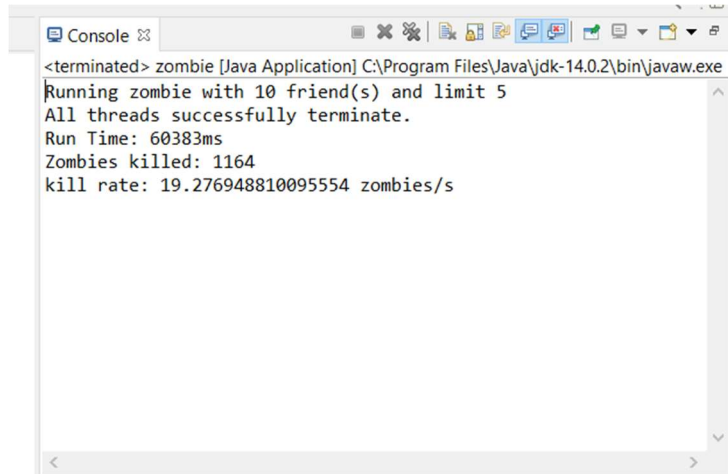


## Comp 409 Assignment 1

### 1. zombie.java k n.

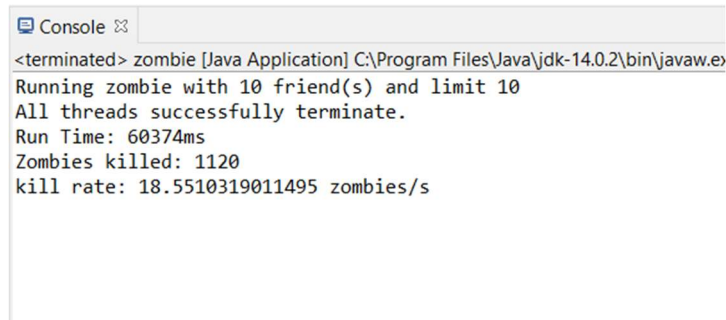
Program runs for 1 minute by default,  $k = 10$ . Friends do not interact with each other. Each Friend only interacts with main thread with synchronized methods, and their shared variables are protected by volatile.

#### a. $n = 5$



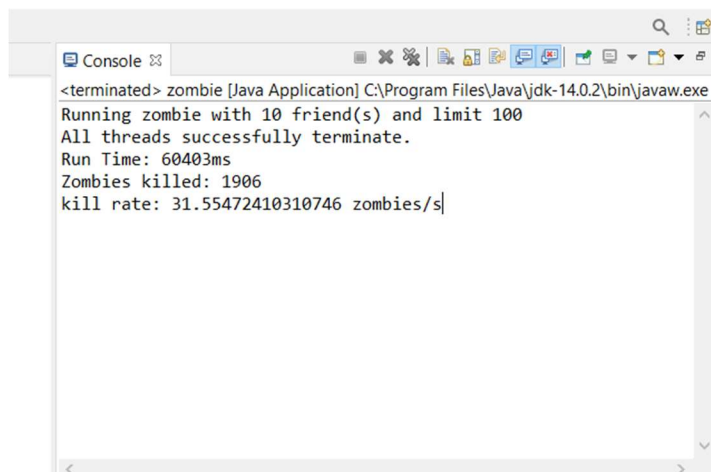
```
<terminated> zombie [Java Application] C:\Program Files\Java\jdk-14.0.2\bin\javaw.exe
Running zombie with 10 friend(s) and limit 5
All threads successfully terminate.
Run Time: 60383ms
Zombies killed: 1164
kill rate: 19.276948810095554 zombies/s
```

#### b. $n = 10$



```
<terminated> zombie [Java Application] C:\Program Files\Java\jdk-14.0.2\bin\javaw.exe
Running zombie with 10 friend(s) and limit 10
All threads successfully terminate.
Run Time: 60374ms
Zombies killed: 1120
kill rate: 18.5510319011495 zombies/s
```

#### c. $n = 100$



```
<terminated> zombie [Java Application] C:\Program Files\Java\jdk-14.0.2\bin\javaw.exe
Running zombie with 10 friend(s) and limit 100
All threads successfully terminate.
Run Time: 60403ms
Zombies killed: 1906
kill rate: 31.55472410310746 zombies/s
```

2. fault.java w h t k.

