Optimizations in the .NET GC

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.NET GC Architect

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Very brief intro of the .NET GC

- Generational – 3 generations
- Workstation vs Server (parallel GC)
- STW vs concurrent
- GCs of any generations can be done STW, only full GCs are done as concurrent
- STW GCs can compact or sweep
- Concurrent GC can only sweep

How the heap is organized

How the heap is organized

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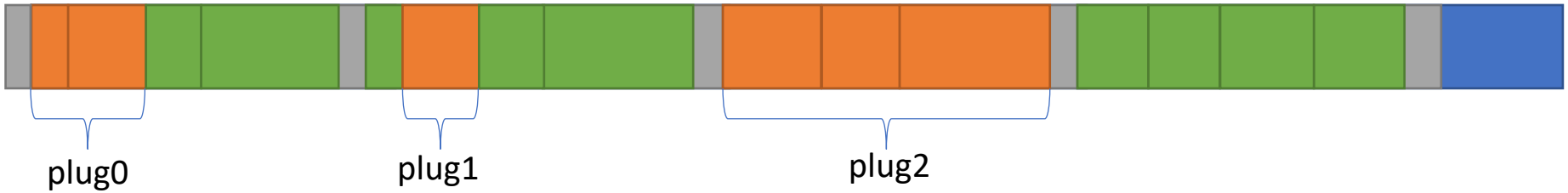
How the heap is organized

