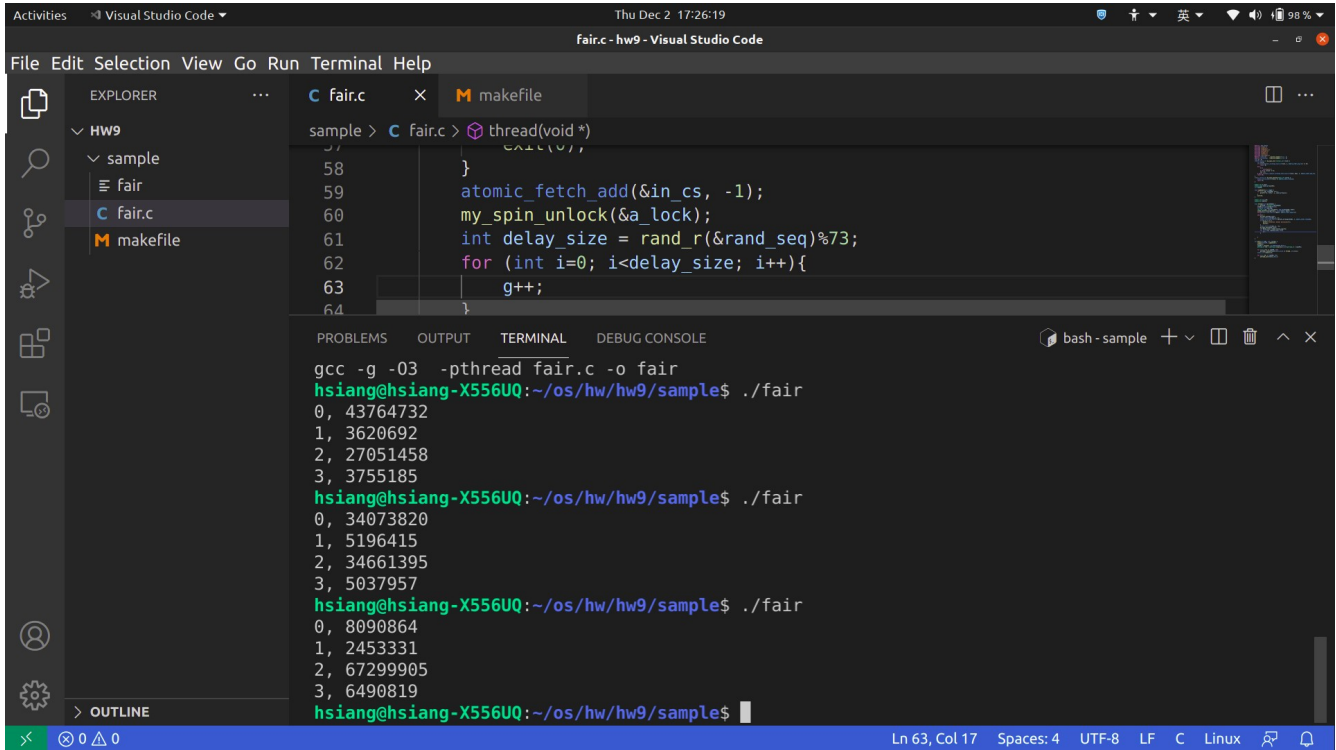


HW9 報告

資工三 408410098 蔡×祥

4.實驗數據:

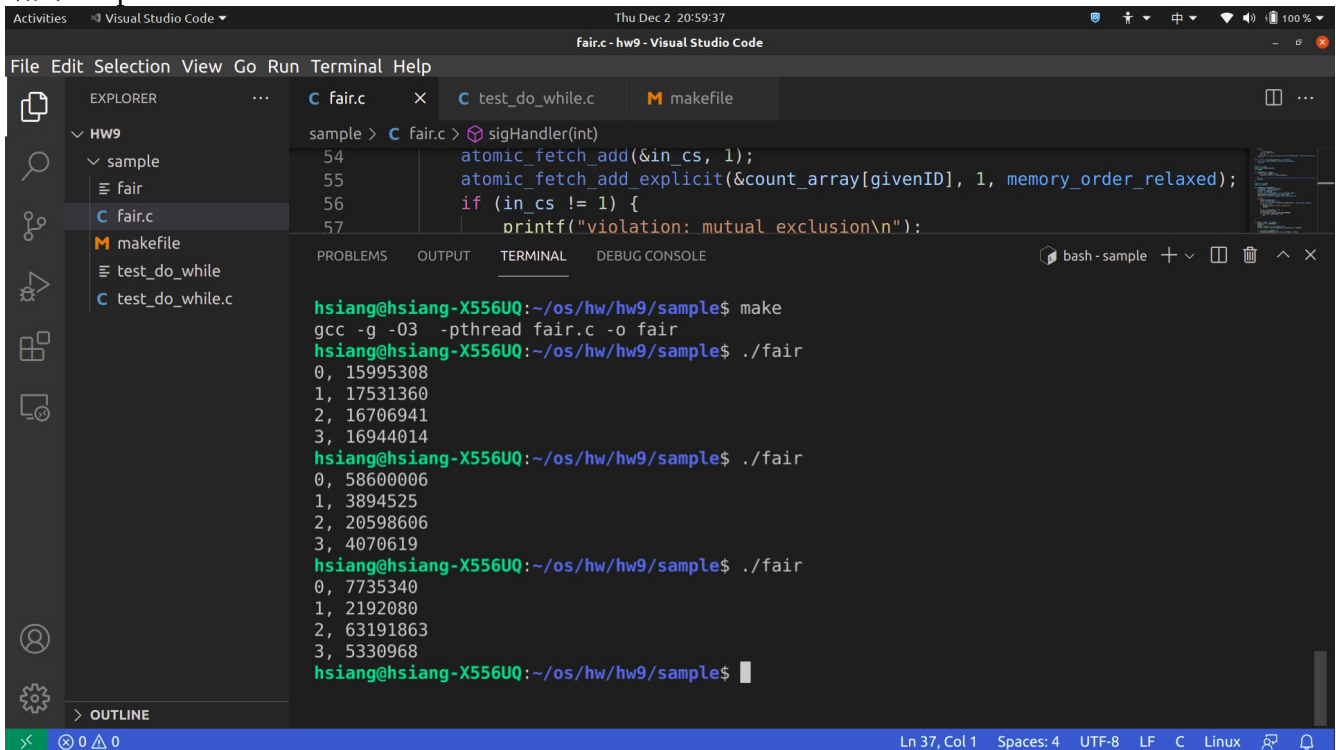
-O3:



```
sample > C fair.c > thread(void *)
58     }
59     atomic_fetch_add(&in_cs, -1);
60     my_spin_unlock(&a_lock);
61     int delay_size = rand_r(&rand_seq)%73;
62     for (int i=0; i<delay_size; i++){
63         g++;
64     }
```

```
gcc -g -O3 -pthread fair.c -o fair
hsiang@hsiang-X556UQ:~/os/hw/hw9/sample$ ./fair
0, 43764732
1, 3620692
2, 27051458
3, 3755185
hsiang@hsiang-X556UQ:~/os/hw/hw9/sample$ ./fair
0, 34073820
1, 5196415
2, 34661395
3, 5037957
hsiang@hsiang-X556UQ:~/os/hw/hw9/sample$ ./fair
0, 8090864
1, 2453331
2, 67299905
3, 6490819
hsiang@hsiang-X556UQ:~/os/hw/hw9/sample$
```

增大 sleep time:

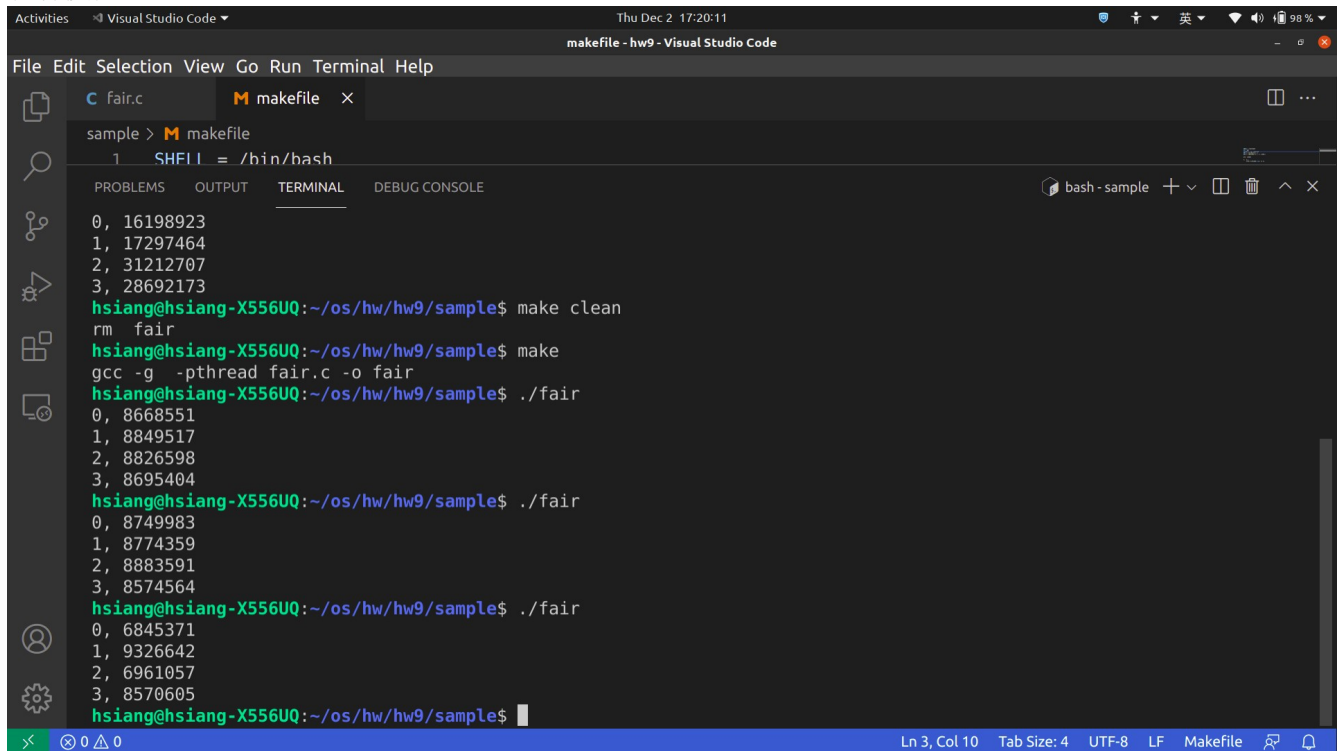


```
sample > C fair.c > sigHandler(int)
54     atomic_fetch_add(&in_cs, 1);
55     atomic_fetch_add_explicit(&count_array[givenID], 1, memory_order_relaxed);
56     if (in_cs != 1) {
57         printf("violation: mutual exclusion\n");
58     }
```

```
hsiang@hsiang-X556UQ:~/os/hw/hw9/sample$ make
gcc -g -O3 -pthread fair.c -o fair
hsiang@hsiang-X556UQ:~/os/hw/hw9/sample$ ./fair
0, 15995308
1, 17531360
2, 16706941
3, 16944014
hsiang@hsiang-X556UQ:~/os/hw/hw9/sample$ ./fair
0, 58600006
1, 3894525
2, 20598606
3, 4070619
hsiang@hsiang-X556UQ:~/os/hw/hw9/sample$ ./fair
0, 7735340
1, 2192080
2, 63191863
3, 5330968
hsiang@hsiang-X556UQ:~/os/hw/hw9/sample$
```

感覺不太穩定

沒有優化:

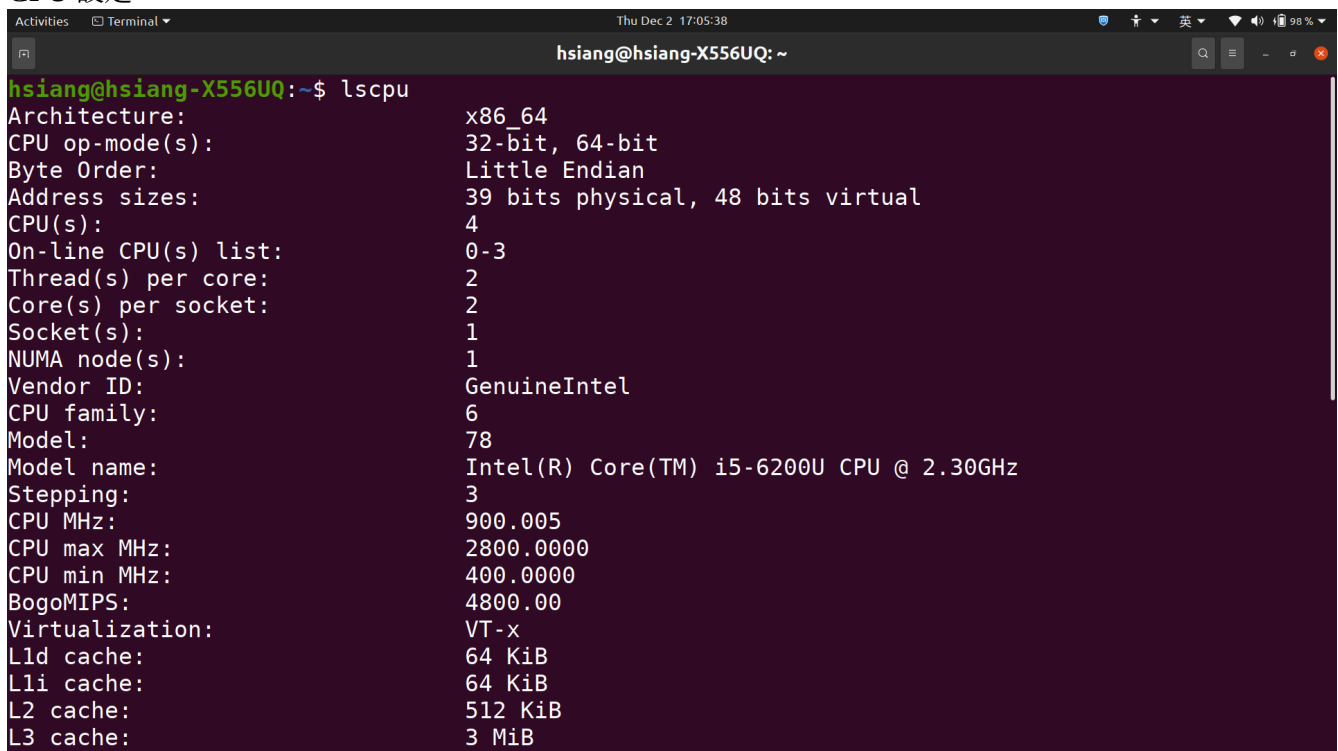


The screenshot shows the Visual Studio Code interface. The file explorer on the left shows a file named 'fair.c'. The main editor area displays a 'makefile' with the following content:

```
sample > makefile
1 SHF11 = /bin/bash
```

The terminal window at the bottom shows the execution of the makefile. The user runs 'make clean', 'make', and './fair' multiple times. The output shows the compilation of 'fair.c' and the execution of the resulting binary, which prints out a list of numbers (0, 16198923, 1, 17297464, 2, 31212707, 3, 28692173) and then a list of memory addresses (0, 8668551, 1, 8849517, 2, 8826598, 3, 8695404, etc.).

CPU 設定:



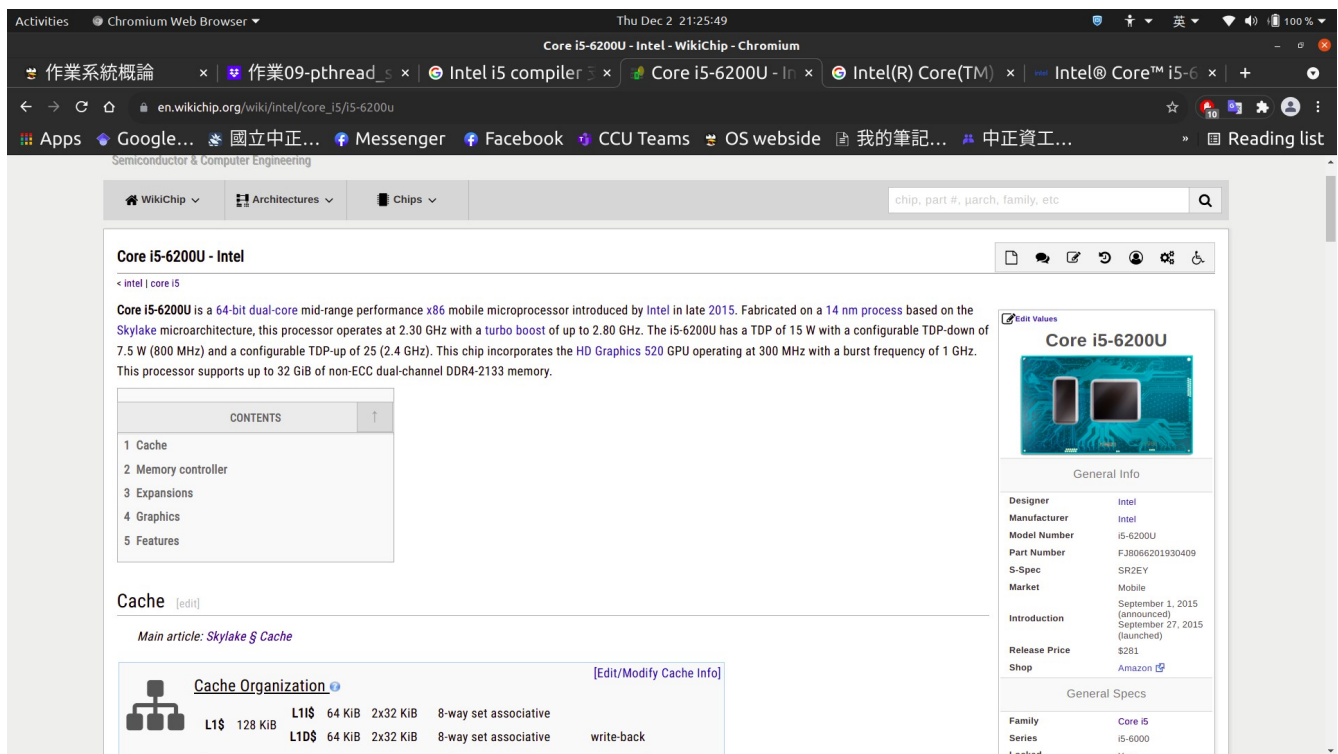
The screenshot shows a terminal window with the output of the 'lscpu' command. The output provides detailed information about the system's CPU architecture and configuration.

```
hsiang@hsiang-X556UQ:~$ lscpu
Architecture:                x86_64
CPU op-mode(s):              32-bit, 64-bit
Byte Order:                  Little Endian
Address sizes:               39 bits physical, 48 bits virtual
CPU(s):                      4
On-line CPU(s) list:        0-3
Thread(s) per core:         2
Core(s) per socket:         2
Socket(s):                   1
NUMA node(s):               1
Vendor ID:                   GenuineIntel
CPU family:                   6
Model:                       78
Model name:                  Intel(R) Core(TM) i5-6200U CPU @ 2.30GHz
Stepping:                    3
CPU MHz:                     900.005
CPU max MHz:                 2800.0000
CPU min MHz:                 400.0000
BogoMIPS:                    4800.00
Virtualization:              VT-x
L1d cache:                   64 KiB
L1i cache:                   64 KiB
L2 cache:                    512 KiB
L3 cache:                    3 MiB
```

說明:

型號: Intel i5

2 核心 4 執行緒, 所以有創 4 個 threads



gcc version 9.3.0 (Ubuntu 9.3.0-17ubuntu1~20.04)

下 -O3 時，就算將 sleep time 提昇 10000 倍，感覺還是不公平，推測應該是 compiler 覺得 g 這個變數沒有實際的用途，就也把整個 for 優化掉了。
後面沒有下 -O3 後，執行看起來比較公平。

intel i5 skylake 架構優化後：

```

File Edit Selection View Go Run Terminal Help
fair.c - hw9 - Visual Studio Code

EXPLORER
  hw9
    sample
      fair.c
      makefile
      test_do_while.c
      test_do_while.c

sample > C fair.c > sigHandler(int)
54     atomic_fetch_add(&in_cs, 1);
55     atomic_fetch_add_explicit(&count_array[givenID], 1, memory_order_relaxed);

PROBLEMS OUTPUT TERMINAL DEBUG CONSOLE
bash - sample

hsiang@hsiang-X556UQ:~/os/hw/hw9/sample$ make
gcc -g -O3 -pthread -march=skylake fair.c -o fair
gcc -g -O3 -pthread -march=skylake test_do_while.c -o test_do_while
hsiang@hsiang-X556UQ:~/os/hw/hw9/sample$ ./fair
0, 54801559
1, 5093213
2, 18251918
3, 5152156
hsiang@hsiang-X556UQ:~/os/hw/hw9/sample$

```

好像更不公平了

