



سیستم‌های عامل تمرین‌های سری سوم کارگاه

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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

پاسخ.

```
ali@DESKTOP:~$ python2.7 relocation.py -s 1 -c
ARG seed 1
ARG address space size 1k
ARG phys mem size 16k

Base-and-Bounds register information:

Base : 0x0000363c (decimal 13884)
```

```
Limit : 290
```

Virtual Address Trace

```
VA 0: 0x0000030e (decimal: 782) --> SEGMENTATION VIOLATION
VA 1: 0x00000105 (decimal: 261) --> VALID: 0x00003741 (decimal: 14145)
VA 2: 0x000001fb (decimal: 507) --> SEGMENTATION VIOLATION
VA 3: 0x000001cc (decimal: 460) --> SEGMENTATION VIOLATION
VA 4: 0x0000029b (decimal: 667) --> SEGMENTATION VIOLATION
```

```
ali@DESKTOP:~$ python2.7 relocation.py -s 2 -c
```

```
ARG seed 2
```

```
ARG address space size 1k
```

```
ARG phys mem size 16k
```

Base-and-Bounds register information:

```
Base : 0x00003ca9 (decimal 15529)
```

```
Limit : 500
```

Virtual Address Trace

```
VA 0: 0x00000039 (decimal: 57) --> VALID: 0x00003ce2 (decimal: 15586)
VA 1: 0x00000056 (decimal: 86) --> VALID: 0x00003cff (decimal: 15615)
VA 2: 0x00000357 (decimal: 855) --> SEGMENTATION VIOLATION
VA 3: 0x000002f1 (decimal: 753) --> SEGMENTATION VIOLATION
VA 4: 0x000002ad (decimal: 685) --> SEGMENTATION VIOLATION
```

```
ali@DESKTOP:~$ python2.7 relocation.py -s 3 -c
```

```
ARG seed 3
```

```
ARG address space size 1k
```

```
ARG phys mem size 16k
```

Base-and-Bounds register information:

```
Base : 0x000022d4 (decimal 8916)
```

```
Limit : 316
```

Virtual Address Trace

```
VA 0: 0x0000017a (decimal: 378) --> SEGMENTATION VIOLATION
VA 1: 0x0000026a (decimal: 618) --> SEGMENTATION VIOLATION
VA 2: 0x00000280 (decimal: 640) --> SEGMENTATION VIOLATION
VA 3: 0x00000043 (decimal: 67) --> VALID: 0x00002317 (decimal: 8983)
VA 4: 0x0000000d (decimal: 13) --> VALID: 0x000022e1 (decimal: 8929)
```

translation = virtual address + base address

درمورد VA و BA را با هم جمع کنیم اگر از BA + limit کمتر بود آن آدرس Valid می‌شود.

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

پاسخ.

```
ali@DESKTOP:~$ python2.7 relocation.py -s 0 -n 10 -c
```

```
ARG seed 0
```

```
ARG address space size 1k
```

```
ARG phys mem size 16k
```

```
Base-and-Bounds register information:
```

```
Base   : 0x00003082 (decimal 12418)
Limit  : 472
```

```
Virtual Address Trace
```

```
VA 0: 0x000001ae (decimal: 430) --> VALID: 0x00003230 (decimal: 12848)
VA 1: 0x00000109 (decimal: 265) --> VALID: 0x0000318b (decimal: 12683)
VA 2: 0x0000020b (decimal: 523) --> SEGMENTATION VIOLATION
VA 3: 0x0000019e (decimal: 414) --> VALID: 0x00003220 (decimal: 12832)
VA 4: 0x00000322 (decimal: 802) --> SEGMENTATION VIOLATION
VA 5: 0x00000136 (decimal: 310) --> VALID: 0x000031b8 (decimal: 12728)
VA 6: 0x000001e8 (decimal: 488) --> SEGMENTATION VIOLATION
VA 7: 0x00000255 (decimal: 597) --> SEGMENTATION VIOLATION
VA 8: 0x000003a1 (decimal: 929) --> SEGMENTATION VIOLATION
VA 9: 0x00000204 (decimal: 516) --> SEGMENTATION VIOLATION
```

برای قبول شدن همه باید limit را زیاد کنیم. limit جدید باید بیش‌تر از همه‌ی VA ها باشد.

$$\text{limit} = 929 + 1 = 930$$

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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?