GC happens

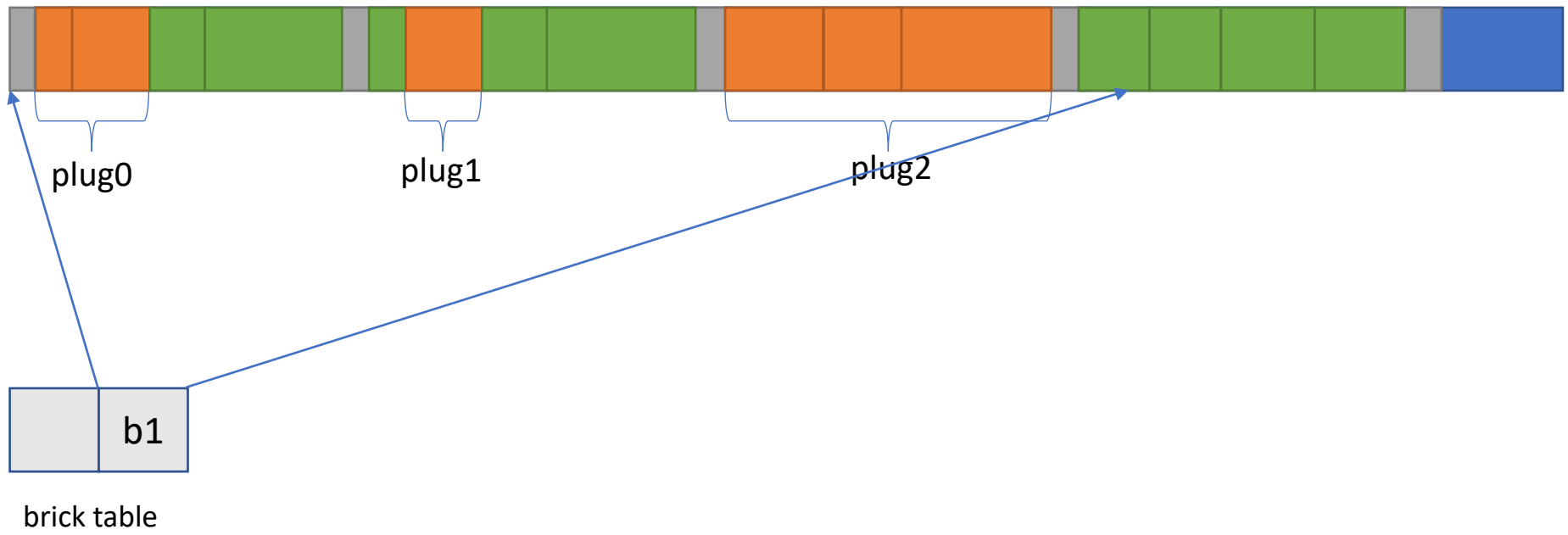
GC happens

After mark phase

Plan phase

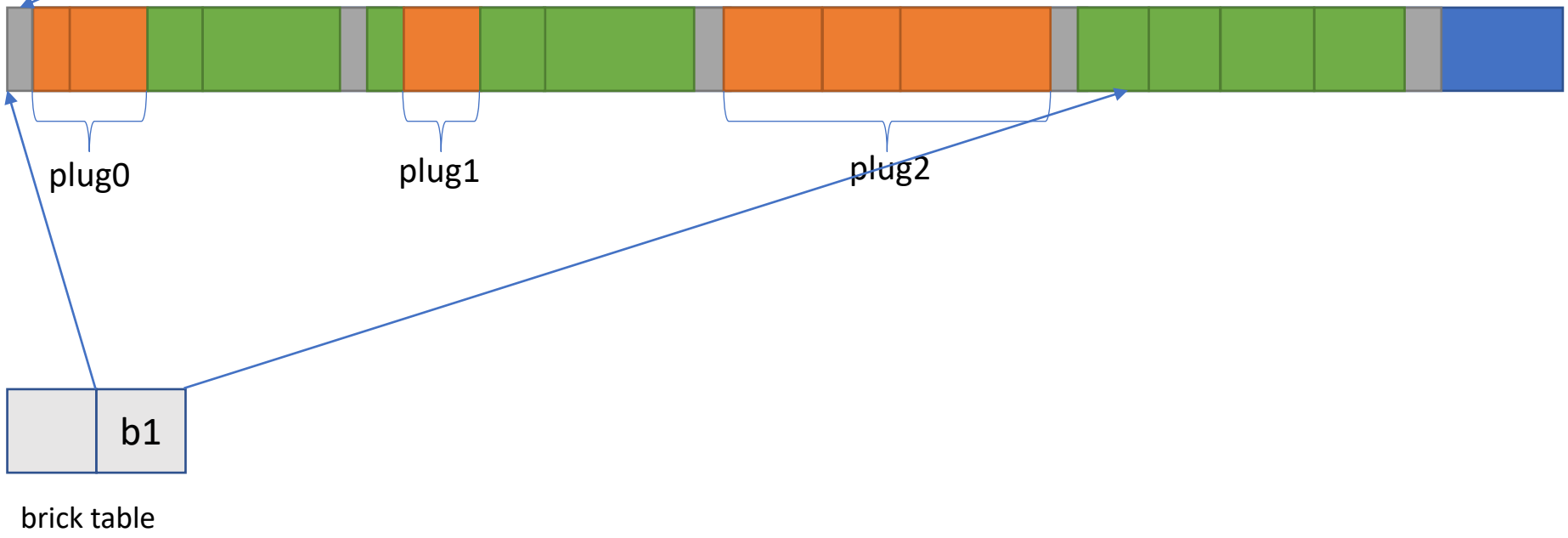


Plan phase

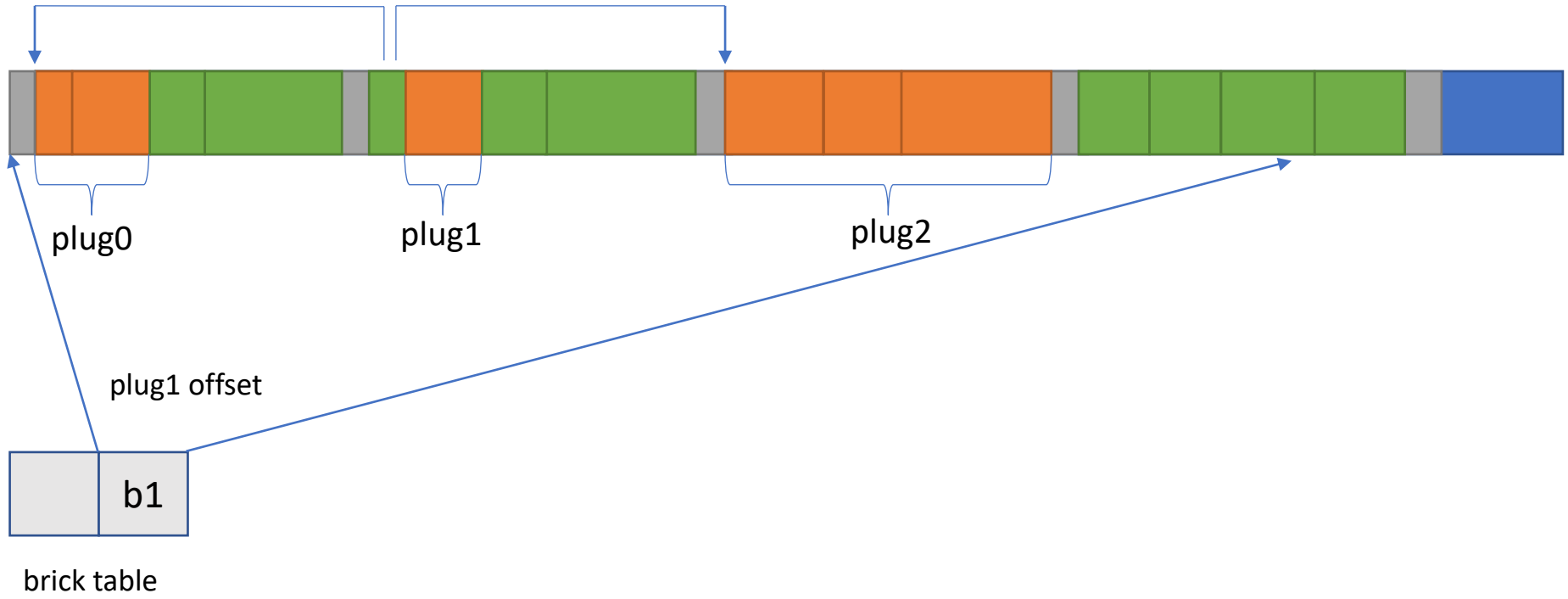


Plan phase

```
class pair
