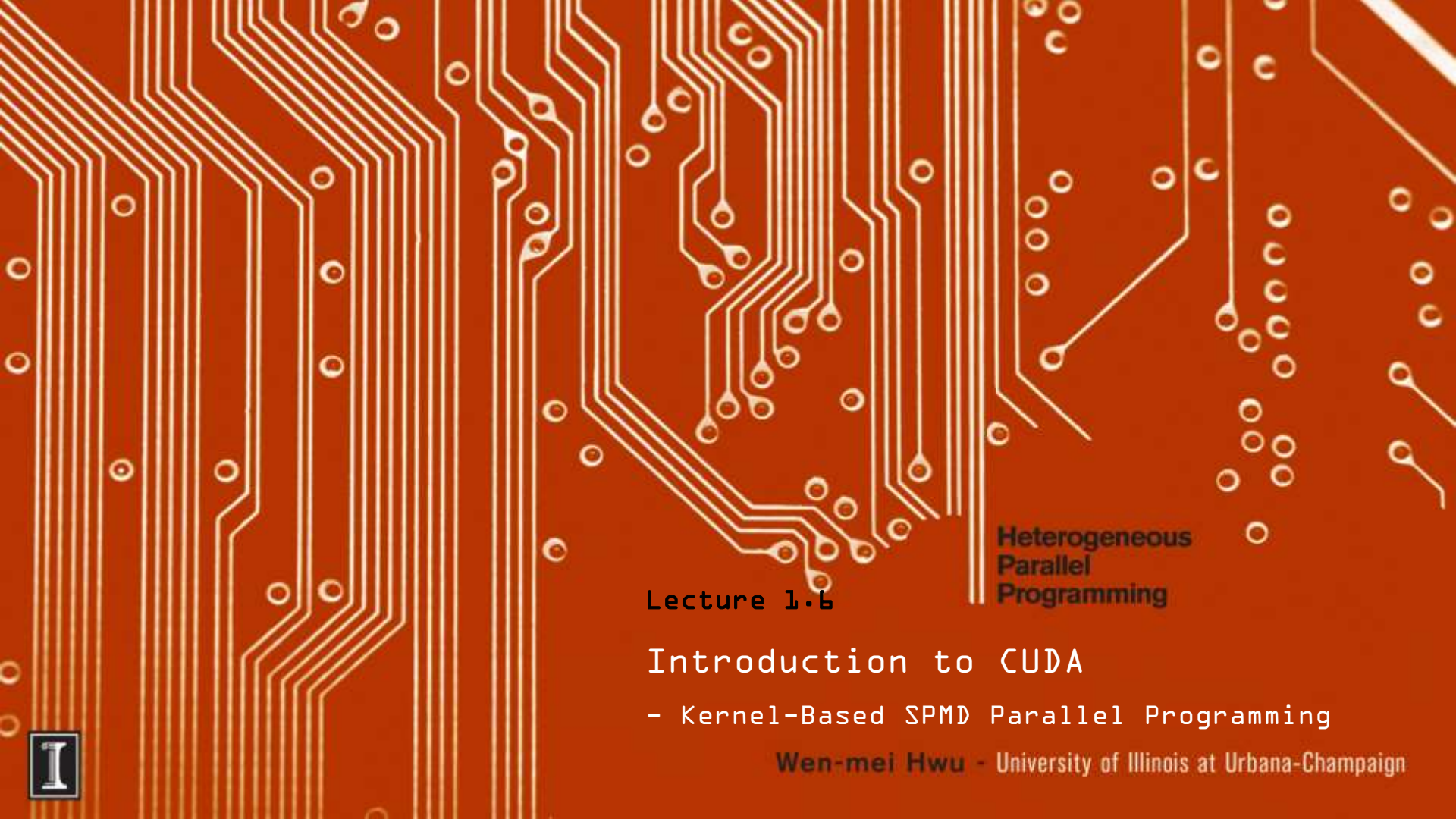

Lecture 1.6

Introduction to CUDA

- Kernel-Based SPMD Parallel Programming

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Objective

- To learn the basic concepts involved in a simple CUDA kernel function
  - Declaration
  - Built-in variables
  - Thread index to data index mapping

Example: Vector Addition Kernel

Device Code

```
// Compute vector sum C = A+B
// Each thread performs one pair-wise addition

__global__
void vecAddKernel(float* A, float* B, float*
    C, int n)
{
    int i = threadIdx.x+blockDim.x*blockIdx.x;
    if(i<n) C[i] = A[i] + B[i];
}
```


Example: Vector Addition Kernel (Host Code)

```
int vecAdd(float* h_A, float* h_B, float* h_C, int n)
{
 // d_A, d_B, d_C allocations and copies omitted
 // Run ceil(n/256.0) blocks of 256 threads each
  vecAddKernnel<<<ceil(n/256.0),256>>>(d_A, d_B, d_C, n);
}
```

Host Code

More on Kernel Launch (Host Code)

```
int vecAdd(float* h_A, float* h_B, float* h_C, int n)
{
  dim3 DimGrid((n-1)/256 + 1, 1, 1);
  dim3 DimBlock(256, 1, 1);
  vecAddKernnel<<<DimGrid,DimBlock>>>(d_A, d_B, d_C, n);
}
```

