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CIS-450

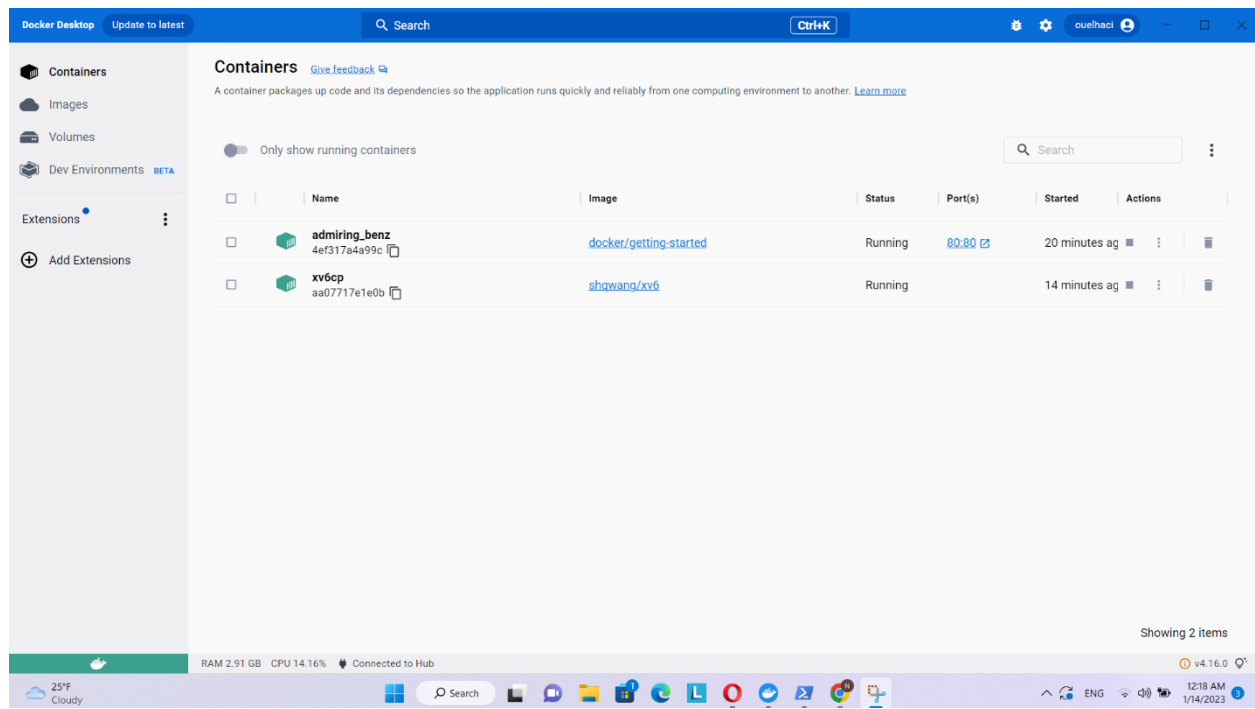
January 14, 2023

# Programming 1 (P1): Building xv6

Instructor: Dr. Shengquan Wang

Part 1 Due Time: 10PM, 1/15/2023

## Submission:



```
root@aa07717e10b:/v6
Windows PowerShell
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Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows

PS C:\Users\youa1> docker run --rm --name xv6p -v /c/Users/youa1/xv6:/xv6 -it shuang/xv6 bash
Unable to find image 'docker/getting-started:latest' locally
latest: Pulling from docker/getting-started
c158987b0551: Pull complete
c35f6679fab: Pull complete
c8626c7d08b: Pull complete
b63346ace34: Pull complete
f1dic9928c82: Pull complete
b0f639e6ee: Pull complete
e068d3549e8: Pull complete
33e0cbb4673: Pull complete
4f7e1c2de1d: Pull complete
Digest: sha256:d7936f4822b547a53e735a0dd6b7f8f7071b414fbcd9297609ff9b989bc1
Status: Downloaded newer image for docker/getting-started:latest
4ef317a4a99cd0ee5688d37766995f51de0340d1d9361ee0793add52a9000
PS C:\Users\youa1> docker run --name xv6p -v /c/Users/youa1/xv6:/xv6 -it shuang/xv6 bash
docker: Error response from daemon: mkdir c:\Users\danking: Access is denied.
See 'docker run --help'.

PS C:\Users\youa1> docker run --name xv6p -v /c/Users/youa1/xv6:/xv6 -it shuang/xv6 bash
Unable to find image 'shuang/xv6:latest' locally
latest: Pulling from shuang/xv6
72b39c1d4615: Pull complete
66a2d5ede4fd: Pull complete
72aef9e1add: Pull complete
7ac9f284354: Pull complete
a3ed95caeb02: Pull complete
186c7c176c7b: Pull complete
336ce09a5f5: Pull complete
211fc0c7342: Pull complete
daf079b0232: Pull complete
Digest: sha256:d0541d083b0c15acdaf5d4d09bdc2a5b893457017927c5ab6a8092a1
Status: Downloaded newer image for shuang/xv6:latest
root@aa07717e10b:/#
hash: $'v': command not found
root@aa07717e10b:/# cp /v6-public/* /v6/.
root@aa07717e10b:/# cd /v6
root@aa07717e10b:/v6# make
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -fno-pic -O0 -nostdinc -I. -c bootmain.c
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -fno-pic -nostdinc -I. -c bootasm.S
ld -m elf_i386 -N -e start -Ttext 0x7000 -o bootblock.o bootmain.o bootasm.o
objdump -S bootblock.o > bootblock.asm
objcopy -S -O binary -j .text bootblock.o bootblock
./align.pl bootblock
boot block is 444 bytes (max 510)
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -c -o bio.o bio.c
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -c -o console.o console.c
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -c -o exec.o exec.c
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -c -o file.o file.c
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -c -o fs.o fs.c
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -c -o ide.o ide.c
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -c -o ioapic.o ioapic.c
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -c -o kalloc.o kalloc.c
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -c -o kbd.o kbd.c
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -c -o lapic.o lapic.c
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -c -o log.o log.c
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -c -o main.o main.c
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -c -o mp.o mp.c
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -c -o picirq.o picirq.c
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -c -o pipe.o pipe.c
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -c -o proc.o proc.c
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -c -o spinlock.o spinlock.c
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -c -o string.o string.c
gcc -m32 -gdwarf-2 -Wl,-divide -c -o switch.o switch.S