{
    short left;
    short right;
};
```

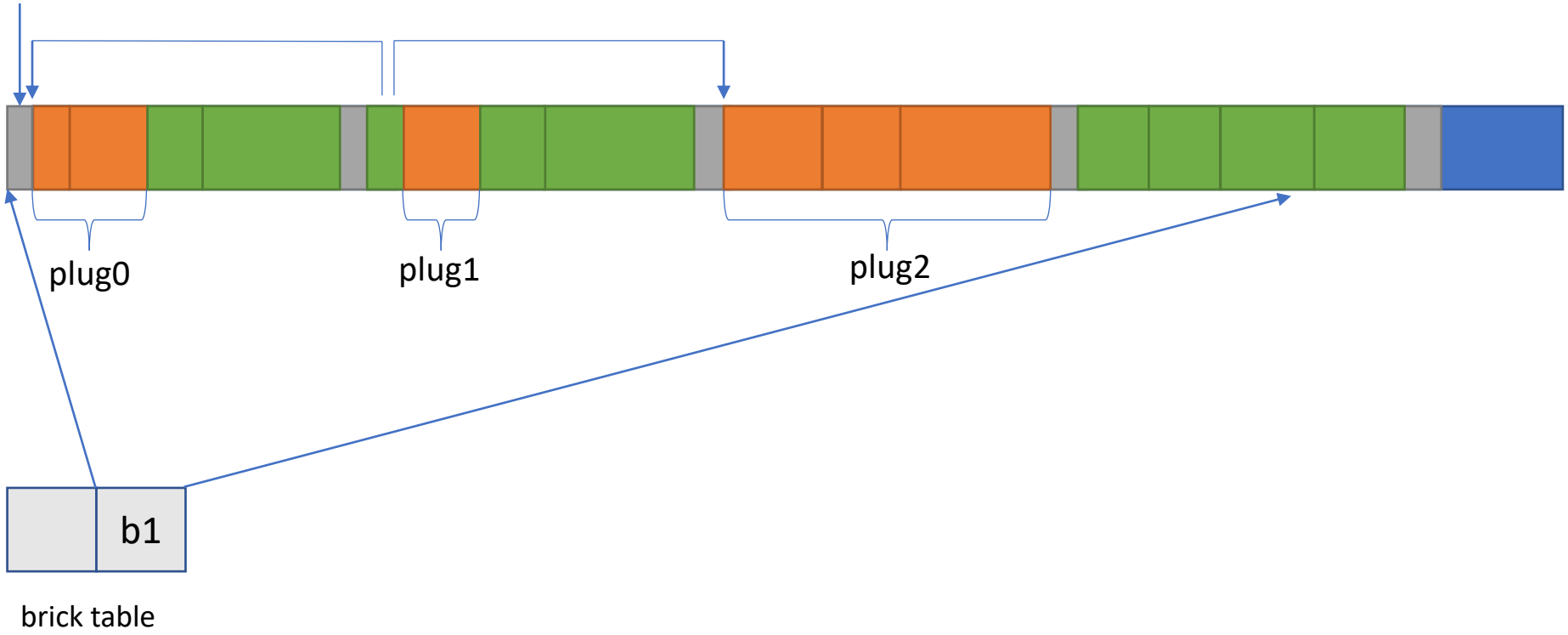


Plan phase



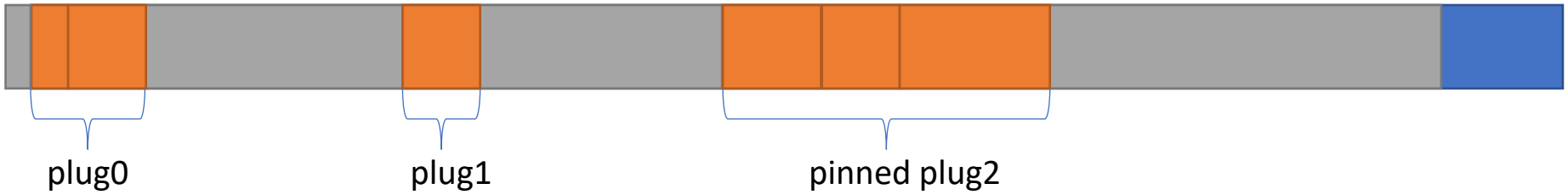
Plan phase

```
ptrdiff_t  gap;
ptrdiff_t  reloc;
pair       m_pair;
```

