

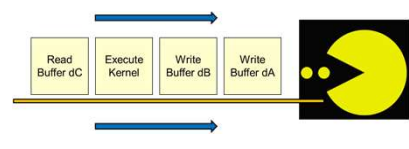
OpenCL Events



Oregon State University
Mike Bailey
mjb@cs.oregonstate.edu

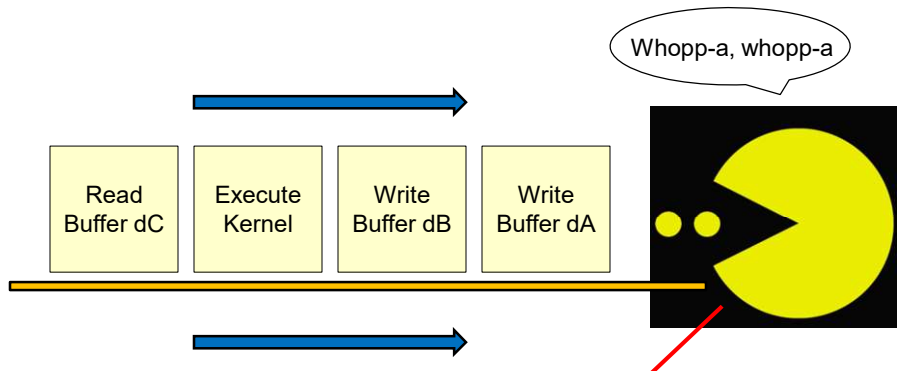


This work is licensed under a [Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License](https://creativecommons.org/licenses/by-nc-nd/4.0/)



OpenCL Events

An event is an object that communicates the status of OpenCL commands



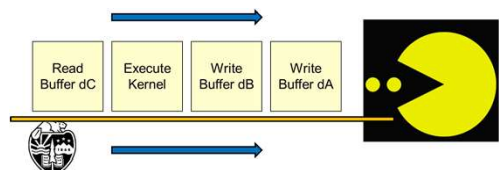
From the OpenCL Notes: 11. Enqueue the Kernel Object for Execution

3

```
size_t globalWorkSize[ 3 ] = { NUM_ELEMENT, 1, 1 };
size_t localWorkSize[ 3 ] = { LOCAL_SIZE, 1, 1 };

status = clEnqueueNDRangeKernel( cmdQueue, kernel, 1, NULL, globalWorkSize, localWorkSize, 0, NULL, NULL );
```

```
status = clEnqueueNDRangeKernel( cmdQueue, kernel, 1, NULL, globalWorkSize, localWorkSize, 0, NULL, NULL );
```



event that will be thrown when this kernel is finished executing

events to wait for before this kernel is allowed to execute

event wait list

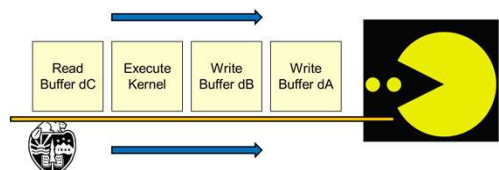
3

Creating an Event

4

```
cl_event waitKernelA, waitKernel B, waitKernelC;

status = clEnqueueNDRangeKernel( cmdQueue, kernel, 1, NULL, globalWorkSize, localWorkSize, 0, NULL, &waitKernelC );
```



event that will be thrown when this kernel is finished executing

event(s) to wait for before this kernel is allowed to execute

4

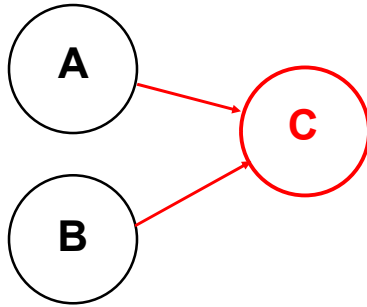
Waiting for Events from Previously-Executed Kernels

5

```
cl_event waitKernelA, waitKernel B, waitKernelC;  
  
...  
  
cl_event dependenciesAB[ 2 ];  
dependenciesAB[ 0 ] = waitKernelA;  
dependenciesAB[ 1 ] = waitKernelB;  
status = clEnqueueNDRangeKernel( cmdQueue, kernelC, 1, NULL, globalWorkSize, localWorkSize, 2, dependenciesAB, NULL );
```

event that will be thrown when this kernel is finished executing

event(s) to wait for before this kernel is allowed to execute



mjb -- , March 27, 2021

5

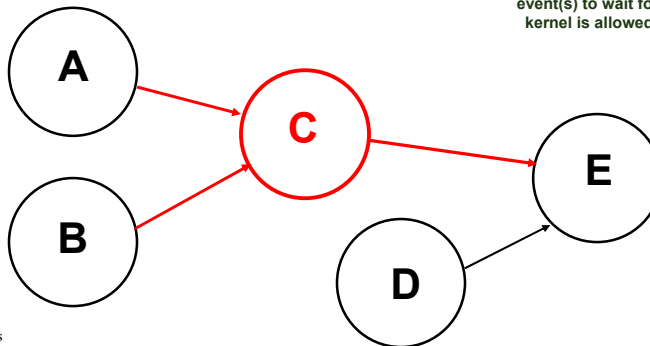
Creating an Execution Graph Structure

6

```
cl_event waitKernelA, waitKernel B, waitKernelC;  
  
cl_event dependenciesAB[ 2 ];  
dependenciesAB[ 0 ] = waitKernelA;  
dependenciesAB[ 1 ] = waitKernelB;  
status = clEnqueueNDRangeKernel( cmdQueue, kernelC, 1, NULL, globalWorkSize, localWorkSize, 2, dependenciesAB, &waitKernelC );
```

