```
void *producer(void *arg) {
                                                                                                           Count
    int i;
                                                                                 T_{c2}
                                                                                               T_p
    for (i = 0; i < loops; i++) {
                                                                    Tcl
                                                                          State
                                                                                       State
                                                                                                    State
                                                                                                                   Comment
         Pthread_mutex_lock(&mutex);
                                                    // pl
                                                                           Run
                                                                                       Ready
                                                                                                   Ready
                                                                                                           0
                                                                     c1
         if (count == 1)
                                                    // p2
                                                                     c2
                                                                          Run
                                                                                       Ready
                                                                                                   Ready
             Pthread_cond_wait(&cond, &mutex); // p3
                                                                     c3
                                                                          Sleep
                                                                                       Ready
                                                                                                           0
                                                                                                                Nothing to get
                                                                                                   Ready
                                                    // p4
                                                                          Sleep
                                                                                       Ready
                                                                                              p1
                                                                                                    Run
         Pthread cond signal (&cond);
                                                    // p5
                                                                                                           0
                                                                                                    Run
                                                                          Sleep
                                                                                       Ready
                                                                                              p2
         Pthread mutex unlock (&mutex);
                                                    // p6
                                                                          Sleep
                                                                                       Ready
                                                                                              p4
                                                                                                    Run
                                                                                                           1
                                                                                                                Buffer now full
                                                                                                                 Tc1 awoken
                                                                          Ready
                                                                                       Ready
                                                                                              p5
                                                                                                    Run
                                                                                                           1
                                                                          Ready
                                                                                       Ready
                                                                                              p6
                                                                                                    Run
                                                                                                           1
void *consumer(void *arg) {
                                                                                                           1
                                                                          Ready
                                                                                       Ready
                                                                                              p1
                                                                                                    Run
    int i;
                                                                          Ready
                                                                                       Ready
                                                                                              p2
                                                                                                    Run
                                                                                                           1
    for (i = 0; i < loops; i++) {
                                                                                              p3
                                                                          Ready
                                                                                       Ready
                                                                                                    Sleep
                                                                                                           1
                                                                                                                Buffer full; sleep
         Pthread_mutex_lock(&mutex);
                                                    // cl
                                                                                        Run
                                                                                                    Sleep
                                                                                                           1
                                                                                                                Tc2 sneaks in ...
                                                                          Ready
                                                                                  c1
         if (count == 0)
                                                    // c2
                                                                                                           1
                                                                          Ready
                                                                                  c2
                                                                                        Run
                                                                                                    Sleep
             Pthread cond wait (&cond, &mutex); // c3
                                                                                  c4
                                                                                        Run
                                                                                                    Sleep
                                                                                                               ... and grabs data
                                                                          Ready
         int tmp = get();
                                                    // c4
                                                                                  c5
                                                                                        Run
                                                                                                   Ready
                                                                                                                 Tp awoken
                                                                          Ready
         Pthread_cond_signal(&cond);
                                                    // c5
                                                                                        Run
                                                                                                   Ready
                                                                                                           0
                                                                          Ready
         Pthread_mutex_unlock(&mutex);
                                                    // c6
                                                                                                           0
                                                                          Run
                                                                                       Ready
                                                                                                   Ready
                                                                                                                Oh oh! No data
         printf("%d\n", tmp);
                                                                                                               Count
                                                                                                  T_p
                                                                        Tct
                                                                              State
                                                                                     T_{c2}
                                                                                           State
                                                                                                        State
                                                                                                                       Comment
  void *producer(void *arg) {
      int i;
                                                                                                               0
                                                                        c1
                                                                              Run
                                                                                           Ready
                                                                                                       Ready
      for (i = 0; i < loops; i++) {
                                                                                                               0
                                                                         c2
                                                                              Run
                                                                                           Ready
                                                                                                       Ready
           Pthread_mutex_lock(&mutex);
                                                      // pl
                                                                         c3
                                                                              Sleep
                                                                                           Ready
                                                                                                       Ready
                                                                                                               0
                                                                                                                    Nothing to get
           while (count == 1)
                                                      // p2
                                                                              Sleep
                                                                                      c1
                                                                                           Run
                                                                                                       Ready
                                                                                                               0
                Pthread cond wait (&cond, &mutex); // p3
                                                                                      c2
                                                                                                               0
                                                                              Sleep
                                                                                           Run
                                                                                                       Ready
                                                      // p4
           put(i);
                                                                              Sleep
                                                                                      c3
                                                                                           Sleep
                                                                                                       Ready
                                                                                                               0
                                                                                                                    Nothing to get
           Pthread cond signal (&cond);
                                                      // p5
                                                                              Sleep
                                                                                           Sleep
                                                                                                        Run
                                                                                                  p1
           Pthread_mutex_unlock(&mutex);
                                                      // p6
                                                                              Sleep
                                                                                           Sleep
                                                                                                  p2
                                                                                                        Run
                                                                                                               0
                                                                                                               1
                                                                                                        Run
                                                                                                                    Buffer now full
                                                                              Sleep
                                                                                           Sleep
                                                                                                  p4
                                                                                           Sleep
                                                                                                  p5
                                                                              Ready
                                                                                                        Run
                                                                                                               1
                                                                                                                     Tc1 awoken
                                                                                                  p6
                                                                              Ready
                                                                                           Sleep
                                                                                                        Run
                                                                                                               1
  void *consumer(void *arg) {
                                                                              Ready
                                                                                           Sleep
                                                                                                  p1
                                                                                                        Run
                                                                                                               1
      int i;
                                                                                                        Run
                                                                                                               1
                                                                              Ready
                                                                                           Sleep
                                                                                                  p2
       for (i = 0; i < loops; i++) {
                                                                                           Sleep
                                                                                                  p3
                                                                                                       Sleep
                                                                                                               1
                                                                                                                    Must sleep (full)
                                                                              Ready
           Pthread_mutex_lock(&mutex);
                                                      // cl
                                                                              Run
                                                                                           Sleep
                                                                                                        Sleep
                                                                                                               1
                                                                                                                   Recheck condition
                                                                         c2
           while (count == 0)
                                                      // c2
                                                                         c4
                                                                              Run
                                                                                           Sleep
                                                                                                        Sleep
                                                                                                               0
                                                                                                                    Tc1 grabs data
                Pthread_cond_wait(&cond, &mutex); // c3
                                                                         c5
                                                                              Run
                                                                                           Ready
                                                                                                        Sleep
                                                                                                                    Oops! Woke Tc2
           int tmp = get();
                                                      // c4
                                                                         c6
                                                                              Run
                                                                                           Ready
                                                                                                        Sleep
                                                      // c5
           Pthread cond signal (&cond);
                                                                                                        Sleep
                                                                                                               0
                                                                         c1
                                                                              Run
                                                                                           Ready
           Pthread_mutex_unlock(&mutex);
                                                      // c6
                                                                         c2
                                                                              Run
                                                                                           Ready
                                                                                                        Sleep
           printf("%d\n", tmp);
                                                                                                               0
                                                                         c3
                                                                              Sleep
                                                                                           Ready
                                                                                                       Sleep
                                                                                                                    Nothing to get
                                                                                                       Sleep
                                                                              Sleep
                                                                                      c2
                                                                                           Run
                                                                                                       Sleep
                                                                              Sleep
                                                                                           Sleep
                                                                                                                   Everyone asleep...
```