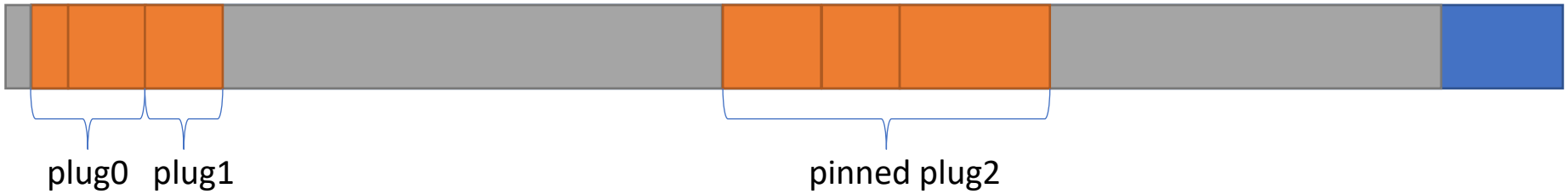


After compact phase

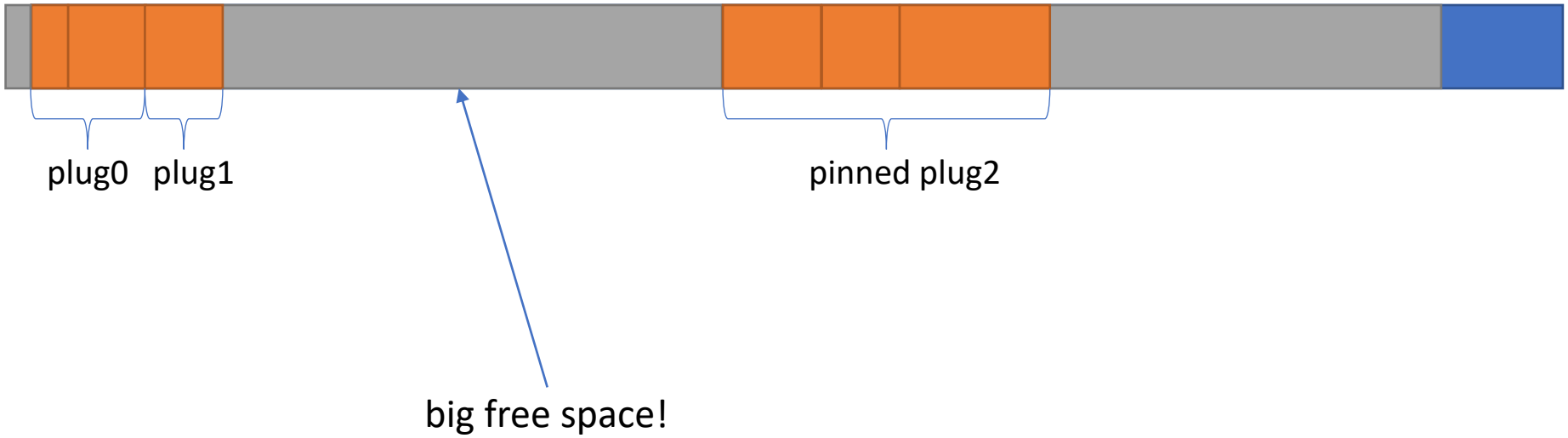
What about pinning?



