### **Concurrent CUDA Streams**

A **stream** is a series of instructions, and CUDA has a **default stream** 

### **DEFAULT STREAM**



By default, CUDA kernels run in the default stream

#### **DEFAULT STREAM**

kernel 1



In any stream, including the default, an instruction in it (here a kernel launch) must complete before the next can begin

kernel 1 kernel 2

In any stream, including the default, an instruction in it (here a kernel launch) must complete before the next can begin

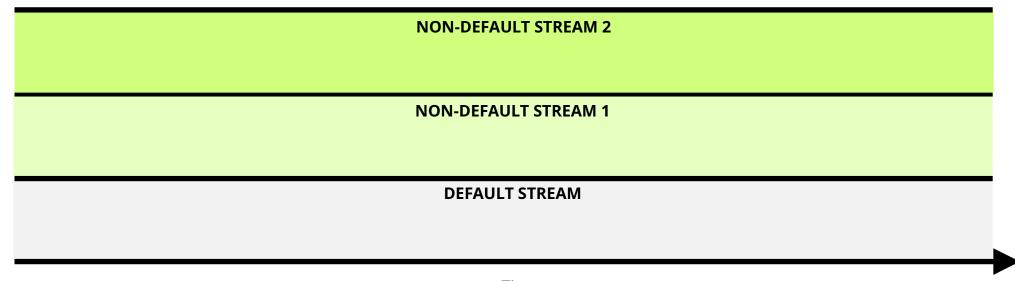
kernel 1 kernel 2 kernel 3 kernel 4 kernel 5

Non-default streams can also be created for kernel execution

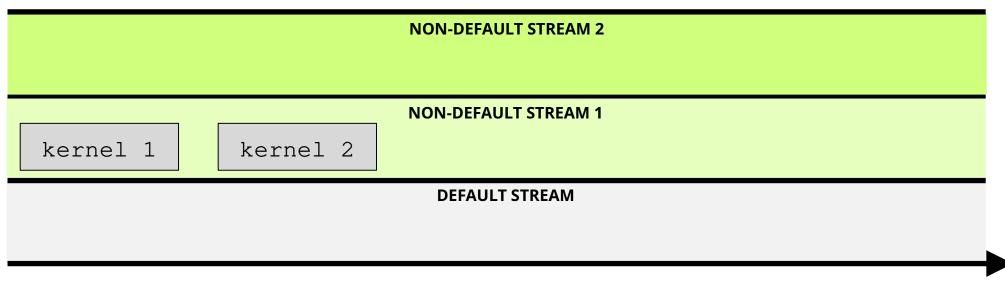
#### **NON-DEFAULT STREAM 1**

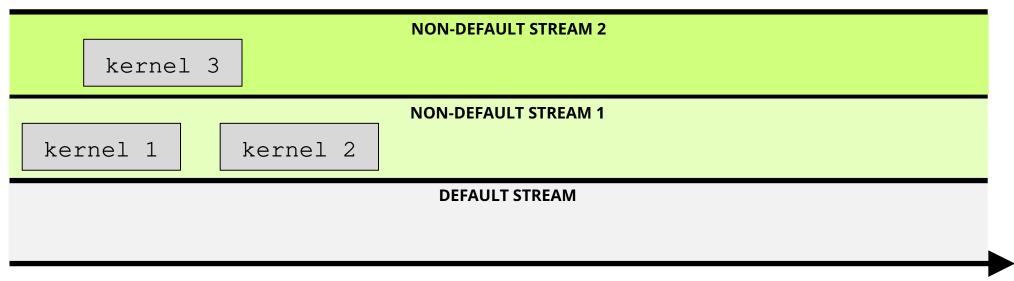
#### **DEFAULT STREAM**

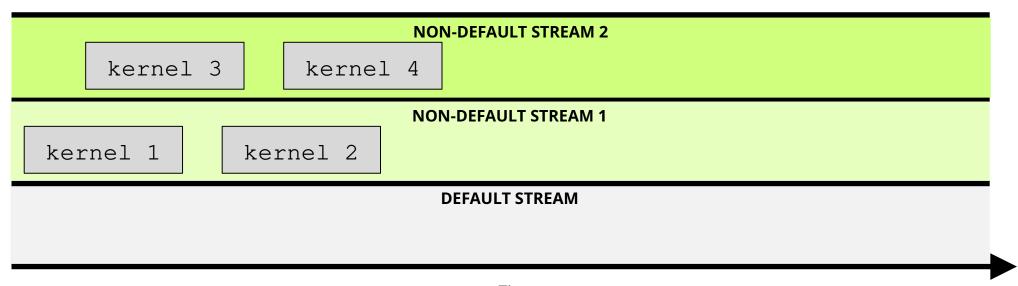
Non-default streams can also be created for kernel execution

