

Virtual address: 61103 Physical Address: 6063 Value: -85

Virtual address: 10184 Physical Address: 60360 Value: 0

Virtual address: 39543 Physical Address: 43383 Value: -99

Virtual address: 9555 Physical Address: 59475 Value: 84

Virtual address: 13963 Physical Address: 31371 Value: -94

Virtual address: 58975 Physical Address: 14943 Value: -105

Virtual address: 19537 Physical Address: 22609 Value: 0

Virtual address: 6101 Physical Address: 9429 Value: 0

Virtual address: 41421 Physical Address: 25037 Value: 0

Virtual address: 45502 Physical Address: 46014 Value: 44

Virtual address: 29328 Physical Address: 37008 Value: 0

Virtual address: 8149 Physical Address: 34005 Value: 0

Virtual address: 25450 Physical Address: 60522 Value: 24

Virtual address: 58944 Physical Address: 14912 Value: 0

Virtual address: 50666 Physical Address: 18666 Value: 49

Virtual address: 23084 Physical Address: 35884 Value: 0

Virtual address: 36468 Physical Address: 14452 Value: 0

Virtual address: 33645 Physical Address: 60781 Value: 0

Virtual address: 25002 Physical Address: 52650 Value: 24

Virtual address: 53715 Physical Address: 979 Value: 116

Virtual address: 60173 Physical Address: 57613 Value: 0

Virtual address: 46354 Physical Address: 50194 Value: 45

Virtual address: 4708 Physical Address: 27748 Value: 0

Virtual address: 28208 Physical Address: 34864 Value: 0

Virtual address: 58844 Physical Address: 55260 Value: 0

Virtual address: 22173 Physical Address: 56733 Value: 0

Virtual address: 8535 Physical Address: 20055 Value: 85

Virtual address: 42261 Physical Address: 10773 Value: 0

Virtual address: 29687 Physical Address: 49655 Value: -3

Virtual address: 37799 Physical Address: 29351 Value: -23

Virtual address: 22566 Physical Address: 2854 Value: 22

Virtual address: 62520 Physical Address: 312 Value: 0

Virtual address: 4098 Physical Address: 50690 Value: 4

Virtual address: 47999 Physical Address: 25727 Value: -33

Virtual address: 49660 Physical Address: 45564 Value: 0

Virtual address: 37063 Physical Address: 18375 Value: 49

Virtual address: 41856 Physical Address: 38784 Value: 0

Virtual address: 5417 Physical Address: 21545 Value: 0

Virtual address: 48856 Physical Address: 32984 Value: 0

Virtual address: 10682 Physical Address: 27578 Value: 10

Virtual address: 22370 Physical Address: 11362 Value: 21

Virtual address: 63281 Physical Address: 16945 Value: 0

Virtual address: 62452 Physical Address: 24052 Value: 0

Virtual address: 50532 Physical Address: 18532 Value: 0

Virtual address: 9022 Physical Address: 48190 Value: 8

Virtual address: 59300 Physical Address: 10404 Value: 0

Virtual address: 58660 Physical Address: 55076 Value: 0

Virtual address: 56401 Physical Address: 51281 Value: 0

Virtual address: 8518 Physical Address: 20038 Value: 8

Virtual address: 63066 Physical Address: 22106 Value: 61

Virtual address: 63250 Physical Address: 16914 Value: 61

Virtual address: 48592 Physical Address: 2000 Value: 0

Virtual address: 28771 Physical Address: 1379 Value: 24

Virtual address: 37673 Physical Address: 29225 Value: 0

Virtual address: 60776 Physical Address: 23656 Value: 0

Virtual address: 56438 Physical Address: 51318 Value: 55

Virtual address: 60424 Physical Address: 7176 Value: 0

Virtual address: 39993 Physical Address: 1081 Value: 0

Virtual address: 56004 Physical Address: 34756 Value: 0

Virtual address: 59002 Physical Address: 14970 Value: 57

Virtual address: 33982 Physical Address: 42174 Value: 33

Virtual address: 25498 Physical Address: 60570 Value: 24

Virtual address: 57047 Physical Address: 37591 Value: -75

Virtual address: 1401 Physical Address: 51577 Value: 0

Virtual address: 15130 Physical Address: 32282 Value: 14

Virtual address: 42960 Physical Address: 19664 Value: 0

Virtual address: 61827 Physical Address: 22403 Value: 96