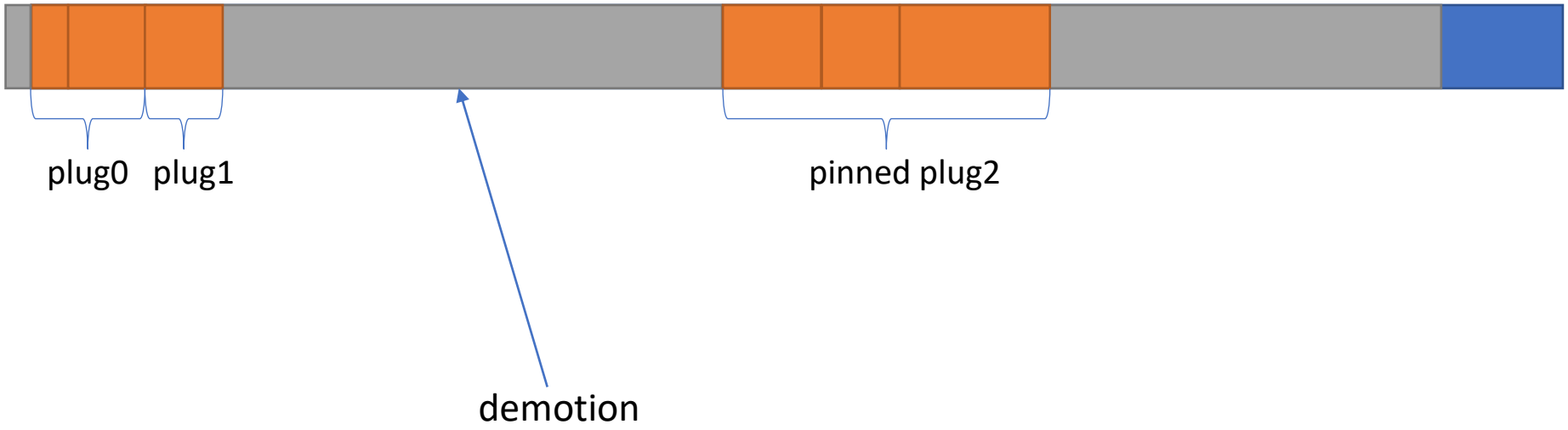
After compact phase



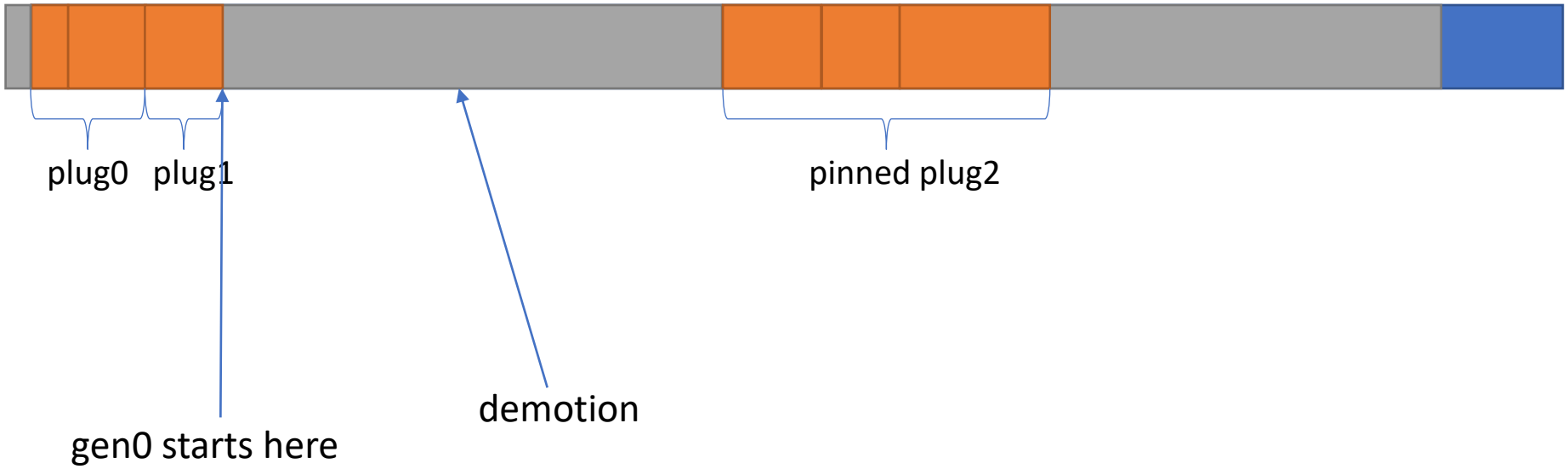
After compact phase



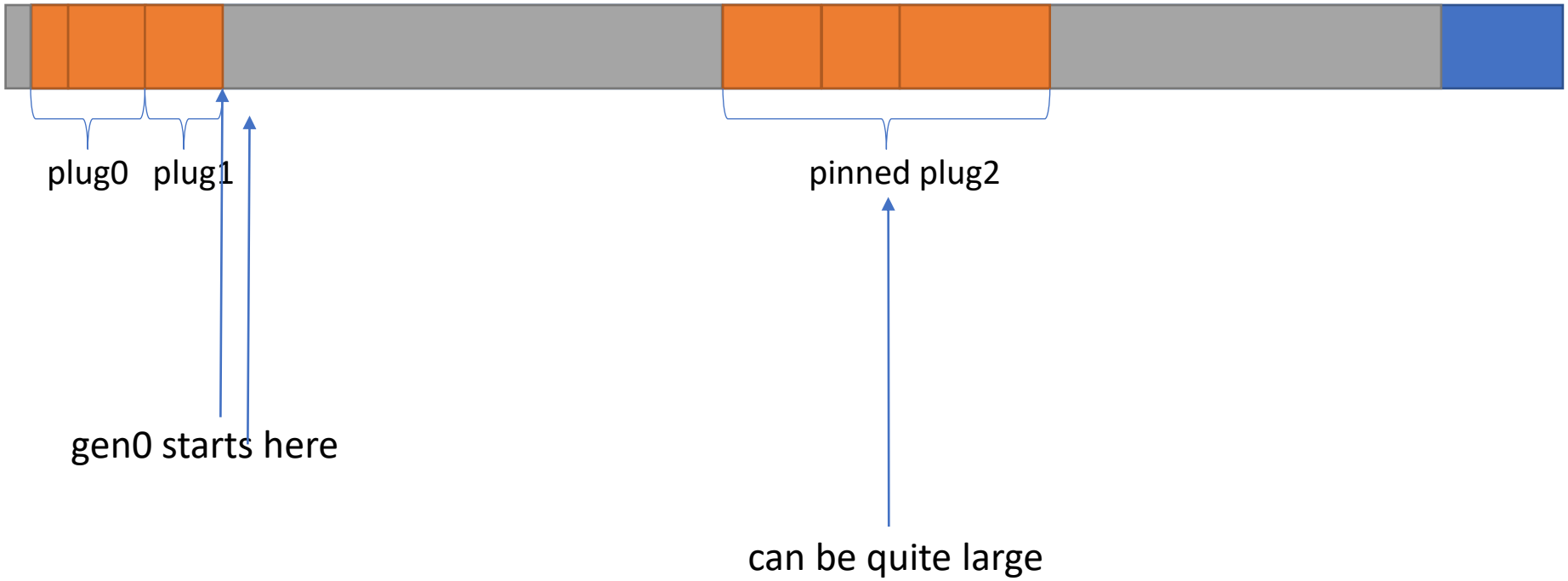