پاسخ.

```
ali@DESKTOP:~$ python2.7 relocation.py -s 1 -n 10 -l 100 -c
```

```
ARG seed 1
ARG address space size 1k
ARG phys mem size 16k
```

```
Base-and-Bounds register information:
```

```
Base   : 0x00000899 (decimal 2201)
Limit  : 100
```

```
Virtual Address Trace
```

```
VA 0: 0x00000363 (decimal: 867) --> SEGMENTATION VIOLATION
VA 1: 0x0000030e (decimal: 782) --> SEGMENTATION VIOLATION
VA 2: 0x00000105 (decimal: 261) --> SEGMENTATION VIOLATION
VA 3: 0x000001fb (decimal: 507) --> SEGMENTATION VIOLATION
VA 4: 0x000001cc (decimal: 460) --> SEGMENTATION VIOLATION
VA 5: 0x0000029b (decimal: 667) --> SEGMENTATION VIOLATION
VA 6: 0x00000327 (decimal: 807) --> SEGMENTATION VIOLATION
VA 7: 0x00000060 (decimal: 96) --> VALID: 0x000008f9 (decimal: 2297)
VA 8: 0x0000001d (decimal: 29) --> VALID: 0x000008b6 (decimal: 2230)
VA 9: 0x00000357 (decimal: 855) --> SEGMENTATION VIOLATION
```

$$\text{Max value of BA} = \text{psize} - \text{limit} = 16384 - 100 = 16284$$

Run some of the same problems above, but with larger address spaces (**-a**) and physical memories (**-p**).

پاسخ.

```
ali@DESKTOP:~$ python2.7 relocation.py -s 1 -c -a 12k -p 64k
```

```
ARG seed 1
```

```
ARG address space size 12k
```

```
ARG phys mem size 64k
```

```
Base-and-Bounds register information:
```

```
Base : 0x0000d8f1 (decimal 55537)
```

```
Limit : 3484
```

```
Virtual Address Trace
```

```
VA 0: 0x000024a9 (decimal: 9385) --> SEGMENTATION VIOLATION
```

```
VA 1: 0x00000c3e (decimal: 3134) --> VALID: 0x0000e52f (decimal: 58671)
```

```
VA 2: 0x000017c7 (decimal: 6087) --> SEGMENTATION VIOLATION
```

```
VA 3: 0x00001593 (decimal: 5523) --> SEGMENTATION VIOLATION
```

```
VA 4: 0x00001f46 (decimal: 8006) --> SEGMENTATION VIOLATION
```

```
ali@DESKTOP:~$ python2.7 relocation.py -s 2 -c -a 12k -p 64k
```

```
ARG seed 2
```

```
ARG address space size 12k
```

```
ARG phys mem size 64k
```

```
Base-and-Bounds register information:
```

```
Base : 0x00000e7a (decimal 3706)
```

```
Limit : 6008
```

```
Virtual Address Trace
```

```
VA 0: 0x00000412 (decimal: 1042) --> VALID: 0x0000128c (decimal: 4748)
```

```
VA 1: 0x0000281a (decimal: 10266) --> SEGMENTATION VIOLATION
```

```
VA 2: 0x00002353 (decimal: 9043) --> SEGMENTATION VIOLATION
```

```
VA 3: 0x00002025 (decimal: 8229) --> SEGMENTATION VIOLATION
```

```
VA 4: 0x00000eca (decimal: 3786) --> VALID: 0x00001d44 (decimal: 7492)
```

```
ali@DESKTOP:~$ python2.7 relocation.py -s 3 -c -a 12k -p 64k
```

```
ARG seed 3
```

```
ARG address space size 12k
```

```
ARG phys mem size 64k
```

```
Base-and-Bounds register information:
```

```
Base : 0x00008b52 (decimal 35666)
```

```
Limit : 3803
```

```
Virtual Address Trace
```

```
VA 0: 0x000011c2 (decimal: 4546) --> SEGMENTATION VIOLATION
```

```
VA 1: 0x00001cfc (decimal: 7420) --> SEGMENTATION VIOLATION
```

```
VA 2: 0x00001e08 (decimal: 7688) --> SEGMENTATION VIOLATION
```

```
VA 3: 0x00000325 (decimal: 805) --> VALID: 0x00008e77 (decimal: 36471)
```

```
VA 4: 0x000000a1 (decimal: 161) --> VALID: 0x00008bf3 (decimal: 35827)
```