Virtual address: 32442 Physical Address: 7098 Value: 31

Virtual address: 64304 Physical Address: 4912 Value: 0

Virtual address: 30273 Physical Address: 58945 Value: 0

Virtual address: 38082 Physical Address: 37314 Value: 37

Virtual address: 22404 Physical Address: 11396 Value: 0

Virtual address: 3808 Physical Address: 10208 Value: 0

Virtual address: 16883 Physical Address: 48115 Value: 124

Virtual address: 23111 Physical Address: 35911 Value: -111

Virtual address: 62417 Physical Address: 24017 Value: 0

Virtual address: 60364 Physical Address: 57804 Value: 0

Virtual address: 4542 Physical Address: 58814 Value: 4

Virtual address: 14829 Physical Address: 33517 Value: 0

Virtual address: 44964 Physical Address: 13220 Value: 0

Virtual address: 33924 Physical Address: 42116 Value: 0

Virtual address: 2141 Physical Address: 35165 Value: 0

Virtual address: 19245 Physical Address: 14125 Value: 0

Virtual address: 47168 Physical Address: 29760 Value: 0

Virtual address: 24048 Physical Address: 39664 Value: 0

Virtual address: 1022 Physical Address: 8190 Value: 0

Virtual address: 23075 Physical Address: 35875 Value: -120

Virtual address: 24888 Physical Address: 52536 Value: 0

Virtual address: 49247 Physical Address: 8543 Value: 23

Virtual address: 4900 Physical Address: 13604 Value: 0

Virtual address: 22656 Physical Address: 2944 Value: 0

Virtual address: 34117 Physical Address: 60997 Value: 0

Virtual address: 55555 Physical Address: 59907 Value: 64

Virtual address: 48947 Physical Address: 50483 Value: -52

Virtual address: 59533 Physical Address: 25997 Value: 0

Virtual address: 21312 Physical Address: 9024 Value: 0

Virtual address: 21415 Physical Address: 9127 Value: -23

Virtual address: 813 Physical Address: 7981 Value: 0

Virtual address: 19419 Physical Address: 14299 Value: -10

Virtual address: 1999 Physical Address: 33231 Value: -13

Virtual address: 20155 Physical Address: 40635 Value: -82

Virtual address: 21521 Physical Address: 52241 Value: 0

Virtual address: 13670 Physical Address: 53094 Value: 13

Virtual address: 19289 Physical Address: 14169 Value: 0

Virtual address: 58483 Physical Address: 15475 Value: 28

Virtual address: 41318 Physical Address: 24934 Value: 40

Virtual address: 16151 Physical Address: 55831 Value: -59

Virtual address: 13611 Physical Address: 53035 Value: 74

Virtual address: 21514 Physical Address: 52234 Value: 21

Virtual address: 13499 Physical Address: 36283 Value: 46

Virtual address: 45583 Physical Address: 7695 Value: -125

Virtual address: 49013 Physical Address: 50549 Value: 0

Virtual address: 64843 Physical Address: 2123 Value: 82

Virtual address: 63485 Physical Address: 17149 Value: 0

Virtual address: 38697 Physical Address: 46889 Value: 0

Virtual address: 59188 Physical Address: 10292 Value: 0

Virtual address: 24593 Physical Address: 38417 Value: 0

Virtual address: 57641 Physical Address: 61225 Value: 0

Virtual address: 36524 Physical Address: 14508 Value: 0

Virtual address: 56980 Physical Address: 37524 Value: 0

Virtual address: 36810 Physical Address: 35786 Value: 35

Virtual address: 6096 Physical Address: 9424 Value: 0

Virtual address: 11070 Physical Address: 39998 Value: 10

Virtual address: 60124 Physical Address: 10716 Value: 0

Virtual address: 37576 Physical Address: 21448 Value: 0

Virtual address: 15096 Physical Address: 24824 Value: 0

Virtual address: 45247 Physical Address: 49087 Value: 47

Virtual address: 32783 Physical Address: 4111 Value: 3

Virtual address: 58390 Physical Address: 15382 Value: 57

Virtual address: 60873 Physical Address: 23753 Value: 0

Virtual address: 23719 Physical Address: 54951 Value: 41

Virtual address: 24385 Physical Address: 1601 Value: 0

Virtual address: 22307 Physical Address: 11299 Value: -56

Virtual address: 17375 Physical Address: 61663 Value: -9

Virtual address: 15990 Physical Address: 21110 Value: 15