After compact phase



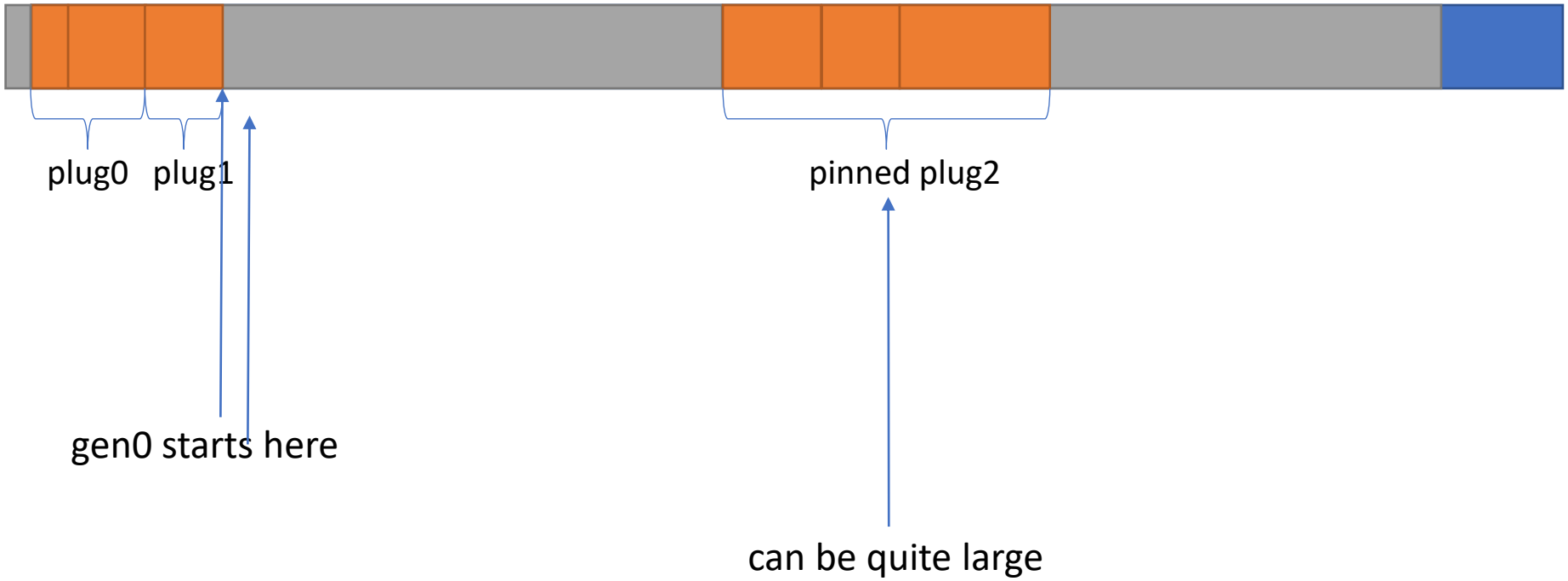
After compact phase



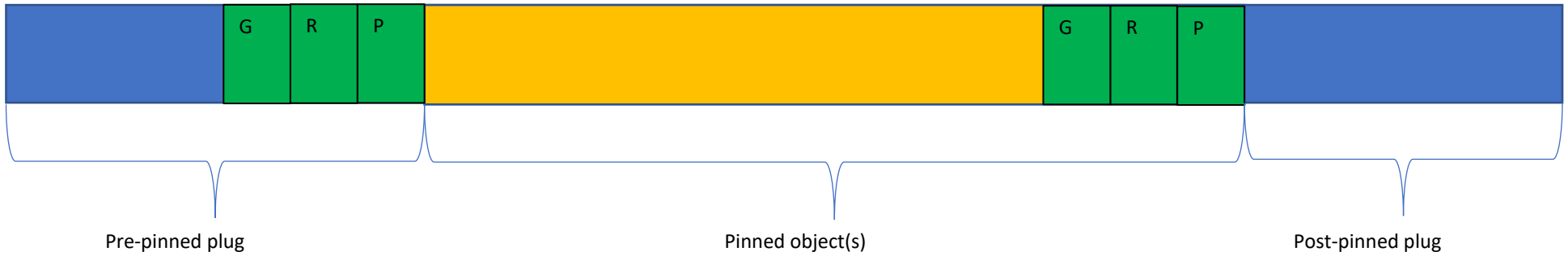
But wait…


plug0
plug1