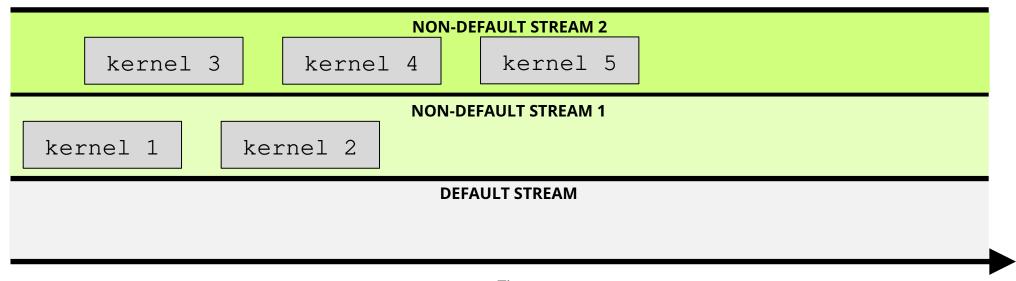


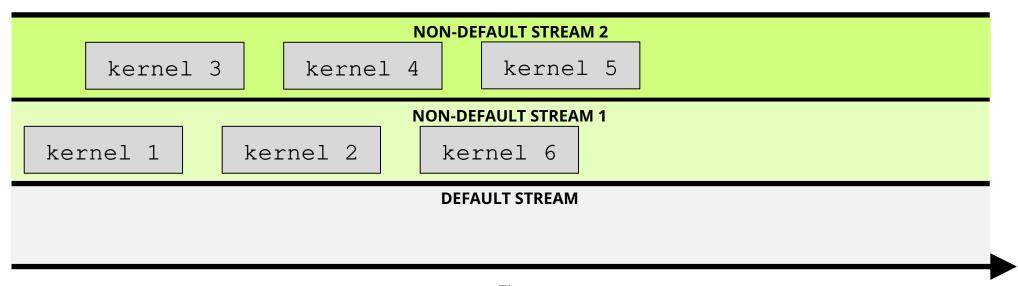
Kernels within any single stream must execute in order

