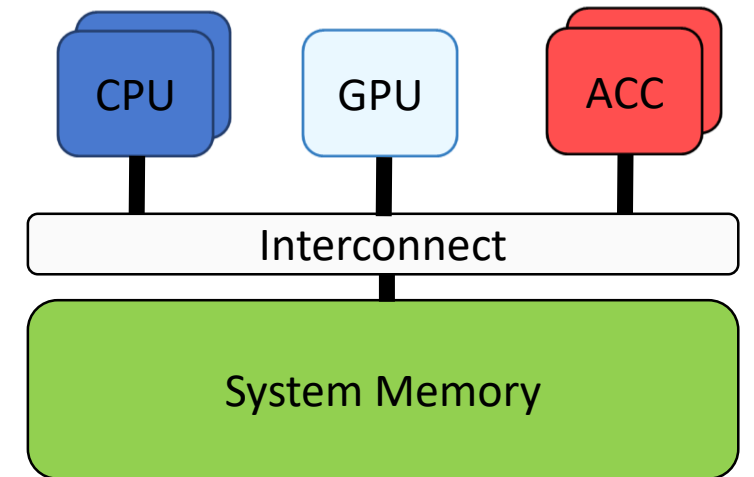


Devirtualizing Memory in Heterogeneous Systems

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- Accelerators going mainstream
- Benefit from Shared Memory



3Ps for Memory Management

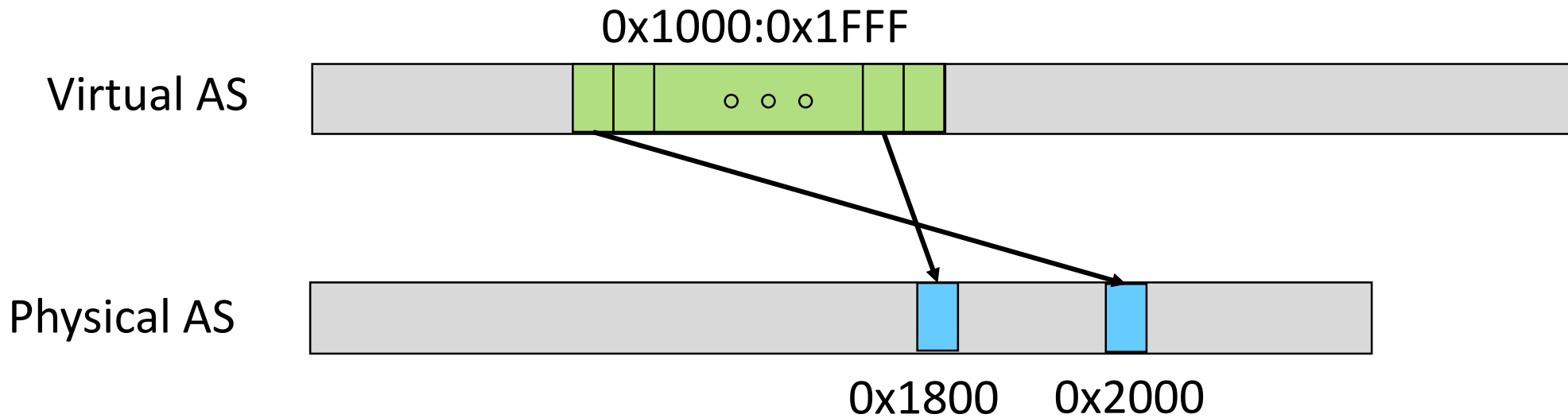
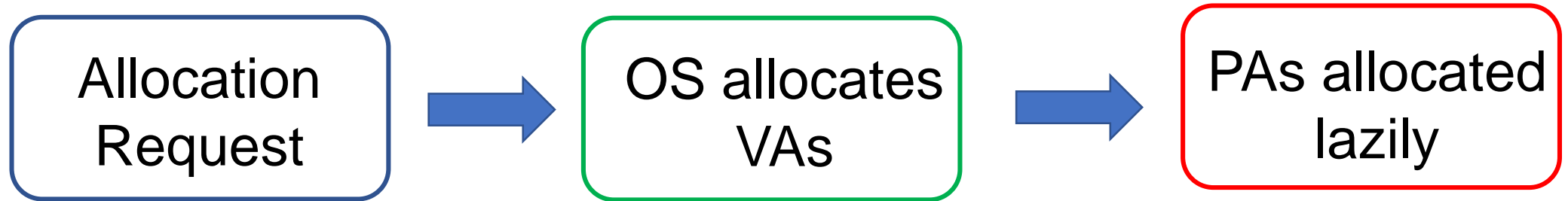
	Physical Addressing	Virtual Addressing
Protection	×	✓
Performance	✓	×
Programmability	×	✓

How do we get the best for both worlds?