Virtual address: 20526 Physical Address: 56878 Value: 20

Virtual address: 25904 Physical Address: 36656 Value: 0

Virtual address: 42224 Physical Address: 46320 Value: 0

Virtual address: 9311 Physical Address: 22879 Value: 23

Virtual address: 7862 Physical Address: 58038 Value: 7

Virtual address: 3835 Physical Address: 10235 Value: -66

Virtual address: 30535 Physical Address: 16199 Value: -47

Virtual address: 65179 Physical Address: 48539 Value: -90

Virtual address: 57387 Physical Address: 37931 Value: 10

Virtual address: 63579 Physical Address: 28251 Value: 22

Virtual address: 4946 Physical Address: 13650 Value: 4

Virtual address: 9037 Physical Address: 48205 Value: 0

Virtual address: 61033 Physical Address: 5993 Value: 0

Virtual address: 55543 Physical Address: 58359 Value: 61

Virtual address: 50361 Physical Address: 14009 Value: 0

Virtual address: 6480 Physical Address: 29008 Value: 0

Virtual address: 14042 Physical Address: 31450 Value: 13

Virtual address: 21531 Physical Address: 52251 Value: 6

Virtual address: 39195 Physical Address: 55579 Value: 70

Virtual address: 37511 Physical Address: 21383 Value: -95

Virtual address: 23696 Physical Address: 54928 Value: 0

Virtual address: 27440 Physical Address: 15664 Value: 0

Virtual address: 28201 Physical Address: 34857 Value: 0

Virtual address: 23072 Physical Address: 35872 Value: 0

Virtual address: 7814 Physical Address: 57990 Value: 7

Virtual address: 6552 Physical Address: 29080 Value: 0

Virtual address: 43637 Physical Address: 12661 Value: 0

Virtual address: 35113 Physical Address: 39721 Value: 0

Virtual address: 34890 Physical Address: 26698 Value: 34

Virtual address: 61297 Physical Address: 42353 Value: 0

Virtual address: 45633 Physical Address: 7745 Value: 0

Virtual address: 61431 Physical Address: 42487 Value: -3

Virtual address: 46032 Physical Address: 51152 Value: 0

Virtual address: 18774 Physical Address: 61782 Value: 18

Virtual address: 62991 Physical Address: 22031 Value: -125

Virtual address: 28059 Physical Address: 3483 Value: 102

Virtual address: 35229 Physical Address: 39837 Value: 0

Virtual address: 51230 Physical Address: 32542 Value: 50

Virtual address: 14405 Physical Address: 5701 Value: 0

Virtual address: 52242 Physical Address: 46610 Value: 51

Virtual address: 43153 Physical Address: 17553 Value: 0

Virtual address: 2709 Physical Address: 53909 Value: 0

Virtual address: 47963 Physical Address: 25691 Value: -42

Virtual address: 36943 Physical Address: 18255 Value: 19

Virtual address: 54066 Physical Address: 51762 Value: 52

Virtual address: 10054 Physical Address: 60230 Value: 9

Virtual address: 43051 Physical Address: 17451 Value: 10

Virtual address: 11525 Physical Address: 41477 Value: 0

Virtual address: 17684 Physical Address: 9748 Value: 0

Virtual address: 41681 Physical Address: 41937 Value: 0

Virtual address: 27883 Physical Address: 44267 Value: 58

Virtual address: 56909 Physical Address: 37453 Value: 0

Virtual address: 45772 Physical Address: 7884 Value: 0

Virtual address: 27496 Physical Address: 15720 Value: 0

Virtual address: 46842 Physical Address: 55546 Value: 45

Virtual address: 38734 Physical Address: 46926 Value: 37

Virtual address: 28972 Physical Address: 16428 Value: 0

Virtual address: 59684 Physical Address: 47396 Value: 0

Virtual address: 11384 Physical Address: 54392 Value: 0

Virtual address: 21018 Physical Address: 37658 Value: 20

Virtual address: 2192 Physical Address: 35216 Value: 0

Virtual address: 18384 Physical Address: 2512 Value: 0

Virtual address: 13464 Physical Address: 36248 Value: 0

Virtual address: 31018 Physical Address: 61994 Value: 30

Virtual address: 62958 Physical Address: 28654 Value: 61

Virtual address: 30611 Physical Address: 16275 Value: -28

Virtual address: 1913 Physical Address: 33145 Value: 0

