OpenCL Events

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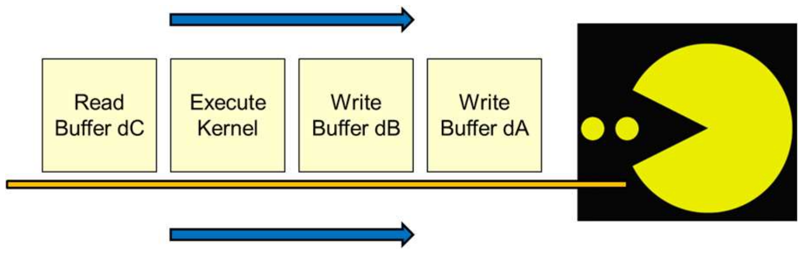
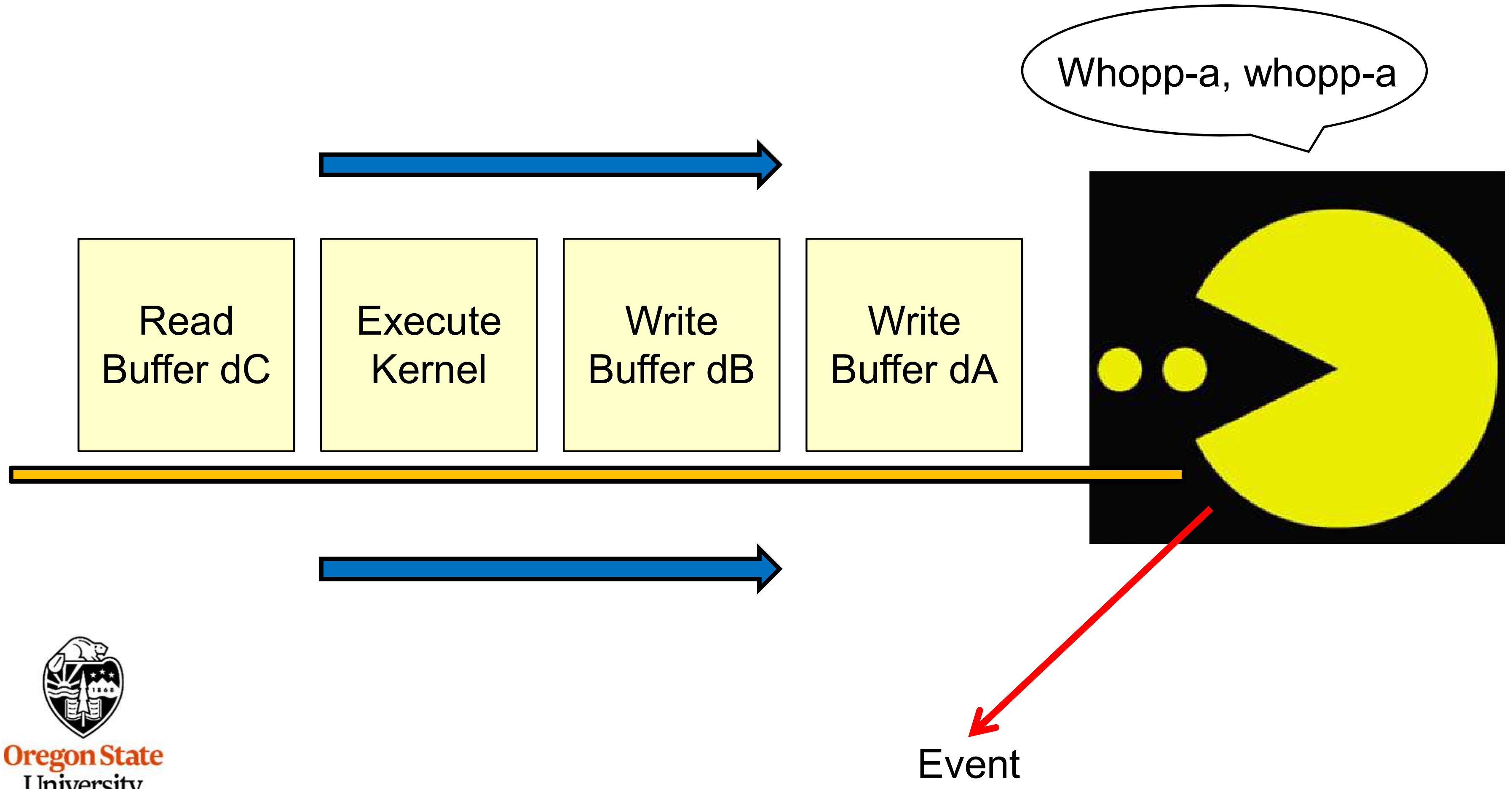