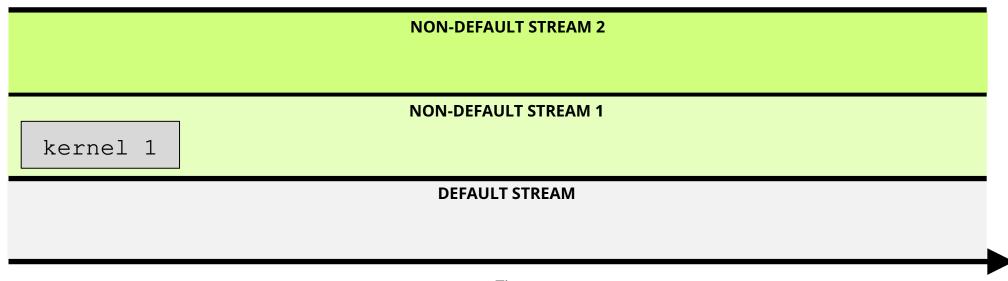


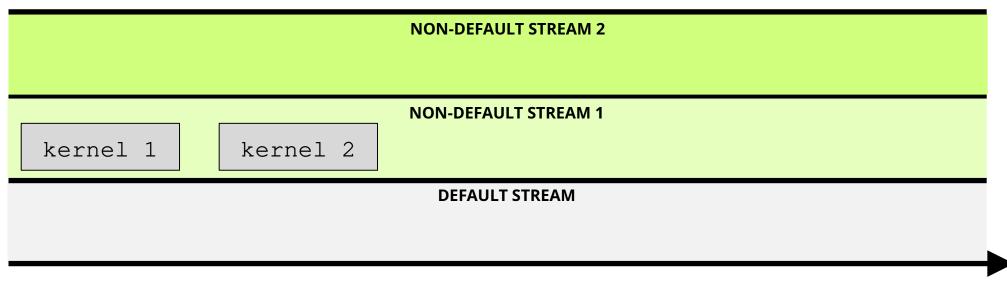


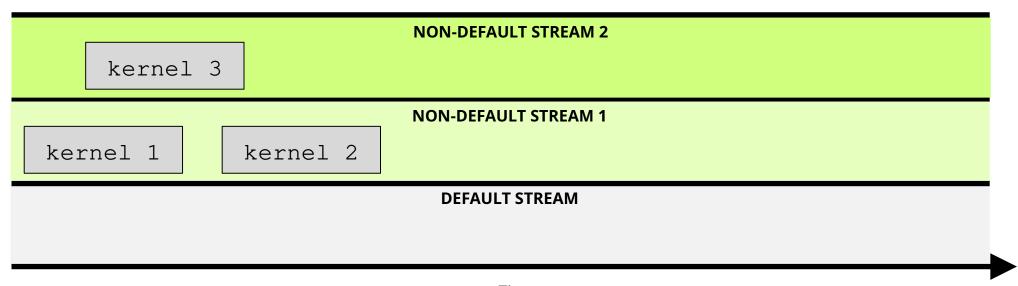


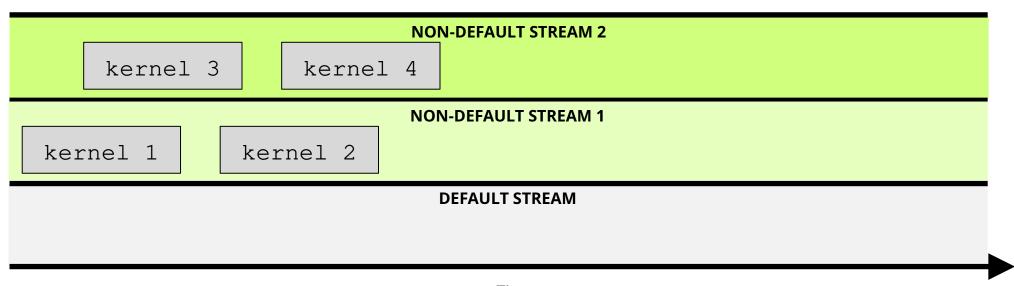


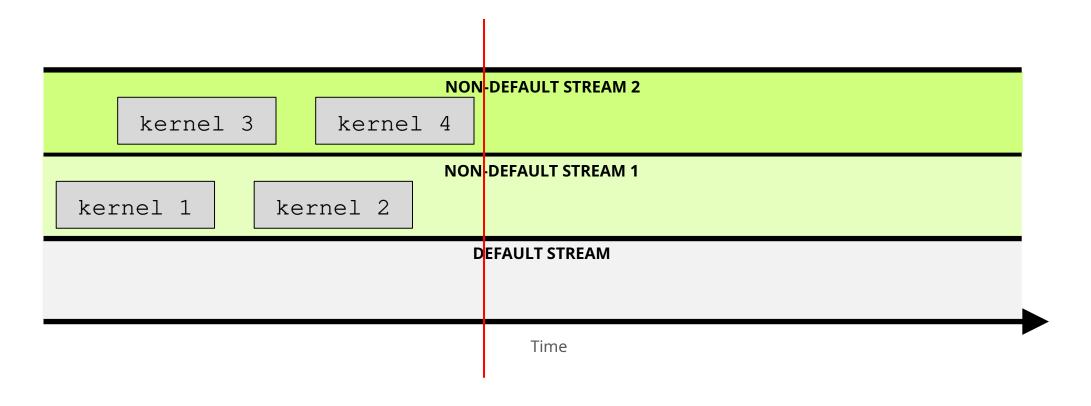


