

```

void *producer(void *arg) {
    int i;
    for (i = 0; i < loops; i++) {
        Pthread_mutex_lock(&mutex);          // p1
        if (count == 1)                       // p2
            Pthread_cond_wait(&cond, &mutex); // p3
        put(i);                              // p4
        Pthread_cond_signal(&cond);           // p5
        Pthread_mutex_unlock(&mutex);         // p6
    }
}

void *consumer(void *arg) {
    int i;
    for (i = 0; i < loops; i++) {
        Pthread_mutex_lock(&mutex);          // c1
        if (count == 0)                       // c2
            Pthread_cond_wait(&cond, &mutex); // c3
        int tmp = get();                     // c4
        Pthread_cond_signal(&cond);           // c5
        Pthread_mutex_unlock(&mutex);         // c6
        printf("%d\n", tmp);
    }
}

```

| T <sub>c1</sub> | State | T <sub>c2</sub> | State | T <sub>p</sub> | State | Count | Comment                       |
|-----------------|-------|-----------------|-------|----------------|-------|-------|-------------------------------|
| c1              | Run   |                 | Ready |                | Ready | 0     |                               |
| c2              | Run   |                 | Ready |                | Ready | 0     |                               |
| c3              | Sleep |                 | Ready |                | Ready | 0     | Nothing to get                |
|                 | Sleep |                 | Ready | p1             | Run   | 0     |                               |
|                 | Sleep |                 | Ready | p2             | Run   | 0     |                               |
|                 | Sleep |                 | Ready | p4             | Run   | 1     | Buffer now full               |
|                 | Ready |                 | Ready | p5             | Run   | 1     | T <sub>c1</sub> awoken        |
|                 | Ready |                 | Ready | p6             | Run   | 1     |                               |
|                 | Ready |                 | Ready | p1             | Run   | 1     |                               |
|                 | Ready |                 | Ready | p2             | Run   | 1     |                               |
|                 | Ready |                 | Ready | p3             | Sleep | 1     | Buffer full; sleep            |
|                 | Ready | c1              | Run   |                | Sleep | 1     | T <sub>c2</sub> sneaks in ... |
|                 | Ready | c2              | Run   |                | Sleep | 1     |                               |
|                 | Ready | c4              | Run   |                | Sleep | 0     | ... and grabs data            |
|                 | Ready | c5              | Run   |                | Ready | 0     | T <sub>p</sub> awoken         |
|                 | Ready | c6              | Run   |                | Ready | 0     |                               |
| c4              | Run   |                 | Ready |                | Ready | 0     | Oh oh! No data                |

```

void *producer(void *arg) {
    int i;
    for (i = 0; i < loops; i++) {
        Pthread_mutex_lock(&mutex);          // p1
        while (count == 1)                   // p2
            Pthread_cond_wait(&cond, &mutex); // p3
        put(i);                              // p4
        Pthread_cond_signal(&cond);           // p5
        Pthread_mutex_unlock(&mutex);         // p6
    }
}

void *consumer(void *arg) {
    int i;
    for (i = 0; i < loops; i++) {
        Pthread_mutex_lock(&mutex);          // c1
        while (count == 0)                   // c2
            Pthread_cond_wait(&cond, &mutex); // c3
        int tmp = get();                     // c4
        Pthread_cond_signal(&cond);           // c5
        Pthread_mutex_unlock(&mutex);         // c6
        printf("%d\n", tmp);
    }
}

```

| T <sub>c1</sub> | State | T <sub>c2</sub> | State | T <sub>p</sub> | State | Count | Comment                    |
|-----------------|-------|-----------------|-------|----------------|-------|-------|----------------------------|
| c1              | Run   |                 | Ready |                | Ready | 0     |                            |
| c2              | Run   |                 | Ready |                | Ready | 0     |                            |
| c3              | Sleep |                 | Ready |                | Ready | 0     | Nothing to get             |
|                 | Sleep | c1              | Run   |                | Ready | 0     |                            |
|                 | Sleep | c2              | Run   |                | Ready | 0     |                            |
|                 | Sleep | c3              | Sleep |                | Ready | 0     | Nothing to get             |
|                 | Sleep |                 | Sleep | p1             | Run   | 0     |                            |
|                 | Sleep |                 | Sleep | p2             | Run   | 0     |                            |
|                 | Sleep |                 | Sleep | p4             | Run   | 1     | Buffer now full            |
|                 | Ready |                 | Sleep | p5             | Run   | 1     | T <sub>c1</sub> awoken     |
|                 | Ready |                 | Sleep | p6             | Run   | 1     |                            |
|                 | Ready |                 | Sleep | p1             | Run   | 1     |                            |
|                 | Ready |                 | Sleep | p2             | Run   | 1     |                            |
|                 | Ready |                 | Sleep | p3             | Sleep | 1     | Must sleep (full)          |
| c2              | Run   |                 | Sleep |                | Sleep | 1     | Recheck condition          |
| c4              | Run   |                 | Sleep |                | Sleep | 0     | T <sub>c1</sub> grabs data |
| c5              | Run   |                 | Ready |                | Sleep | 0     | Oops! Woke T <sub>c2</sub> |
| c6              | Run   |                 | Ready |                | Sleep | 0     |                            |
| c1              | Run   |                 | Ready |                | Sleep | 0     |                            |
| c2              | Run   |                 | Ready |                | Sleep | 0     |                            |
| c3              | Sleep |                 | Ready |                | Sleep | 0     | Nothing to get             |
|                 | Sleep | c2              | Run   |                | Sleep | 0     |                            |
|                 | Sleep | c3              | Sleep |                | Sleep | 0     | Everyone asleep...         |