OpenCL Events

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

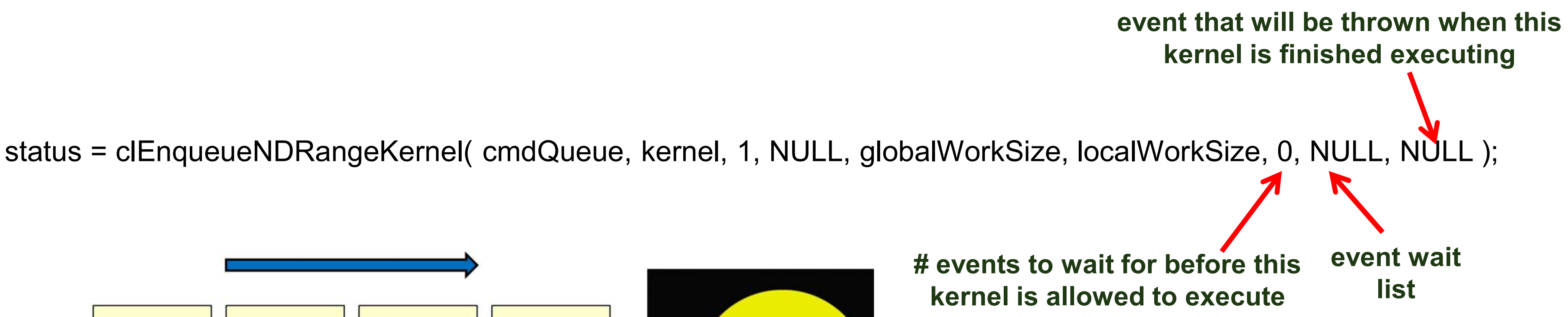


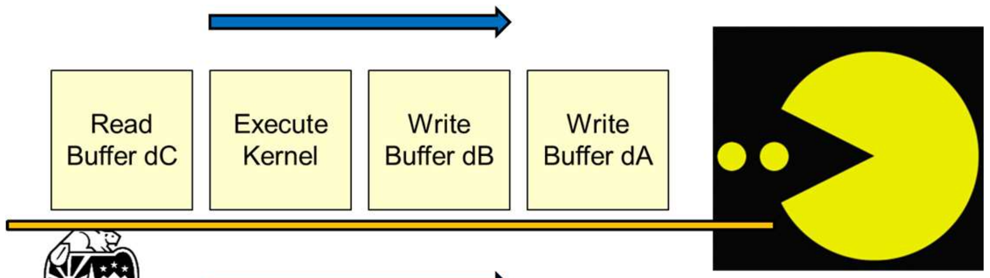
From the OpenCL Notes:

11. Enqueue the Kernel Object for Execution

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


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


event that will be thrown when this kernel is finished executing
status = clEnqueueNDRangeKernel(cmdQueue, kernel, 1, NULL, globalWorkSize, localWorkSize, 0, NULL, NULL);
# events to wait for before this kernel is allowed to execute
event wait list



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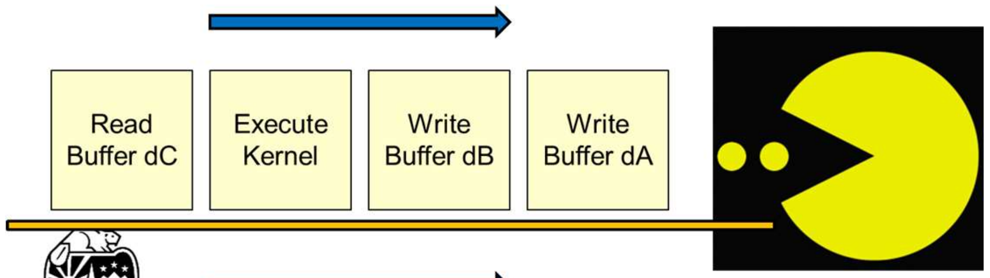
Creating an Event

