Address Space ID

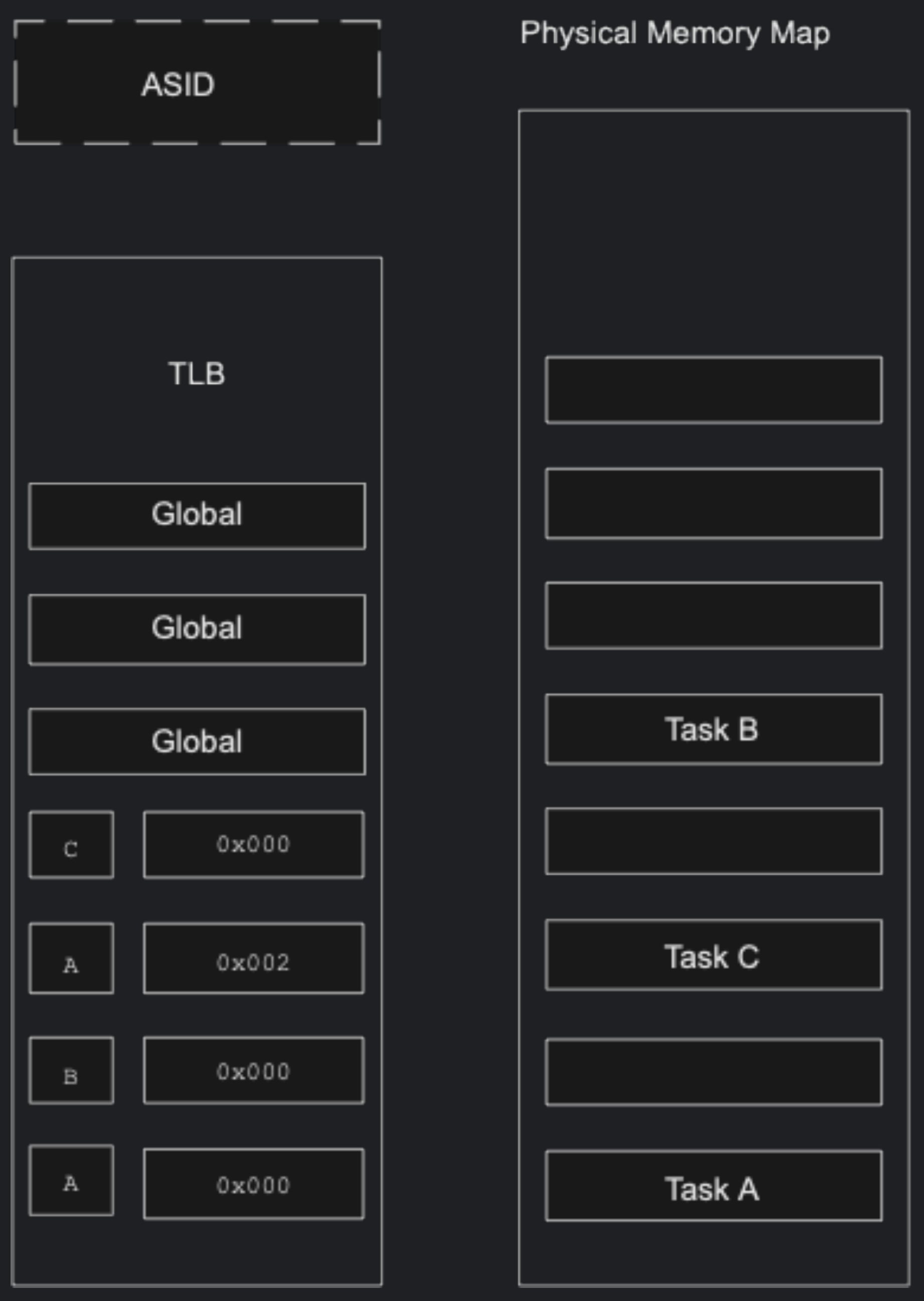
When we described the translation table bits in *Level 2 translation tables* we noted a bit called nG (non-global). If the nG bit is set for a particular page, the page is associated with a specific application. When the MMU performs a translation, it uses both the virtual address and an ASID value.

The ASID is a number assigned by the OS to each individual task. This value is in the range 0-255 and the value for the current task is written in the ASID register (accessed using CP15 c13). When the TLB is updated and the entry is marked as non-global, the ASID value will be stored in the TLB entry in addition to the normal translation information. Subsequent TLB look-ups will only match on that entry if the current ASID matches with the ASID that is stored in the entry. You can therefore have multiple valid TLB entries for a particular page (marked as non-global), but with different ASID values. This significantly reduces the software overhead of *context switches*, as it avoids the requirement to flush the on-chip TLBs. The ASID forms part of a larger (32-bit) process ID register that can be used in task-aware debugging.

> ## Note
>
> A *context switch* denotes the scheduler transferring execution from one process to another. This typically requires saving the current process state and restoring the state of the next process waiting to be run.

Figure 9.11 illustrates this. Here, you have multiple applications (A, B and C), each of which is linked to run from virtual address 0. Each application is located in a separate address space in physical memory. There is an ASID value associated with each application so you can have multiple entries within the TLB at any particular time, that will be valid for virtual address 0.

Figure 9.11. ASIDs in TLB mapping the same virtual address



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