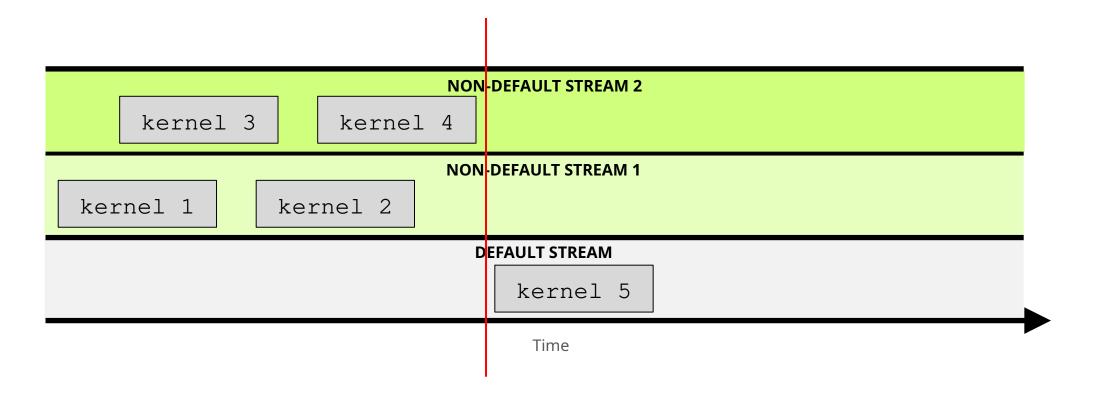


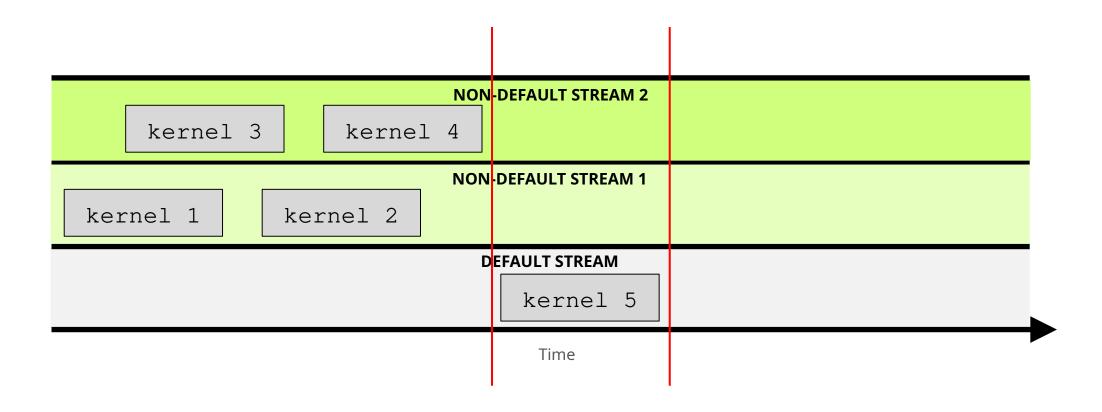


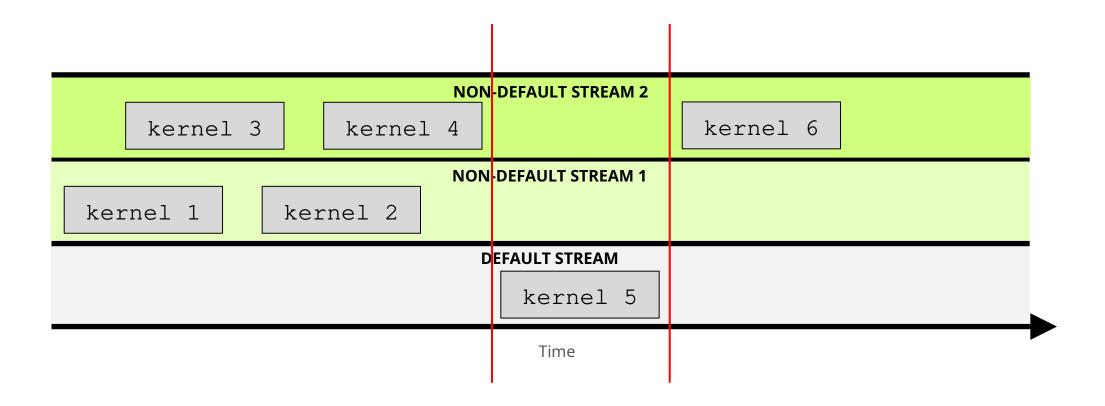


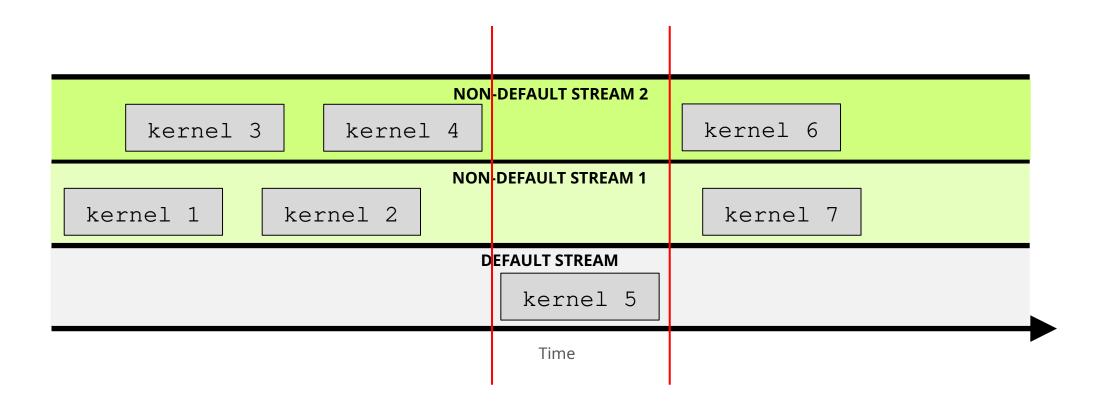


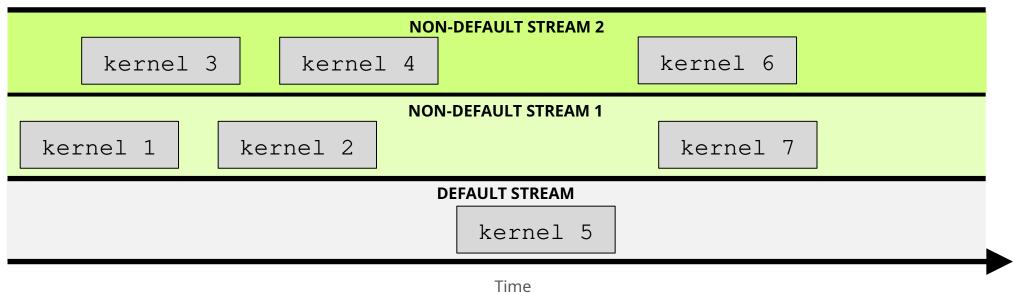