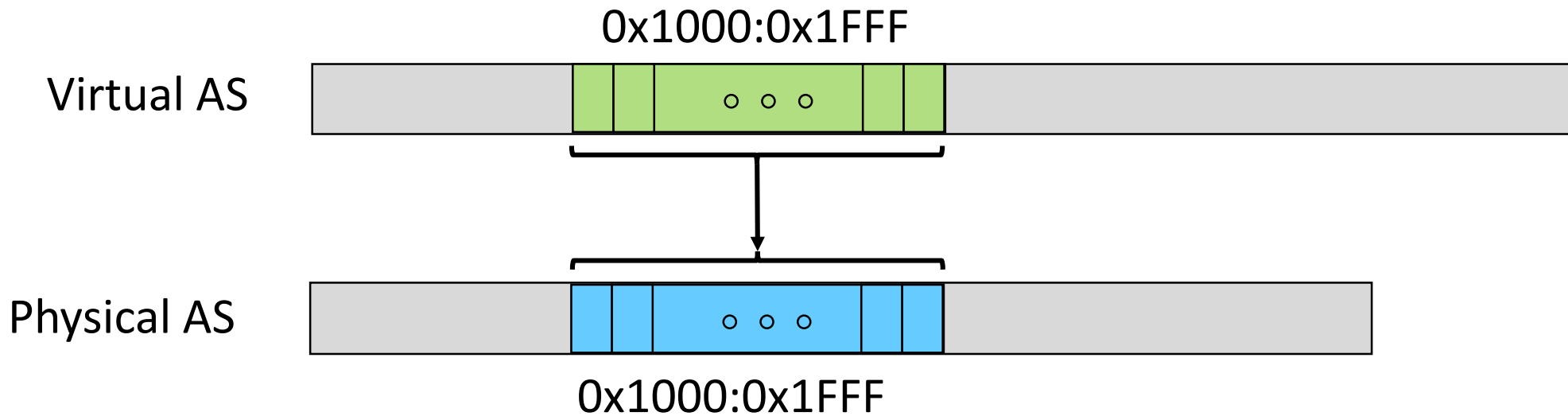
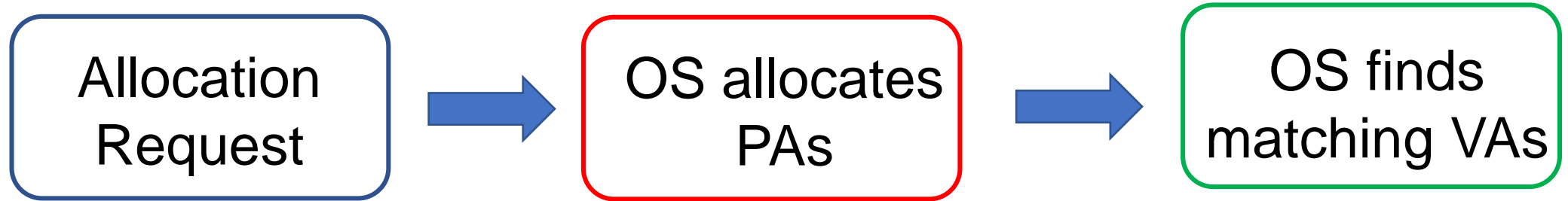
Devirtualized Memory (DVM)

1. (Usually) Allocate data such that its $VA == PA!$

How is Heap Memory Allocated Today?



Allocating VA == PA



Devirtualized Memory (DVM)

1. (Usually) Allocate data such that its VA == PA!
2. Exploit PA == VA to mostly skip translation

VM overheads down to ~2% w/o TLB!

Devirtualizing Memory in Heterogeneous Systems

	Physical Addressing	Virtual Addressing	Our Proposal (DVM)
Protection	×	✓	✓
Performance	✓	×	✓
Programmability	×	✓	✓

Today in session **Memory 2** (9 AM)!