a. Single thread average : 171.2 ms


i. 145ms

```
Console 
<terminated> fault [Java Application] C:\Program Files\Java\jdk-14.0.2\bin\javaw.exe (Feb. 9, 2021, 11:35:46 a.m. – 11:35:50 a.m.)
Fault Generation Complete with 200 faults and 1 threads for 200 * 200.
Run Time: 145 ms
Now writting to image
Image Done
```


ii. 163ms

```
Console 
fault [Java Application] C:\Program Files\Java\jdk-14.0.2\bin\javaw.exe (Feb. 9, 2021, 11:38:07 a.m.)
Fault Generation Complete with 200 faults and 1 threads for 200 * 200.
Run Time: 163 ms
Now writting to image
```

iii. 165ms

```
Console 
<terminated> fault [Java Application] C:\Program Files\Java\jdk-14.0.2\bin\javaw.exe (Feb. 9, 2021, 11:38:22 a.m. – 11:38:27 a.m.)
Fault Generation Complete with 200 faults and 1 threads for 200 * 200.
Run Time: 165 ms
Now writting to image
Image Done
```

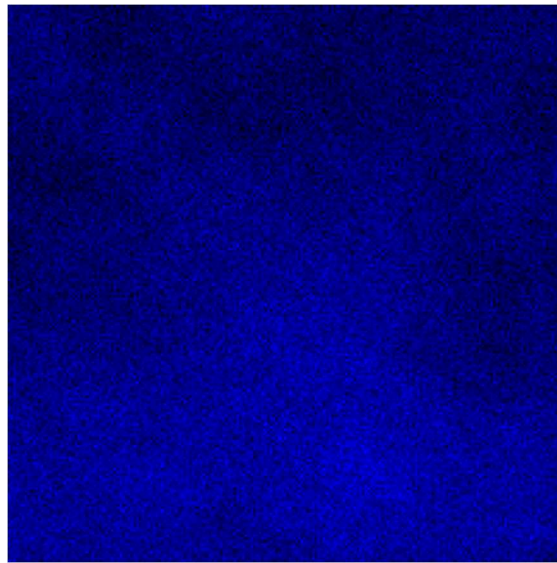
iv. 228ms

```
Console 
<terminated> fault [Java Application] C:\Program Files\Java\jdk-14.0.2\bin\javaw.exe (Feb. 9, 2021, 11:38:39 a.m. – 11:38:45 a.m.)
Fault Generation Complete with 200 faults and 1 threads for 200 * 200.
Run Time: 228 ms
Now writting to image
Image Done
```

v. 155ms

```
Console
<terminated> fault [Java Application] C:\Program Files\Java\jdk-14.0.2\bin\javaw.exe (Feb. 9, 2021, 11:38:56 a.m. – 11:39:01 a.m.)
Fault Generation Complete with 200 faults and 1 threads for 200 * 200.
Run Time: 155 ms
Now writting to image
Image Done
```

This is the image from a.v.



b. 2 threads average : 209.8ms

i. 231ms

```
Console
<terminated> fault [Java Application] C:\Program Files\Java\jdk-14.0.2\bin\javaw.exe (Feb. 9, 2021, 11:51:56 a.m. – 11:52:00 a.m.)
Fault Generation Complete with 200 faults and 2 threads for 200 * 200.
Run Time: 231 ms
Now writting to image
Image Done
```

ii. 196 ms



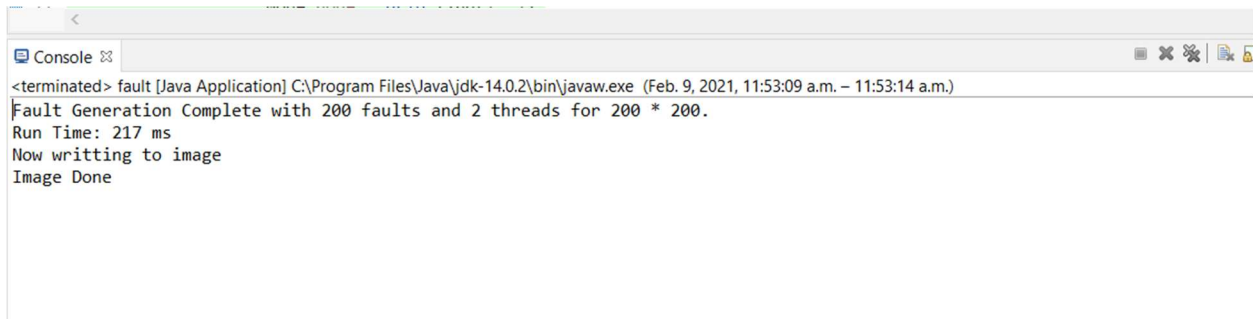
```
<terminated> fault [Java Application] C:\Program Files\Java\jdk-14.0.2\bin\javaw.exe (Feb. 9, 2021, 11:52:33 a.m. – 11:52:38 a.m.)
Fault Generation Complete with 200 faults and 2 threads for 200 * 200.
Run Time: 196 ms
Now writting to image
Image Done
|
```