Virtual address: 18904 Physical Address: 61912 Value: 0

Virtual address: 26773 Physical Address: 42645 Value: 0

Virtual address: 55491 Physical Address: 58307 Value: 48

Virtual address: 21899 Physical Address: 24203 Value: 98

Virtual address: 64413 Physical Address: 5021 Value: 0

Virtual address: 47134 Physical Address: 29726 Value: 46

Virtual address: 23172 Physical Address: 35972 Value: 0

Virtual address: 7262 Physical Address: 43102 Value: 7

Virtual address: 12705 Physical Address: 31137 Value: 0

Virtual address: 7522 Physical Address: 6242 Value: 7

Virtual address: 58815 Physical Address: 55231 Value: 111

Virtual address: 34916 Physical Address: 26724 Value: 0

Virtual address: 3802 Physical Address: 10202 Value: 3

Virtual address: 58008 Physical Address: 3224 Value: 0

Virtual address: 1239 Physical Address: 40919 Value: 53

Virtual address: 63947 Physical Address: 21963 Value: 114

Virtual address: 381 Physical Address: 57213 Value: 0

Virtual address: 60734 Physical Address: 23614 Value: 59

Virtual address: 48769 Physical Address: 32897 Value: 0

Virtual address: 41938 Physical Address: 38866 Value: 40

Virtual address: 38025 Physical Address: 37257 Value: 0

Virtual address: 55099 Physical Address: 5179 Value: -50

Virtual address: 56691 Physical Address: 13427 Value: 92

Virtual address: 39530 Physical Address: 43370 Value: 38

Virtual address: 59003 Physical Address: 14971 Value: -98

Virtual address: 6029 Physical Address: 9357 Value: 0

Virtual address: 20920 Physical Address: 39096 Value: 0

Virtual address: 8077 Physical Address: 33933 Value: 0

Virtual address: 42633 Physical Address: 20873 Value: 0

Virtual address: 17443 Physical Address: 40995 Value: 8

Virtual address: 53570 Physical Address: 834 Value: 52

Virtual address: 22833 Physical Address: 52785 Value: 0

Virtual address: 3782 Physical Address: 10182 Value: 3

Virtual address: 47758 Physical Address: 56462 Value: 46

Virtual address: 22136 Physical Address: 56696 Value: 0

Virtual address: 22427 Physical Address: 11419 Value: -26

Virtual address: 23867 Physical Address: 39483 Value: 78

Virtual address: 59968 Physical Address: 10560 Value: 0

Virtual address: 62166 Physical Address: 62422 Value: 60

Virtual address: 6972 Physical Address: 26428 Value: 0

Virtual address: 63684 Physical Address: 28356 Value: 0

Virtual address: 46388 Physical Address: 50228 Value: 0

Virtual address: 41942 Physical Address: 38870 Value: 40

Virtual address: 36524 Physical Address: 14508 Value: 0

Virtual address: 9323 Physical Address: 22891 Value: 26

Virtual address: 31114 Physical Address: 62090 Value: 30

Virtual address: 22345 Physical Address: 11337 Value: 0

Virtual address: 46463 Physical Address: 50303 Value: 95

Virtual address: 54671 Physical Address: 48783 Value: 99

Virtual address: 9214 Physical Address: 48382 Value: 8

Virtual address: 7257 Physical Address: 43097 Value: 0

Virtual address: 33150 Physical Address: 53630 Value: 32

Virtual address: 41565 Physical Address: 41821 Value: 0

Virtual address: 26214 Physical Address: 49254 Value: 25

Virtual address: 3595 Physical Address: 9995 Value: -126

Virtual address: 17932 Physical Address: 18700 Value: 0

Virtual address: 34660 Physical Address: 18020 Value: 0

Virtual address: 51961 Physical Address: 27385 Value: 0

Virtual address: 58634 Physical Address: 55050 Value: 57

Virtual address: 57990 Physical Address: 3206 Value: 56

Virtual address: 28848 Physical Address: 1456 Value: 0

Virtual address: 49920 Physical Address: 59136 Value: 0

Virtual address: 18351 Physical Address: 2479 Value: -21

Virtual address: 53669 Physical Address: 933 Value: 0

Virtual address: 33996 Physical Address: 42188 Value: 0

Virtual address: 6741 Physical Address: 6741 Value: 0

Virtual address: 64098 Physical Address: 4450 Value: 62

Virtual address: 606 Physical Address: 17246 Value: 0

