Address Translation

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1 Run with seeds 1, 2, and 3, and compute whether each virtual address generated by the process is in or out of bounds. If in bounds, compute the translation.

1.1 Seed 1

Base: 13884 Limit: 290
VA 0: 782 OOB (782>290)
VA 1: 261 PA - 13884+261 = 14145
VA 2: 507 OOB (507>290)
VA 3: 460 OOB (460>290)
VA 4: 667 OOB (667>290)

1.2 Seed 2

Base: 15529 Limit: 500
VA 0: 57 PA - 15529+57=15586
VA 1: 86 PA - 15529+86=15615
VA 2: 855 OOB (855>500)
VA 3: 753 OOB (753>500)
VA 4: 685 OOB (685>500)

1.3 Seed 3

Base: 8916 Limit: 316
VA 0: 378 OOB (378>316)
VA 1: 618 OOB (618>316)
VA 2: 640 OOB (640>316)
VA 3: 67 PA - 8916+67=8983
VA 4: 13 PA - 8916+13=8929

2 Run with these flags: -s 0 -n 10. What value do you have to set the bounds register to in order to ensure that all the generated virtual addresses are within bounds?

The largest virtual address is 929, so the bound would have to be set to at least 930 to accommodate all of them.

3 Run with these flags: -s 1 -n 10 -l 100. What is the maximum value that base can be set to, such that the address space still fits into physical memory in its entirety?

For any virtual address space with the limit equal to 100, the maximum value the base can be set to is 16*1024-100 = 16284. However, for this particular address space, most of the virtual addresses are larger than 100. No matter what the base is set to, with a limit of 100, these virtual addresses will cause segmentation violations.

4 Run some of the same problems above, but with larger address spaces and physical memories.

This doesn't seem to make much of a difference, besides the larger address spaces allowing for larger limits.

5 What fraction of randomly-generated virtual addresses are valid, as a function of the value of the bounds register?

For all of the randomly-generated addresses to be valid, the bounds register has to equal the size of the address space. For none to be valid, it must equal zero. Therefore, the proportion of valid addresses equals the bounds value divided by the size of the address space.