Dawit Woldegiorgis
COP 4600
Section: 0467
September 24, 2015
Homework #3

Learning Experience:

Just like anything done with some thought given to it, the relationship between buffers, producers and consumers became more clear as I was trying to move around and fit chunks of code. Although having notes and reading them was enough to gain surface level understanding, it's better for retaining information when doing problems related to a concept – which I believe is what happened here.

Suggestion:

N/a

On my honor, I have neither given nor received unauthorized aid in doing this assignment.

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Show an execution pattern where erroneous behavior is observed:
Note: For the following codes, assume that buffer [n] = 0 indicates that there is no product loaded into the buffer, i.e buffer [n] = null

a. With 2 producers and 1 consumer

Shared code

```
    #define N 100 /* number of slots in buffer */
    int buffer[ N ];                   // buffer = {0,0,0}
    int in = 0;
    int out = 0;
```

Producer 1 body

```
    int product;
    while ( 1 ) {
        product = make_product();      // product = 10 (arbitrary)

        while ( (in + 1) % N) == out )
            ; /* busy wait */
        buffer[ in ] = product;        // buffer [0]  = 10
                                       // buffer = {10,0,0}
```

Context Switch

Producer 2 body

```
    int product;
    while ( 1 ) {
        product = make_product();  // product = 14 (arbitrary)

        while ( (in + 1) % N) == out )
            ; /* busy wait */
        buffer[ in ] = product;    // buffer [0] = 14
                                   // buffer = {14,0,0}
                                   // Data integrity compromised!
        in=(in+1)%N;               // in = 1
    }
```

Context Switch

Producer 1 body (RESUME)

```
        in=(in+1)%N;                      // in = 2
    }
```

Context Switch

Consumer's body (LOOP 1)

```
    int product;
    while ( 1 ) {
    while ( in == out )                   // in = 2 > out = 0
        ; /* busy wait */

        product = buffer[ out ];          // product = buffer[0] = 14
        out = (out + 1) % N;              // out = 1
        consume( product );               // buffer = {0,0,0}
    }
```

Consumer's body (LOOP 2)

```
    int product;
    while ( 1 ) {
    while ( in == out )                   // in = 2 > out = 1
        ; /* busy wait */

        product = buffer[ out ];       // product = buffer[1] = null*
        out = (out + 1) % N;
        consume( product );            // ERROR: No product to consume
    }
```

b. With 1 producer and 2 consumers

Shared code

```
     #define N 100 /* number of slots in buffer */
    int buffer[ N ];                   // buffer = {0,0,0}
    int in = 0;
    int out = 0;
```

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Producer’s body

```
    int product;
    while ( 1 ) {
        product = make_product();       // product = 4 (arbitrary)

        while ( (in + 1) % N) == out )
            ; /* busy wait */

        buffer[ in ] = product;         // buffer [0] = 4
                                        // buffer = {4,0,0}
        in=(in+1)%N;                    // in = 1
    }
```

Context Switch

Consumer 1 body

```
    int product;
    while ( 1 ) {
    while ( in == out )                  // in = 1 > out = 0
        ; /* busy wait */
```

Context Switch

Consumer 2 body

```
    int product;
    while ( 1 ) {
    while ( in == out )                  // in = 1 > out = 0
        ; /* busy wait */

        product = buffer[ out ];         // product = buffer[0] = 4
        out = (out + 1) % N;             // out = 1
        consume( product );              // buffer = {0,0,0}

}
```

Context Switch

Consumer 1 body (RESUME)

```
        product = buffer[ out ];        // product = buffer[1] = null*
        out = (out + 1) % N;            // out = 2
        consume( product );             // ERROR! Nothing to consume

}
```