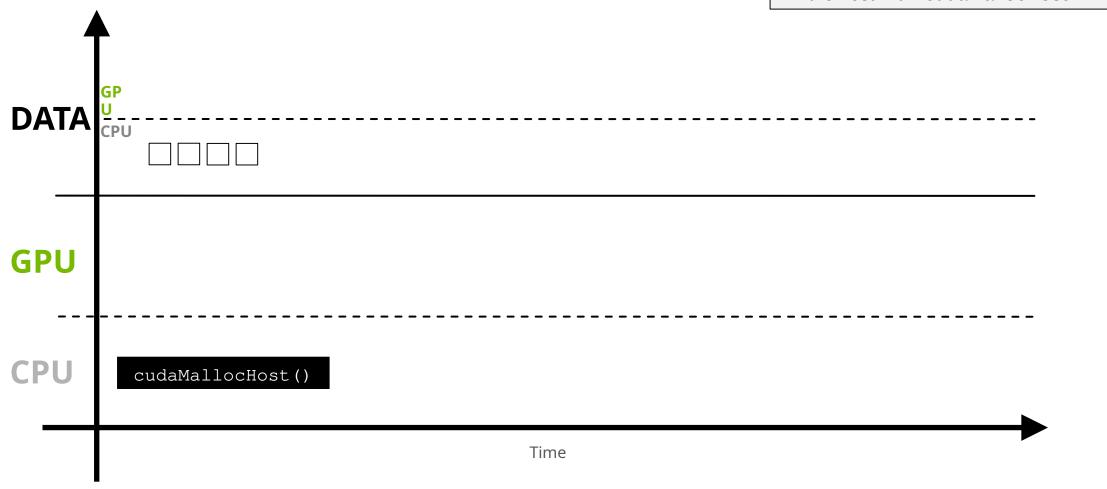


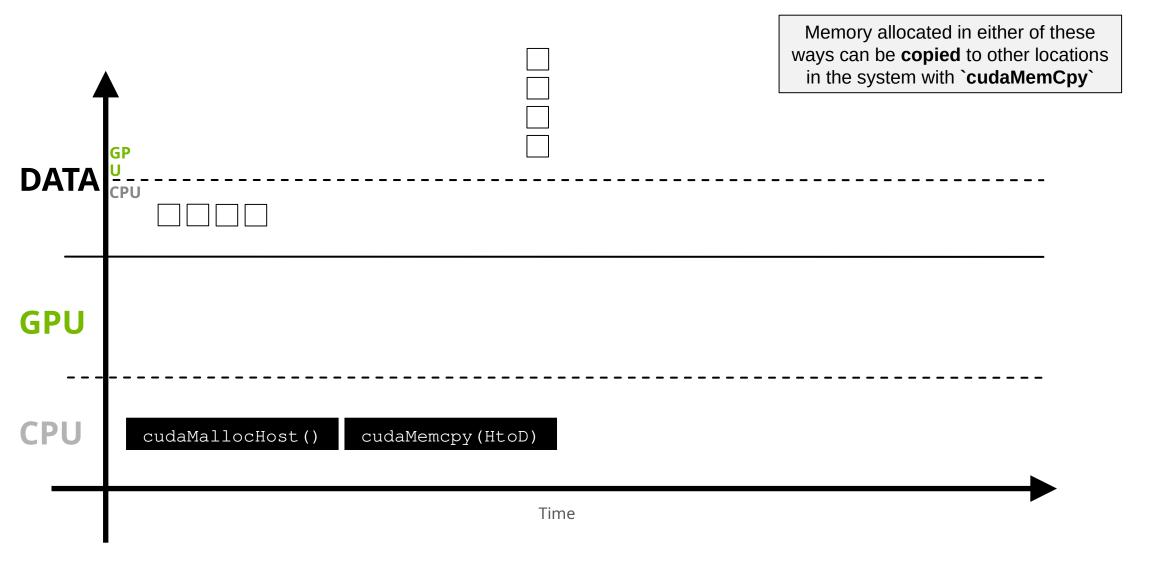
## **Non-Unified Memory**

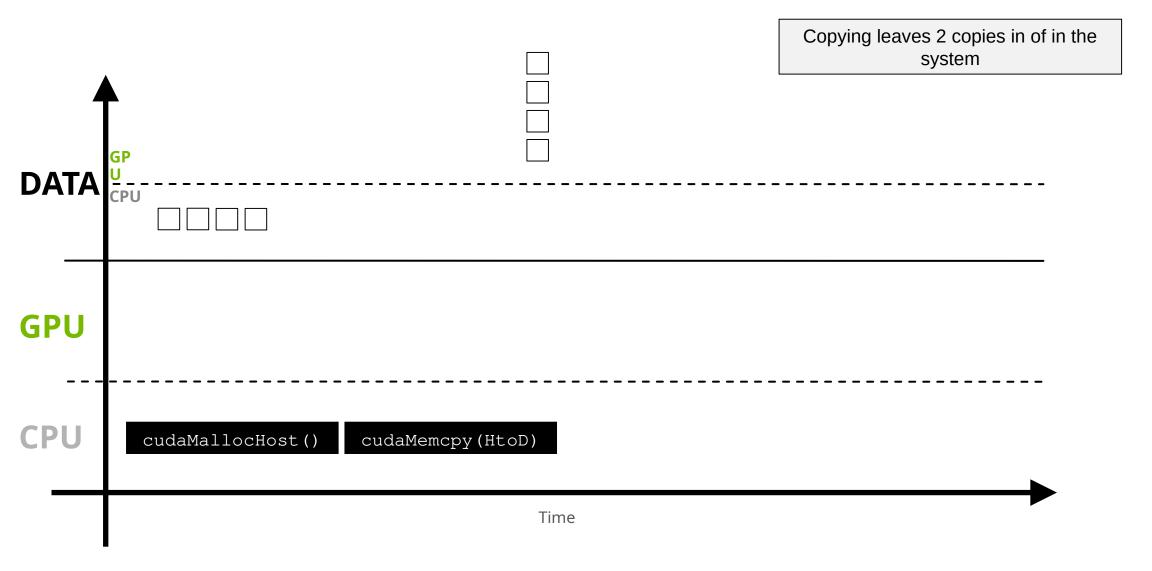
Memory can be allocated directly to the GPU with `cudaMalloc`



Memory can be allocated directly to the host with `cudaMallocHost`









# cudaMemcpyAsync

`cudaMemcpyAsync` can asynchronously transfer memory over a non-default stream **GPU** cudaMallocHost() cudaMemcpyAsync(HtoD)