iii. 190ms



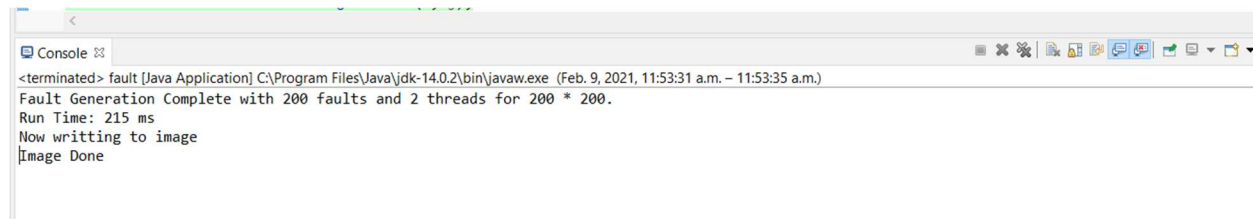
```
<terminated> fault [Java Application] C:\Program Files\Java\jdk-14.0.2\bin\javaw.exe (Feb. 9, 2021, 11:52:51 a.m. – 11:52:56 a.m.)
Fault Generation Complete with 200 faults and 2 threads for 200 * 200.
Run Time: 190 ms
Now writting to image
Image Done
```

iv. 217ms



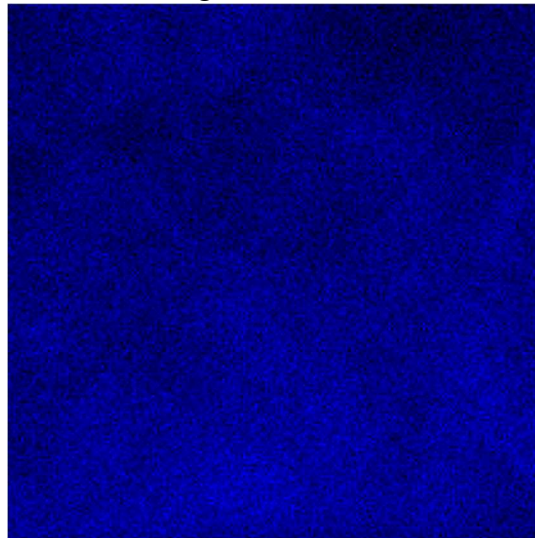
```
<terminated> fault [Java Application] C:\Program Files\Java\jdk-14.0.2\bin\javaw.exe (Feb. 9, 2021, 11:53:09 a.m. – 11:53:14 a.m.)
Fault Generation Complete with 200 faults and 2 threads for 200 * 200.
Run Time: 217 ms
Now writting to image
Image Done
```

v. 215ms



```
<terminated> fault [Java Application] C:\Program Files\Java\jdk-14.0.2\bin\javaw.exe (Feb. 9, 2021, 11:53:31 a.m. – 11:53:35 a.m.)
Fault Generation Complete with 200 faults and 2 threads for 200 * 200.
Run Time: 215 ms
Now writting to image
Image Done
```

This is the image from b.v.



- c. 3 threads average: 259ms
  - i. 256ms

```
Console x
<terminated> fault [Java Application] C:\Program Files\Java\jdk-14.0.2\bin\javaw.exe (Feb. 9, 2021, 12:03:41 p.m. – 12:03:45 p.m.)
Fault Generation Complete with 200 faults and 3 threads for 200 * 200.
Run Time: 256 ms
Now writting to image
Image Done
```

- ii. 273ms

```
Console x
<terminated> fault [Java Application] C:\Program Files\Java\jdk-14.0.2\bin\javaw.exe (Feb. 9, 2021, 12:04:11 p.m. – 12:04:16 p.m.)
Fault Generation Complete with 200 faults and 3 threads for 200 * 200.
Run Time: 273 ms
Now writting to image
Image Done
```

- iii. 251 ms

```
<
Console
fault [Java Application] C:\Program Files\Java\jdk-14.0.2\bin\javaw.exe (Feb. 9, 2021, 12:05:08 p.m.)
Fault Generation Complete with 200 faults and 3 threads for 200 * 200.
Run Time: 251 ms
Now writting to image
```

