

# **Blue Waters Petascale Semester Curriculum v1.0**

## **Unit 7: CUDA**

### **Lesson 11: Branching and GPGPU Efficiency**

**(profiling and debugging)**

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*for the Shodor Education Foundation, Inc.*

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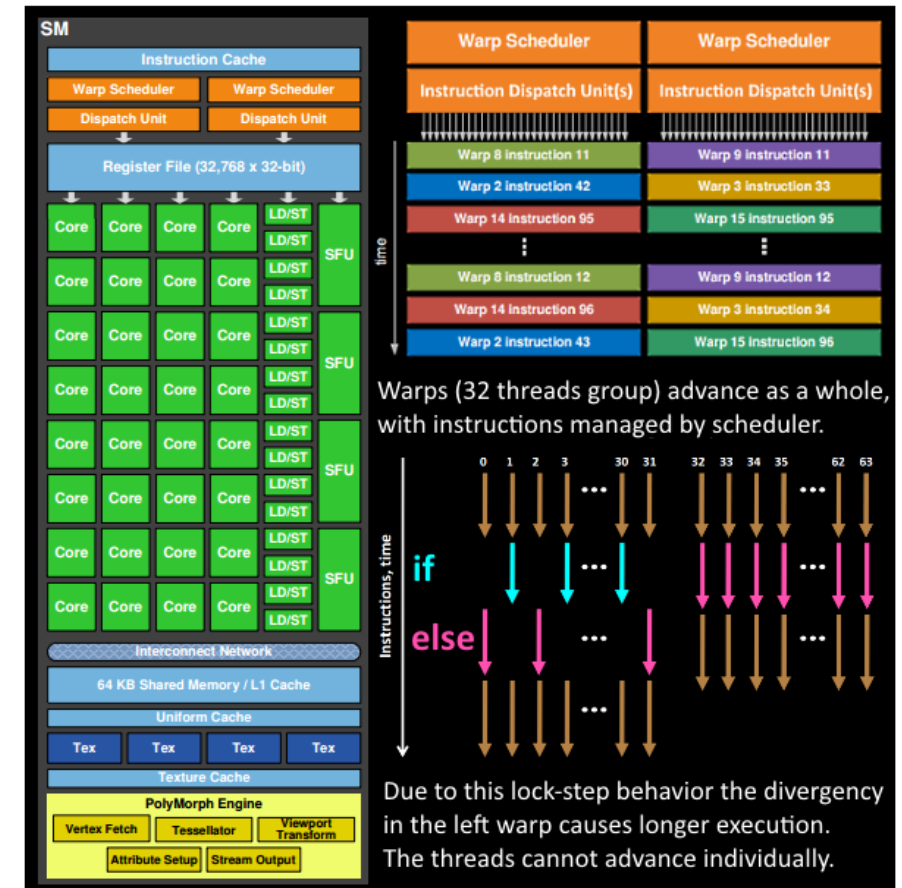
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# Branching and GPU Efficiency

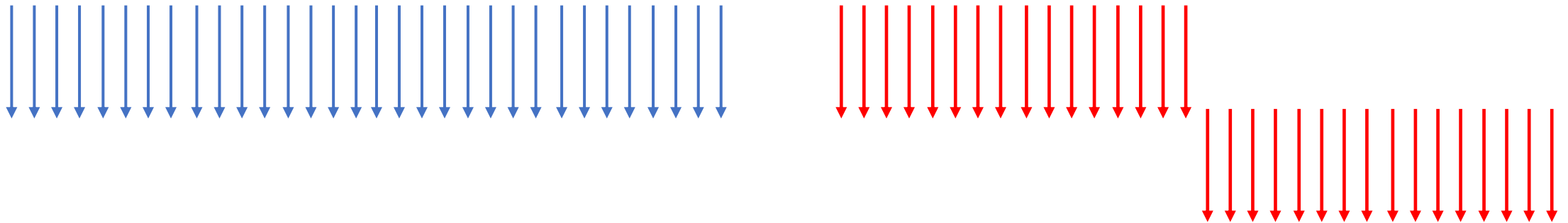
# Many-Core, but not independent

- GPUs are many core, but the structure of memory in the GPU and how threads are organized to access the memory is strictly tied together.
- Threads are bundled in “warps” which have access to the same register and have a bundled set of instructions



# Branching can reduce efficiency

- Any time one of the (typically) 32 threads in a warp does something different from the others, all of the others have to wait for the thread to complete its branched activity



# What branching looks like in your kernel

```
__global__ void branching(int n)
{
    int threadMod = threadIdx.x%threadsPerBlock;

    if ( threadMod < n) {
        ...
    } else if(threadMod<2*n) {
        ...
    } else if(threadMod<3*n) {
        ...
    } else if(threadMod<4*n) {
        ...
    }
}
```