

1 2 3 4 1 2 5 1 2 3 4 5

3 frames

0	+	4	5
1	~~2~~	+	3
2	~~3~~	~~2~~	4

9 faults

4 frames

0	+	5	4
1	~~2~~	+	5
2	~~3~~	~~2~~	
3	~~4~~	3	

10 faults

5 frames

0	1
1	2
2	3
3	4
4	5

5 faults

Threads

user threads - program threads

· kernel threads - used by O.S.
scheduled

JVM threads:

- main
- JIT compiler (just in time)
- garbage collector
- signal dispatcher
- debug listener
- UI Events

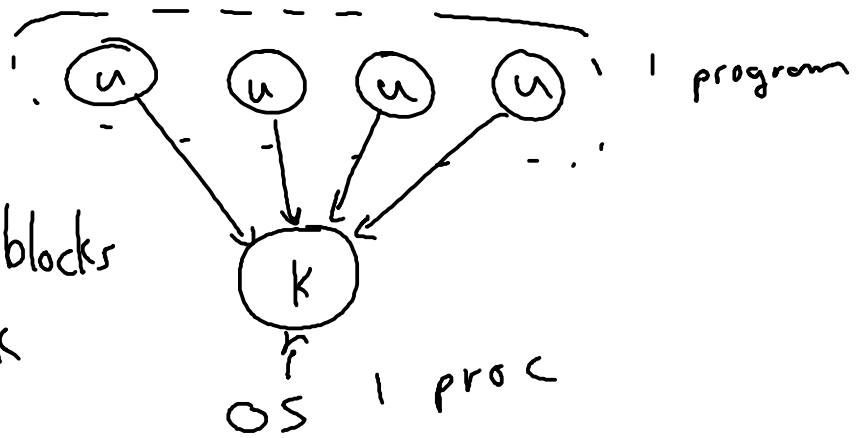
Java:

- Thread Pools
- implement Runnable pass to Thread object
(run method)
- lambda function (run)
- extend Thread, override run

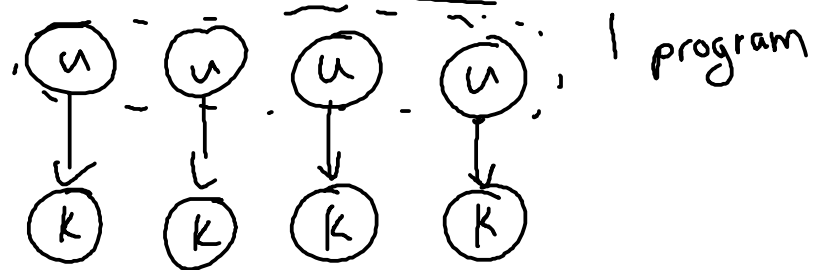
Mapping: user to kernel threads

many-to-one

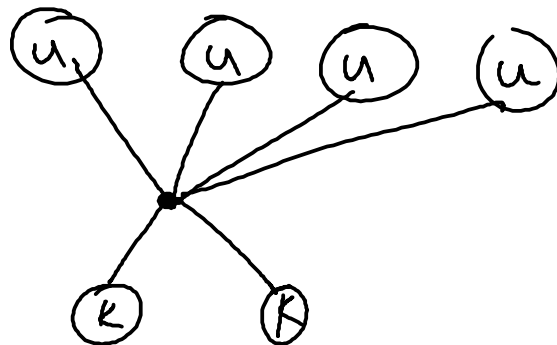
1 user thread blocks
they all block



one-to-one

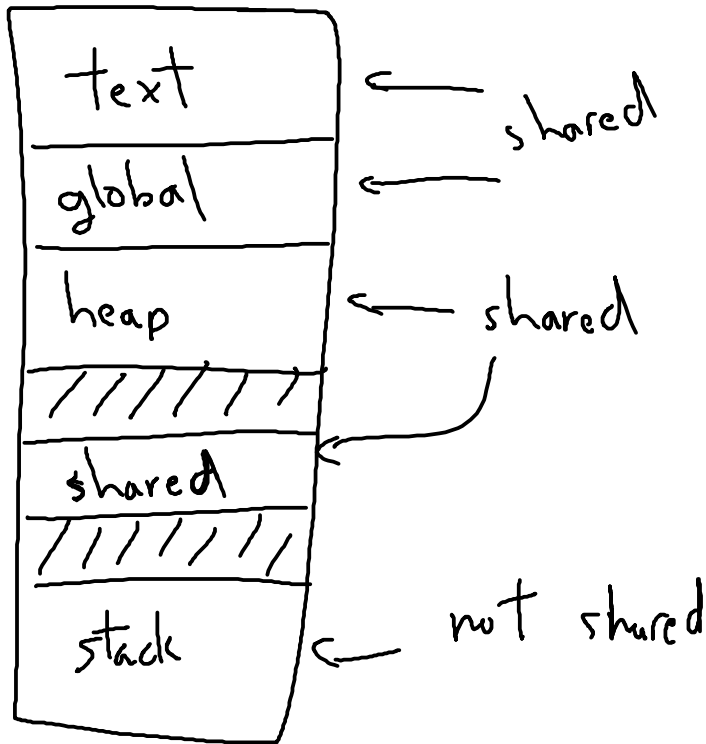


many-to-many



process mem

Threads



different method
calls means
different stack