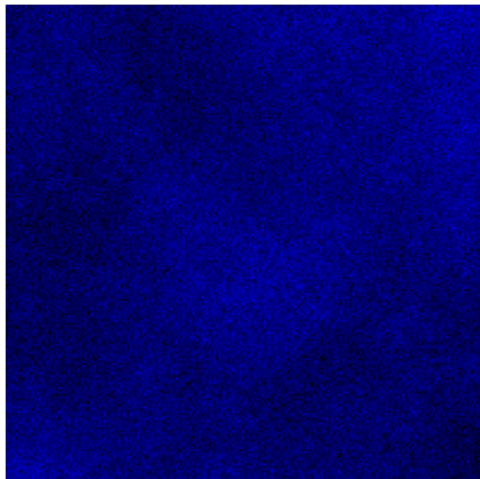
iv. 245ms

```
<
Console
<terminated> fault [Java Application] C:\Program Files\Java\jdk-14.0.2\bin\javaw.exe (Feb. 9, 2021, 12:05:26 p.m. – 12:05:30 p.m.)
Fault Generation Complete with 200 faults and 3 threads for 200 * 200.
Run Time: 245 ms
Now writting to image
Image Done
```

v. 270ms

```
<
Console
<terminated> fault [Java Application] C:\Program Files\Java\jdk-14.0.2\bin\javaw.exe (Feb. 9, 2021, 12:05:43 p.m. – 12:05:48 p.m.)
Fault Generation Complete with 200 faults and 3 threads for 200 * 200.
Run Time: 270 ms
Now writting to image
Image Done
```

This is the image from c.v.



- d. Four threads average:311.6  
i. 309ms

```
<terminated> fault [Java Application] C:\Program Files\Java\jdk-14.0.2\bin\javaw.exe (Feb. 9, 2021, 12:12:33 p.m. – 12:12:38 p.m.)
Fault Generation Complete with 200 faults and 4 threads for 200 * 200.
Run Time: 309 ms
Now writting to image
Image Done
```

- ii. 286ms

```
<terminated> fault [Java Application] C:\Program Files\Java\jdk-14.0.2\bin\javaw.exe (Feb. 9, 2021, 12:13:01 p.m. – 12:13:06 p.m.)
Fault Generation Complete with 200 faults and 4 threads for 200 * 200.
Run Time: 286 ms
Now writting to image
Image Done
```

- iii. 326ms

```
<terminated> fault [Java Application] C:\Program Files\Java\jdk-14.0.2\bin\javaw.exe (Feb. 9, 2021, 12:14:57 p.m. – 12:15:02 p.m.)
Fault Generation Complete with 200 faults and 4 threads for 200 * 200.
Run Time: 326 ms
Now writting to image
Image Done
```

- iv. 329ms

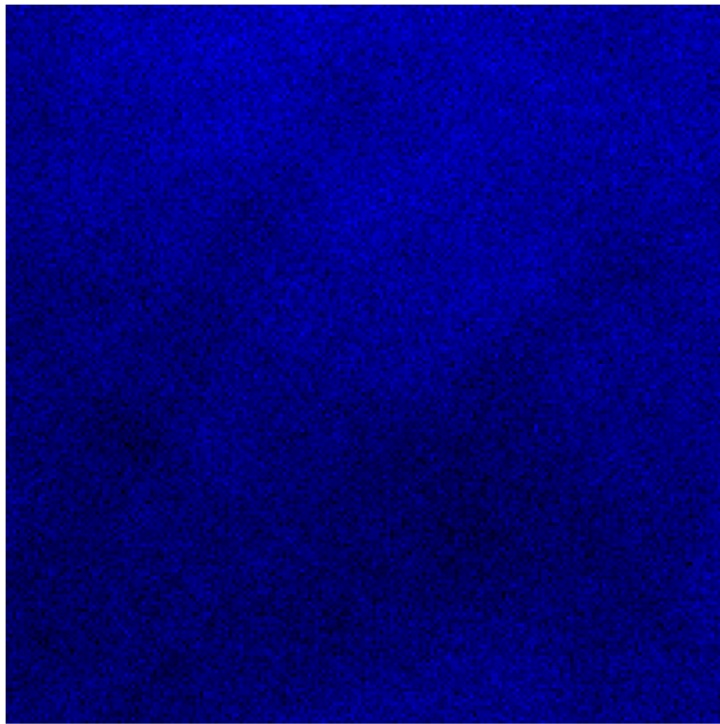
```
<terminated> fault [Java Application] C:\Program Files\Java\jdk-14.0.2\bin\javaw.exe (Feb. 9, 2021, 12:15:16 p.m. – 12:15:21 p.m.)
Fault Generation Complete with 200 faults and 4 threads for 200 * 200.
Run Time: 329 ms
Now writting to image
Image Done
```

- v. 308ms

```
<terminated> fault [Java Application] C:\Program Files\Java\jdk-14.0.2\bin\javaw.exe (Feb. 9, 2021, 12:15:31 p.m. – 12:15:36 p.m.)
Fault Generation Complete with 200 faults and 4 threads for 200 * 200.
Run Time: 308 ms
Now writting to image
Image Done
```



This is the image from d.v.



Comment: This is the relative speedup graph. Adding more threads actually hinders the performance because they locks the Node they tried to increment and having more threads means that they are more likely to run into conflict and have to wait the others to unlock.