Host Code

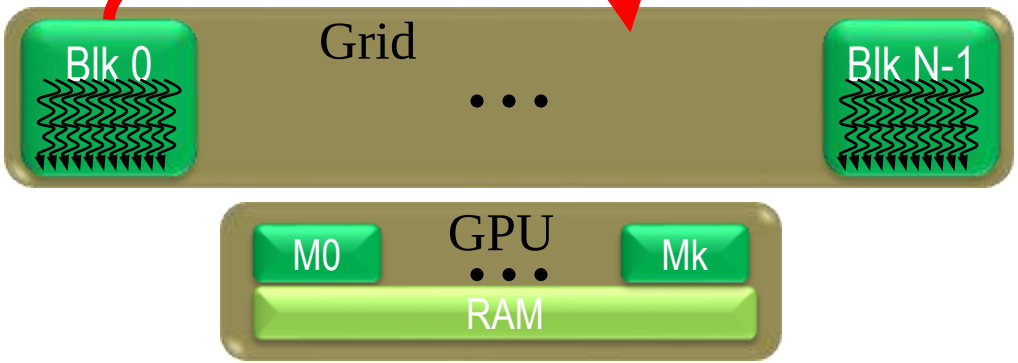
This makes sure that there are enough threads to cover all elements.

Kernel execution in a nutshell

```
__host__
Void vecAdd(…)
{
  dim3 DimGrid(ceil(n/256.0),1,1);
  dim3 DimBlock(256,1,1);
vecAddKernel<<<DimGrid,DimBlock>>>(d_A,d_B
,d_C,n);
}
```

```
__global__
void vecAddKernel(float *A,
     float *B, float *C, int n)
{
   int i = blockIdx.x * blockDim.x
         + threadIdx.x;

   if( i<n ) C[i] = A[i]+B[i];
}
```

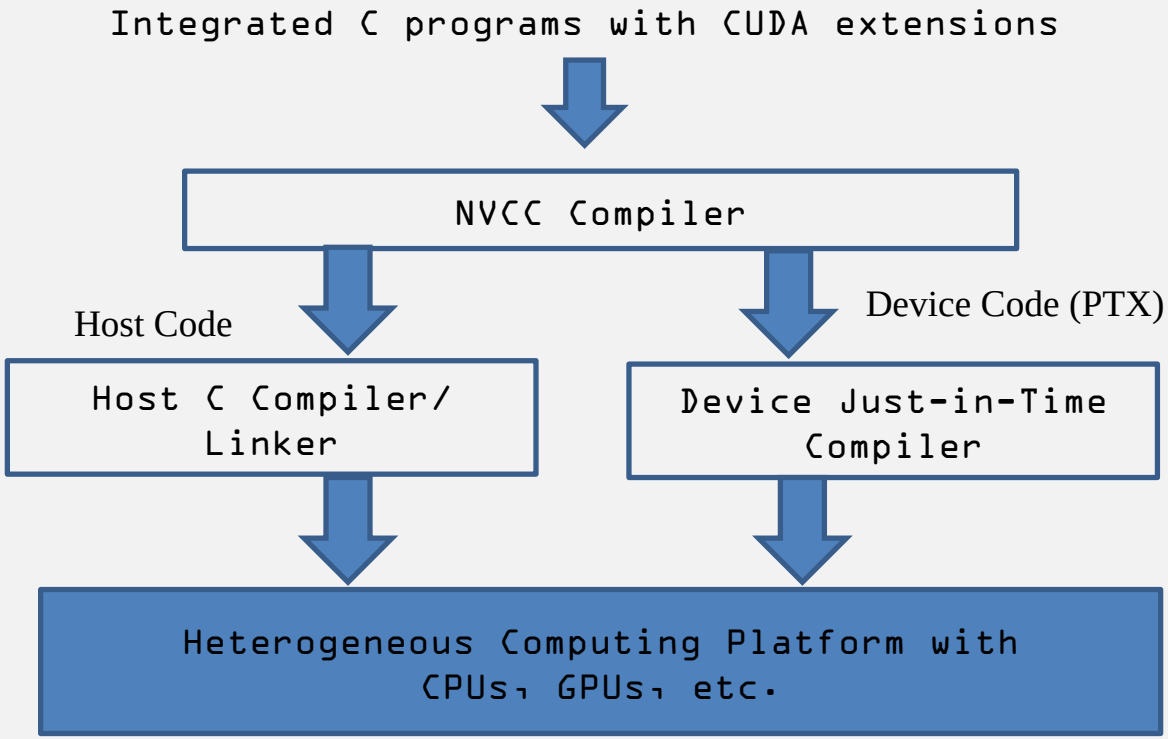


More on CUDA Function Declarations

	Executed on the:	Only callable from the:
`__device__ float DeviceFunc()`	device	device
`__global__ void KernelFunc()`	device	host
`__host__ float HostFunc()`	host	host

- `__global__` defines a kernel function
  - Each "__" consists of two underscore characters
  - A kernel function must return `void`
- `__device__` and `__host__` can be used together
- `__host__` is optional if used alone

Compiling A CUDA Program




To learn more, please read
Chapter 3.