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -c -o syscall.o syscall.c
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -c -o syscalltbl.o syscalltbl.c
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -c -o sysproc.o sysproc.c
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -c -o timer.o timer.c
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -c -o trap.o trap.c
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -c -o uart.o uart.c
perl vectors.pl > vectors.S
gcc -m32 -gdwarf-2 -Wl,-divide -c -o vectors.o vectors.S
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -c -o vm.o vm.c
gcc -m32 -gdwarf-2 -Wl,-divide -c -o entry.o entry.S
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -fno-pic -nostdinc -I. -c entryother.S
ld -m elf_i386 -N -e start -Ttext 0 -o bootblockother.o entryother.o
objcopy -S -O binary -j .text bootblockother.o entryother
objdump -S bootblockother.o > entryother.asm
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -nostdinc -I. -c initcode.S
ld -m elf_i386 -N -e start -Ttext 0 -o initcode.out initcode.o
objcopy -S -O binary initcode.out initcode
objdump -S initcode.o > initcode.asm
ld -m elf_i386 -T kernel.ld -o kernel entry.o bio.o console.o exec.o file.o fs.o ide.o ioapic.o kalloc.o kbd.o lapic.o log.o main.o mp.o picirq.o pipe.o proc.o spinlock.o string.o switch.o syscall.o syscalltbl.o sysproc.o timer.o trapasm.o trap.o uart.o vectors.o vm.o -b binary initcode entryother
objdump -S kernel > kernel.asm
gcc -Werror -Wall -t kernel | sed '1,/SYMBOL TABLE/d; s/ / /; /$/' > kernel.sym
gcc -Werror -Wall -o mkfs mkfs.c
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -c -o ulib.o ulib.c
gcc -m32 -gdwarf-2 -Wl,-divide -c -o usys.o usys.S
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -c -o printf.o printf.c
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -c -o umalloc.o umalloc.c
gcc -fno-pic -static -fno-builtin -fno-strict-aliasing -fvar-tracking -fvar-tracking-assignments -O0 -g -Wall -MD -gdwarf-2 -m32 -Werror -fno-omit-frame-pointer -fno-stack-protector -c -o cat.o cat.c
ld -m elf_i386 -N -e main -Ttext 0 -o _cat cat.o ulib.o usys.o printf.o umalloc.o
objdump -S _cat > cat.asm
objdump -t _cat | sed '1,/SYMBOL TABLE/d; s/ / /; /$/' > cat.sym
```



```
root@a807717e1e0b:/xv6
10000+0 records in
10000+0 records out
518000 bytes (5.1 MiB, 4.9 MiB) copied, 2.12289 s, 2.4 MB/s
dd if=bootblock-of=xv6.img conv=notrunc
1+0 records in
1+0 records out
512 bytes copied, 0.00206189 s, 248 kB/s
dd if=kernel-of=xv6.img seek=1 conv=notrunc
325+1 records in
325+1 records out
166592 bytes (167 kB, 163 KiB) copied, 0.140533 s, 1.2 MB/s
root@a807717e1e0b:/xv6# make qemu-nox
qemu-system-i386 -nographic -hdb fs.img xv6.img -smp 2 -m 512
WARNING: Image format was not specified for 'fs.img' and probing guessed raw.
Automatically detecting the format is dangerous for raw images, write operations on block 0 will be restricted.
Specify the 'raw' format explicitly to remove the restrictions.
WARNING: Image format was not specified for 'xv6.img' and probing guessed raw.
Automatically detecting the format is dangerous for raw images, write operations on block 0 will be restricted.
Specify the 'raw' format explicitly to remove the restrictions.
xv6...
cpu0: starting
cpu0: starting
abi: size 1000 nblocks 941 ninodes 200 nlog 30 logstart 2 inodestart 32 bmap start 58
init: starting sh
$ ls
exec ls failed
$ ls
. 1 1 512
.. 1 1 512
-- 2 2 1973
README 2 3 13088
cat 2 4 12228
echo 2 5 7944
forktest 2 6 14644
grep 2 7 12776
init 2 8 12304
kill 2 9 12192
ln 2 10 14420
ls 2 11 12348
mkdir 2 12 12324
rm 2 13 23136
sh 2 14 12024
stressfs 2 15 58108
usertests 2 16 13524
wc 2 17 12000
zombie 3 18 0
$
```