event that will be thrown when this kernel is finished executing

event(s) to wait for before this kernel is allowed to execute



mjb -- , March 27, 2021

6

Creating the Full Execution Graph Structure

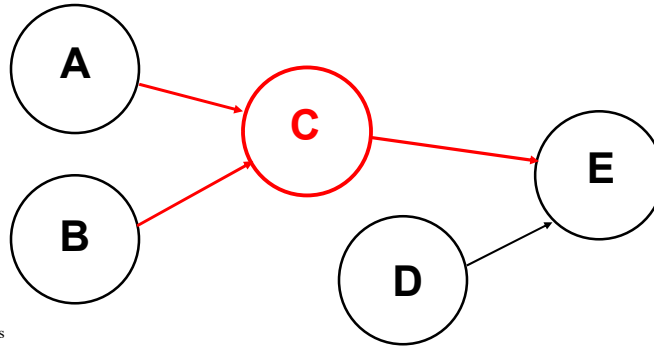
7

```
cl_event waitKernelA, waitKernel B, waitKernelC, waitKernelD;
```

```
cl_event dependenciesAB[ 2 ];  
dependenciesAB[ 0 ] = waitKernelA;  
dependenciesAB[ 1 ] = waitKernelB;
```

```
cl_event dependenciesCD[ 2 ];  
dependenciesCD[ 0 ] = waitKernelC;  
dependenciesCD[ 1 ] = waitKernelD;
```

```
status = clEnqueueNDRangeKernel( cmdQueue, kernelA, 1, NULL, globalWorkSize, localWorkSize, 0, NULL, &waitKernelA );  
status = clEnqueueNDRangeKernel( cmdQueue, kernelB, 1, NULL, globalWorkSize, localWorkSize, 0, NULL, &waitKernelB );  
status = clEnqueueNDRangeKernel( cmdQueue, kernelC, 1, NULL, globalWorkSize, localWorkSize, 2, dependenciesAB, &waitKernelC );  
status = clEnqueueNDRangeKernel( cmdQueue, kernelD, 1, NULL, globalWorkSize, localWorkSize, 0, NULL, &waitKernelD );  
status = clEnqueueNDRangeKernel( cmdQueue, kernelE, 1, NULL, globalWorkSize, localWorkSize, 2, dependenciesCD, NULL );
```



mjb -- , March 27, 2021

7

Waiting for One Event

8

```
cl_event waitKernelA, waitKernel B.
```

```
...
```

```
status = clEnqueueNDRangeKernel( cmdQueue, kernelC, 1, NULL, globalWorkSize, localWorkSize, 1, &waitKernelA, NULL );
```

event(s) to wait for



mjb -- , March 27, 2021

8

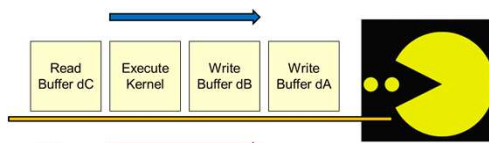
Placing a Barrier in the Command Queue

9

```
status = clEnqueueBarrier( cmdQueue );
```

Note: this *cannot* throw its own event

This does not complete until all commands enqueued before it have completed.



9

Placing an Event Marker in the Command Queue

10

```
cl_event waitMarker;  
status = clEnqueueMarker( cmdQueue, &waitMarker );
```

Note: this *can* throw its own event

This does not complete until all commands enqueued before it have completed.

This is just like a barrier, but it can throw an event to be waited for.

10

Waiting for Events Without Enqueuing Another Command

11

```
status = clWaitForEvents( 2, dependencies );
```


event(s) to wait for

This **blocks** until the specified events are thrown, so use it carefully!




mjb - , March 27, 2021

11

I Like Synchronizing Things This Way

12

```
// wait until all queued tasks have taken place:  
  
void  
Wait( cl_command_queue queue )  
{  
    cl_event wait;  
    cl_int status;  
  
    status = clEnqueueMarker( queue, &wait );  
    if( status != CL_SUCCESS )  
        fprintf( stderr, "Wait: clEnqueueMarker failed\n" );  
  
    status = clWaitForEvents( 1, &wait ); // blocks until everything is done!  
    if( status != CL_SUCCESS )  
        fprintf( stderr, "Wait: clWaitForEvents failed\n" );  
}
```

 Call this before starting the timer, before ending the timer, and before retrieving data from an array computed in an OpenCL program.

mjb - , March 27, 2021

12

Getting Event Statuses Without Blocking

13

CL_EVENT_COMMAND_QUEUE
CL_EVENT_CONTEXT
CL_EVENT_COMMAND_TYPE
CL_EVENT_COMMAND_EXECUTION_STATUS

Specify one of these

```
cl_int eventStatus;  
status = clGetEventInfo( waitKernelC, CL_EVENT_COMMAND_EXECUTION_STATUS, sizeof(cl_int),  
                        &eventStatus, NULL );
```

CL_EVENT_COMMAND_EXECUTION_STATUS
returns one of these

CL_QUEUED
CL_SUBMITTED
CL_RUNNING
CL_COMPLETE

cl_int is what type
CL_EVENT_COMMAND_EXECUTION_STATUS
returns



Note that this is a nice way to check on event statuses without blocking. Thus, you could put this in a loop and go get some other work done in between calls.

University
Computer Graphics



mjb - , March 27, 2021