pinned plug2
gen0 starts here
can be quite large

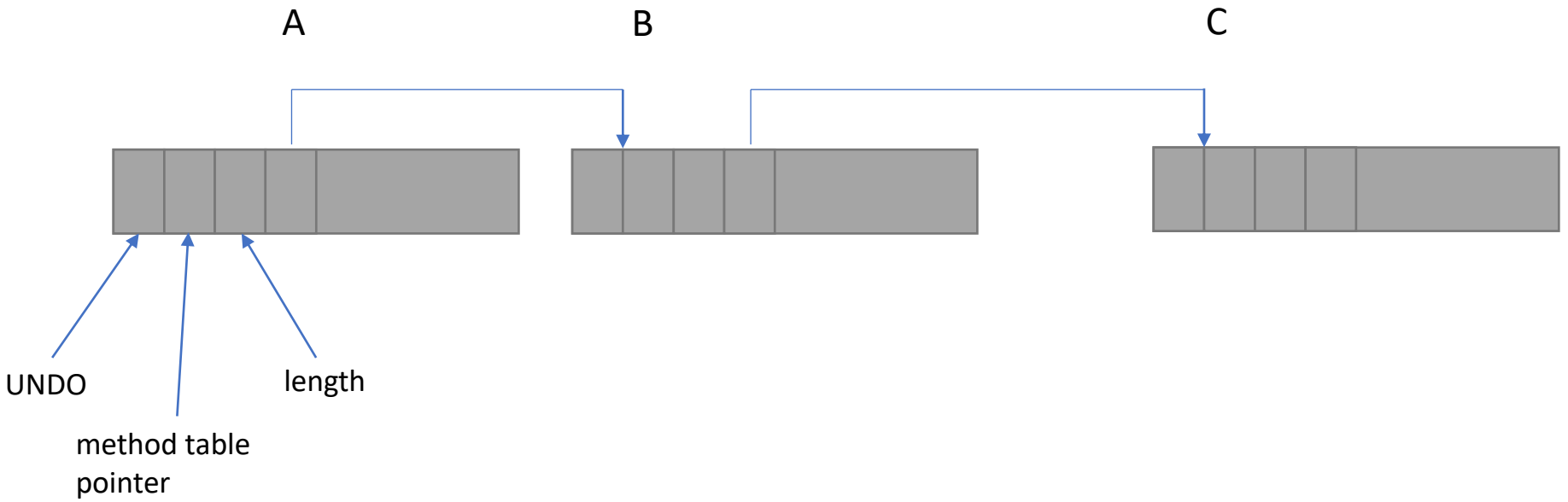
Breaking up this plug would be desirable



POPO (Promote Only Pinned Object)