event that will be thrown when this kernel is finished executing

```
cl_event   waitKernelA,  waitKernel B, waitKernelC;


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

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

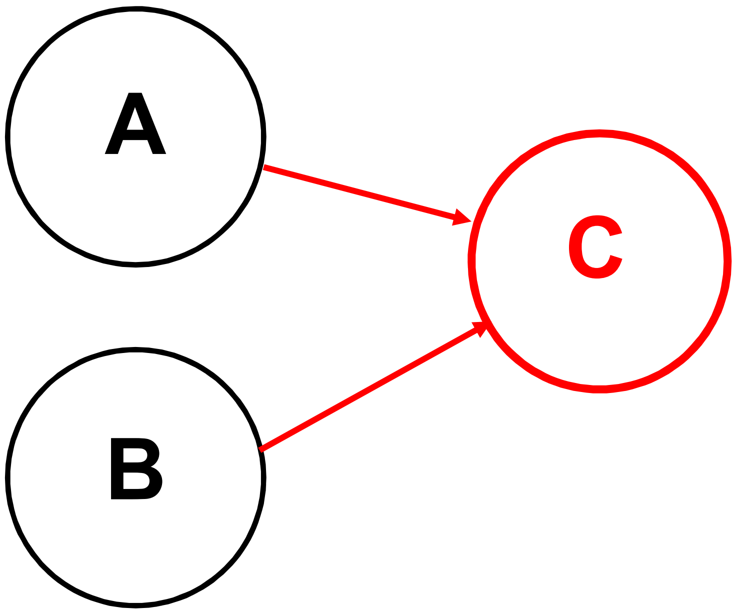


Waiting for Events from Previously-Executed Kernels

```
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



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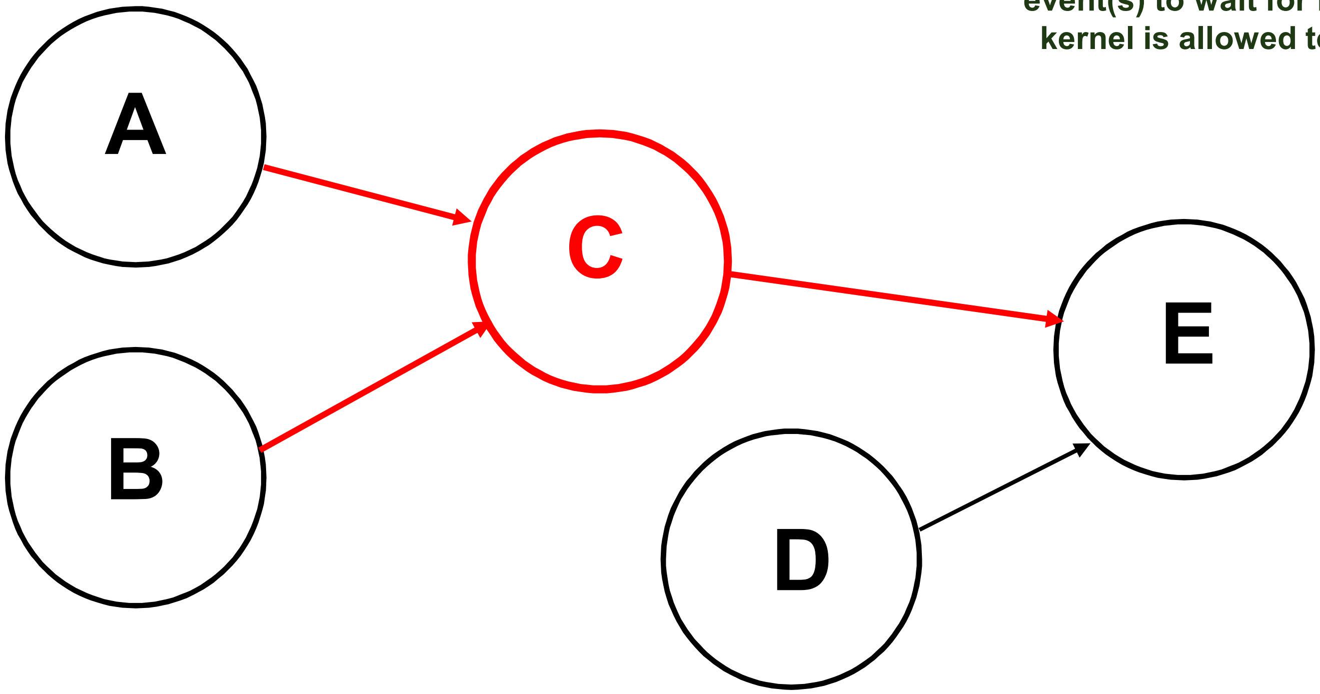
Creating an Execution Graph Structure

```
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



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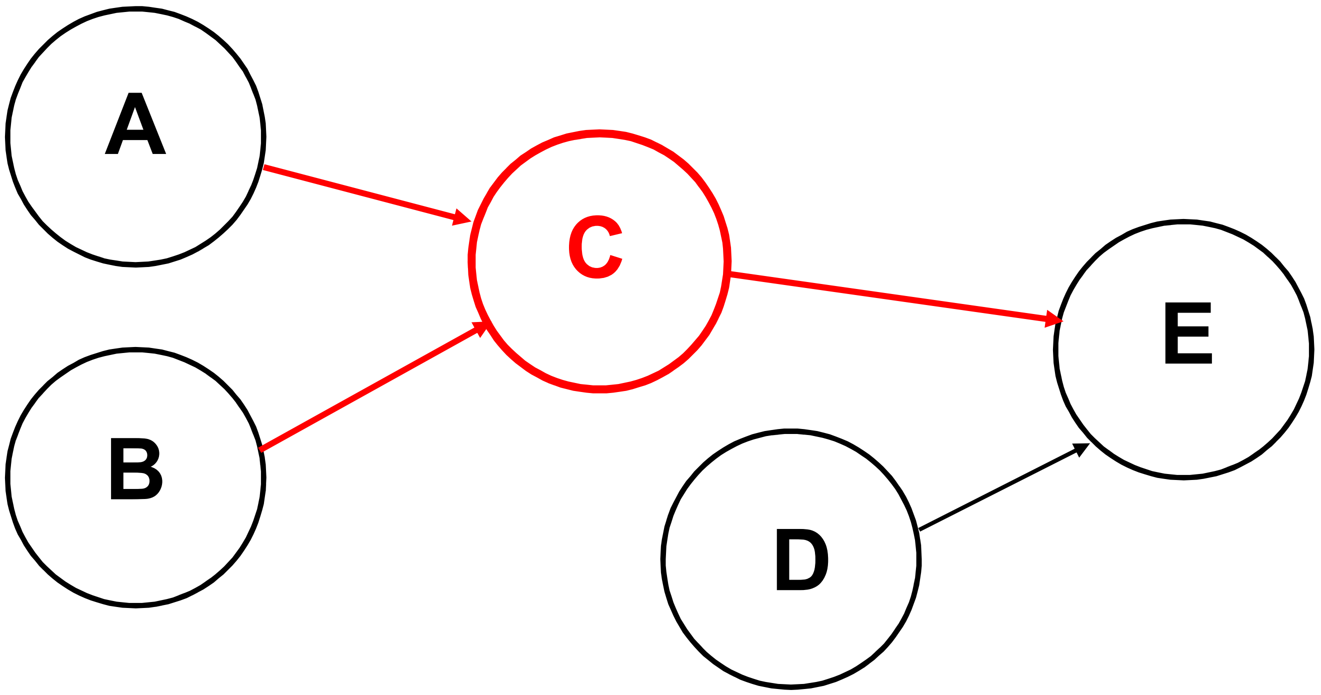
Creating the Full Execution Graph Structure

