```
==269106== Possible data race during read of size 4 at 0×128060 by thread #1
==269106== Locks held: none
==269106==    at 0×10897C: main (main-race.c:18)
==269106==
==269106== This conflicts with a previous write of size 4 by thread #2
==269106== Locks held: 1, at address 0×128068
==269106==    at 0×108904: worker (main-race.c:10)
==269106==    by 0×489385F: ??? (in /usr/libexec/valgrind/vgpreload_helgrind-
arm64-linux.so)
==269106==    by 0×4965453: start_thread (pthread_create.c:447)
==269106==    by 0×49CEB1B: thread_start (clone.S:79)
==269106==  Address 0×128060 is 0 bytes inside data symbol "balance"
==269106==
==269106== ─────────────────────────────────────────────────────────
==269106==
==269106==  Lock at 0×128068 was first observed
==269106==    at 0×48905FC: ??? (in /usr/libexec/valgrind/vgpreload_helgrind-
arm64-linux.so)
==269106==    by 0×1088EB: worker (main-race.c:9)
==269106==    by 0×489385F: ??? (in /usr/libexec/valgrind/vgpreload_helgrind-
arm64-linux.so)
==269106==    by 0×4965453: start_thread (pthread_create.c:447)
```

```
==291501==    by 0×1088F7: worker (main-deadlock.c:10)
==291501==    by 0×489385F: ??? (in /usr/libexec/valgrind/vgpreload_helgrind-
arm64-linux.so)
==291501==    by 0×4965453: start_thread (pthread_create.c:447)
==291501==    by 0×49CEB1B: thread_start (clone.S:79)
==291501==  Address 0×128060 is 0 bytes inside data symbol "m1"
==291501==
==291501==  Lock at 0×128090 was first observed
==291501==    at 0×48905FC: ??? (in /usr/libexec/valgrind/vgpreload_helgrind-
arm64-linux.so)
==291501==    by 0×10892B: worker (main-deadlock.c:11)
==291501==    by 0×489385F: ??? (in /usr/libexec/valgrind/vgpreload_helgrind-
arm64-linux.so)
==291501==    by 0×4965453: start_thread (pthread_create.c:447)
==291501==    by 0×49CEB1B: thread_start (clone.S:79)
==291501==  Address 0×128090 is 0 bytes inside data symbol "m2"
==291501==
==291501==
==291501==
==291501== Use --history-level=approx or =none to gain increased speed, at
==291501== the cost of reduced accuracy of conflicting-access information
==291501== For lists of detected and suppressed errors, rerun with: -s
==291501== ERROR SUMMARY: 1 errors from 1 contexts (suppressed: 8 from 7)
```

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```
==388131==
==388131== Thread #3: lock order "0×128090 before 0×1280C0" violated
==388131==
==388131== Observed (incorrect) order is: acquisition of lock at 0×1280C0
==388131==    at 0×48905FC: ??? (in /usr/libexec/valgrind/vgpreload_helgrind-
arm64-linux.so)
==388131==    by 0×108993: worker (main-deadlock-global.c:15)
==388131==    by 0×489385F: ??? (in /usr/libexec/valgrind/vgpreload_helgrind-
arm64-linux.so)
==388131==    by 0×4965453: start_thread (pthread_create.c:447)
==388131==    by 0×49CEB1B: thread_start (clone.S:79)
==388131==
==388131==  followed by a later acquisition of lock at 0×128090
==388131==    at 0×48905FC: ??? (in /usr/libexec/valgrind/vgpreload_helgrind-
arm64-linux.so)
==388131==    by 0×1089C7: worker (main-deadlock-global.c:16)
==388131==    by 0×489385F: ??? (in /usr/libexec/valgrind/vgpreload_helgrind-
arm64-linux.so)
==388131==    by 0×4965453: start_thread (pthread_create.c:447)
==388131==    by 0×49CEB1B: thread_start (clone.S:79)
==388131==
==388131== Required order was established by acquisition of lock at 0×128090
==388131==    at 0×48905FC: ??? (in /usr/libexec/valgrind/vgpreload_helgrind-
arm64-linux.so)
==388131==    by 0×10892B: worker (main-deadlock-global.c:12)
==388131==    by 0×489385F: ??? (in /usr/libexec/valgrind/vgpreload_helgrind-
arm64-linux.so)
==388131==    by 0×4965453: start_thread (pthread_create.c:447)
==388131==    by 0×49CEB1B: thread_start (clone.S:79)
==388131==
==388131==  followed by a later acquisition of lock at 0×1280C0
```

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```
==399717== Possible data race during read of size 4 at 0×12804C by thread #1
==399717== Locks held: none
==399717==    at 0×1088A8: main (main-signal.c:16)
==399717==
==399717== This conflicts with a previous write of size 4 by thread #2
==399717== Locks held: none
==399717==    at 0×108838: worker (main-signal.c:9)
==399717==    by 0×489385F: ??? (in /usr/libexec/valgrind/vgpreload_helgrind-arm64-linux.so)
==399717==    by 0×4965453: start_thread (pthread_create.c:447)
==399717==    by 0×49CEB1B: thread_start (clone.S:79)
==399717==  Address 0×12804c is 0 bytes inside data symbol "done"
==399717==
this should print last
==399717==
==399717== Use --history-level=approx or =none to gain increased speed, at
==399717== the cost of reduced accuracy of conflicting-access information
==399717== For lists of detected and suppressed errors, rerun with: -s
==399717== ERROR SUMMARY: 1 errors from 1 contexts (suppressed: 60 from 32)
```

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```
==404155== Helgrind, a thread error detector
==404155== Copyright (C) 2007-2024, and GNU GPL'd, by OpenWorks LLP et al.
==404155== Using Valgrind-3.24.0 and LibVEX; rerun with -h for copyright info
==404155== Command: ./main-signal -rv
==404155==
this should print first
this should print last
==404155==
==404155== Use --history-level=approx or =none to gain increased speed, at
==404155== the cost of reduced accuracy of conflicting-access information
==404155== For lists of detected and suppressed errors, rerun with: -s
==404155== ERROR SUMMARY: 0 errors from 0 contexts (suppressed: 7 from 6)
```