برای سوال ۱ فقط آدرس شماره‌ی ۱ مجاز بود با seed=۱

3134 < 3484

```
ali@DESKTOP:~$ python2.7 relocation.py -s 0 -n 10 -c -a 12k -p 64k
ARG seed 0
ARG address space size 12k
ARG phys mem size 64k

Base-and-Bounds register information:

Base   : 0x0000c209 (decimal 49673)
Limit  : 5666

Virtual Address Trace
VA 0: 0x0000142f (decimal: 5167) --> VALID: 0x0000d638 (decimal: 54840)
VA 1: 0x00000c6d (decimal: 3181) --> VALID: 0x0000ce76 (decimal: 52854)
VA 2: 0x0000188a (decimal: 6282) --> SEGMENTATION VIOLATION
VA 3: 0x0000136f (decimal: 4975) --> VALID: 0x0000d578 (decimal: 54648)
VA 4: 0x0000259f (decimal: 9631) --> SEGMENTATION VIOLATION
VA 5: 0x00000e8f (decimal: 3727) --> VALID: 0x0000d098 (decimal: 53400)
VA 6: 0x000016e0 (decimal: 5856) --> SEGMENTATION VIOLATION
VA 7: 0x00001c00 (decimal: 7168) --> SEGMENTATION VIOLATION
VA 8: 0x00002b96 (decimal: 11158) --> SEGMENTATION VIOLATION
VA 9: 0x00001839 (decimal: 6201) --> SEGMENTATION VIOLATION
```

برای سوال ۲

$$11158 + 1 = 11159$$

```
ali@DESKTOP:~$ python2.7 relocation.py -s 1 -n 10 -l 100 -c -a 12k -p 64k
ARG seed 1
ARG address space size 12k
ARG phys mem size 64k

Base-and-Bounds register information:

Base   : 0x00002265 (decimal 8805)
Limit  : 100

Virtual Address Trace
VA 0: 0x000028ad (decimal: 10413) --> SEGMENTATION VIOLATION
VA 1: 0x000024a9 (decimal: 9385) --> SEGMENTATION VIOLATION
VA 2: 0x00000c3e (decimal: 3134) --> SEGMENTATION VIOLATION
VA 3: 0x000017c7 (decimal: 6087) --> SEGMENTATION VIOLATION
VA 4: 0x00001593 (decimal: 5523) --> SEGMENTATION VIOLATION
VA 5: 0x00001f46 (decimal: 8006) --> SEGMENTATION VIOLATION
VA 6: 0x000025db (decimal: 9691) --> SEGMENTATION VIOLATION
VA 7: 0x00000481 (decimal: 1153) --> SEGMENTATION VIOLATION
VA 8: 0x0000015c (decimal: 348) --> SEGMENTATION VIOLATION
VA 9: 0x0000281d (decimal: 10269) --> SEGMENTATION VIOLATION
```

برای سوال ۳

$$\text{Base حد اکثر مقدار} = 65436 - 100 = 64K$$

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What fraction of randomly-generated virtual addresses are valid, as a function of the value of the bounds register? Make a graph from running with different random seeds, with limit values ranging from 0 up to the maximum size of the address space.

پاسخ.