```
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 );
```



Waiting for One Event

```
cl_event  waitKernelA,  waitKernel B.

          . . .

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

$\underbrace{\texttt{1, \&waitKernelA}}_{\text{event(s) to wait for}}$

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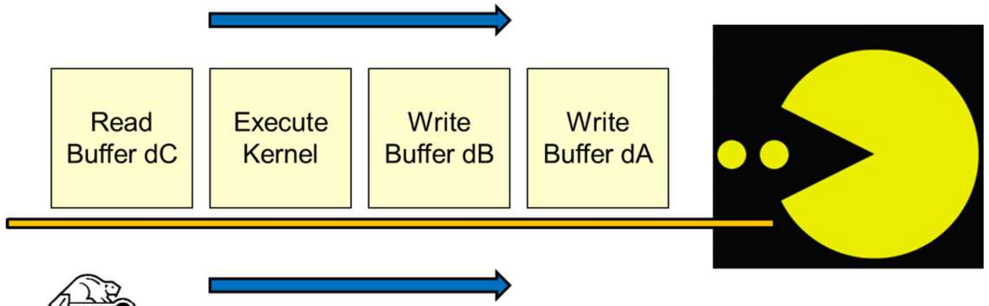
Placing a Barrier in the Command Queue

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

Note: this *cannot* throw its own event

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



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Placing an Event Marker in the Command Queue

```
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.

Waiting for Events Without Enqueuing Another Command

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

$\underbrace{\texttt{dependencies}}_{\text{event(s) to wait for}}$

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

I Like Synchronizing Things This Way

```
// 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.

Getting Event Statuses Without Blocking

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 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.