Virtual address: 27383 Physical Address: 28919 Value: -67

Virtual address: 63140 Physical Address: 22180 Value: 0

Virtual address: 32228 Physical Address: 49892 Value: 0

Virtual address: 63437 Physical Address: 17101 Value: 0

Virtual address: 29085 Physical Address: 16541 Value: 0

Virtual address: 65080 Physical Address: 48440 Value: 0

Virtual address: 38753 Physical Address: 46945 Value: 0

Virtual address: 16041 Physical Address: 21161 Value: 0

Virtual address: 9041 Physical Address: 48209 Value: 0

Virtual address: 42090 Physical Address: 46186 Value: 41

Virtual address: 46388 Physical Address: 50228 Value: 0

Virtual address: 63650 Physical Address: 28322 Value: 62

Virtual address: 36636 Physical Address: 35612 Value: 0

Virtual address: 21947 Physical Address: 24251 Value: 110

Virtual address: 19833 Physical Address: 36473 Value: 0

Virtual address: 36464 Physical Address: 14448 Value: 0

Virtual address: 8541 Physical Address: 20061 Value: 0

Virtual address: 12712 Physical Address: 31144 Value: 0

Virtual address: 48955 Physical Address: 50491 Value: -50

Virtual address: 39206 Physical Address: 55590 Value: 38

Virtual address: 15578 Physical Address: 31962 Value: 15

Virtual address: 49205 Physical Address: 8501 Value: 0

Virtual address: 7731 Physical Address: 57907 Value: -116

Virtual address: 43046 Physical Address: 17446 Value: 42

Virtual address: 60498 Physical Address: 7250 Value: 59

Virtual address: 9237 Physical Address: 22805 Value: 0

Virtual address: 47706 Physical Address: 56410 Value: 46

Virtual address: 43973 Physical Address: 57541 Value: 0

Virtual address: 42008 Physical Address: 46104 Value: 0

Virtual address: 27460 Physical Address: 15684 Value: 0

Virtual address: 24999 Physical Address: 52647 Value: 105

Virtual address: 51933 Physical Address: 27357 Value: 0

Virtual address: 34070 Physical Address: 60950 Value: 33

Virtual address: 65155 Physical Address: 48515 Value: -96

Virtual address: 59955 Physical Address: 10547 Value: -116

Virtual address: 9277 Physical Address: 22845 Value: 0

Virtual address: 20420 Physical Address: 16836 Value: 0

Virtual address: 44860 Physical Address: 13116 Value: 0

Virtual address: 50992 Physical Address: 42800 Value: 0

Virtual address: 10583 Physical Address: 27479 Value: 85

Virtual address: 57751 Physical Address: 61335 Value: 101

Virtual address: 23195 Physical Address: 35995 Value: -90

Virtual address: 27227 Physical Address: 28763 Value: -106

Virtual address: 42816 Physical Address: 19520 Value: 0

Virtual address: 58219 Physical Address: 34155 Value: -38

Virtual address: 37606 Physical Address: 21478 Value: 36

Virtual address: 18426 Physical Address: 2554 Value: 17

Virtual address: 21238 Physical Address: 37878 Value: 20

Virtual address: 11983 Physical Address: 59855 Value: -77

Virtual address: 48394 Physical Address: 1802 Value: 47

Virtual address: 11036 Physical Address: 39964 Value: 0

Virtual address: 30557 Physical Address: 16221 Value: 0

Virtual address: 23453 Physical Address: 20637 Value: 0

Virtual address: 49847 Physical Address: 31671 Value: -83

Virtual address: 30032 Physical Address: 592 Value: 0

Virtual address: 48065 Physical Address: 25793 Value: 0

Virtual address: 6957 Physical Address: 26413 Value: 0

Virtual address: 2301 Physical Address: 35325 Value: 0

Virtual address: 7736 Physical Address: 57912 Value: 0

Virtual address: 31260 Physical Address: 23324 Value: 0

Virtual address: 17071 Physical Address: 175 Value: -85

Virtual address: 8940 Physical Address: 46572 Value: 0

Virtual address: 9929 Physical Address: 44745 Value: 0

Virtual address: 45563 Physical Address: 46075 Value: 126

Virtual address: 12107 Physical Address: 2635 Value: -46

Number of Translated Addresses = 1000

Page Faults = 244

Page Fault rate = 0.244

TLB Hits = 55

TLB Hit rate = 0.055