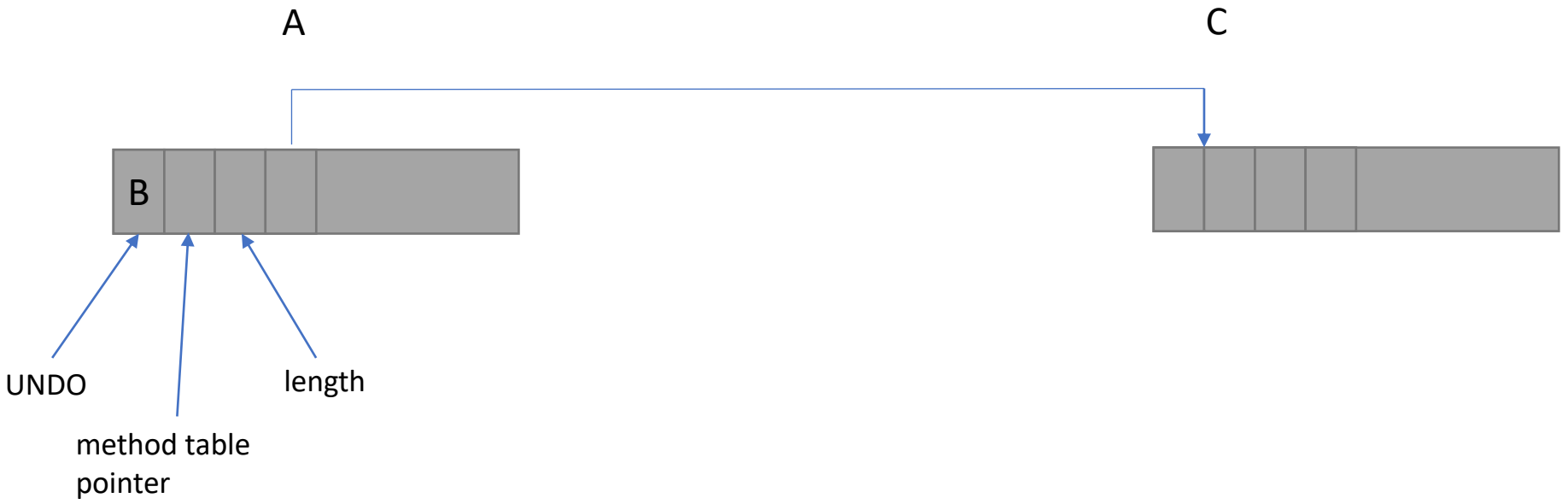


We don’t necessarily compact

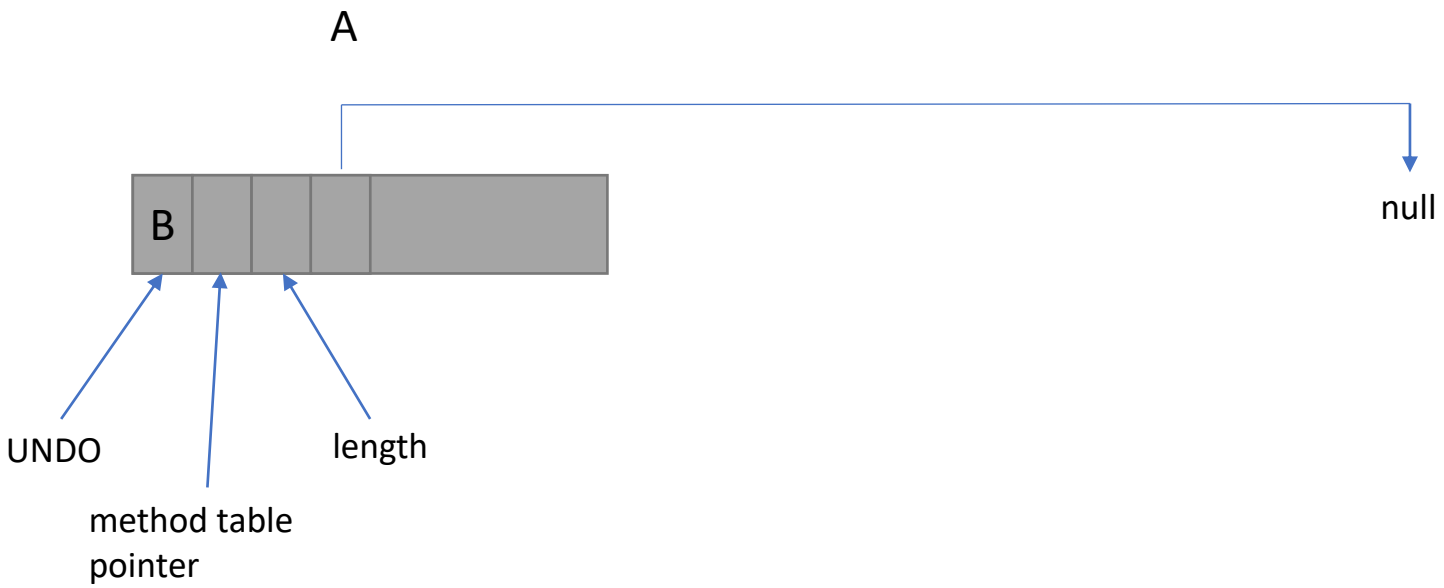


Segregated free list

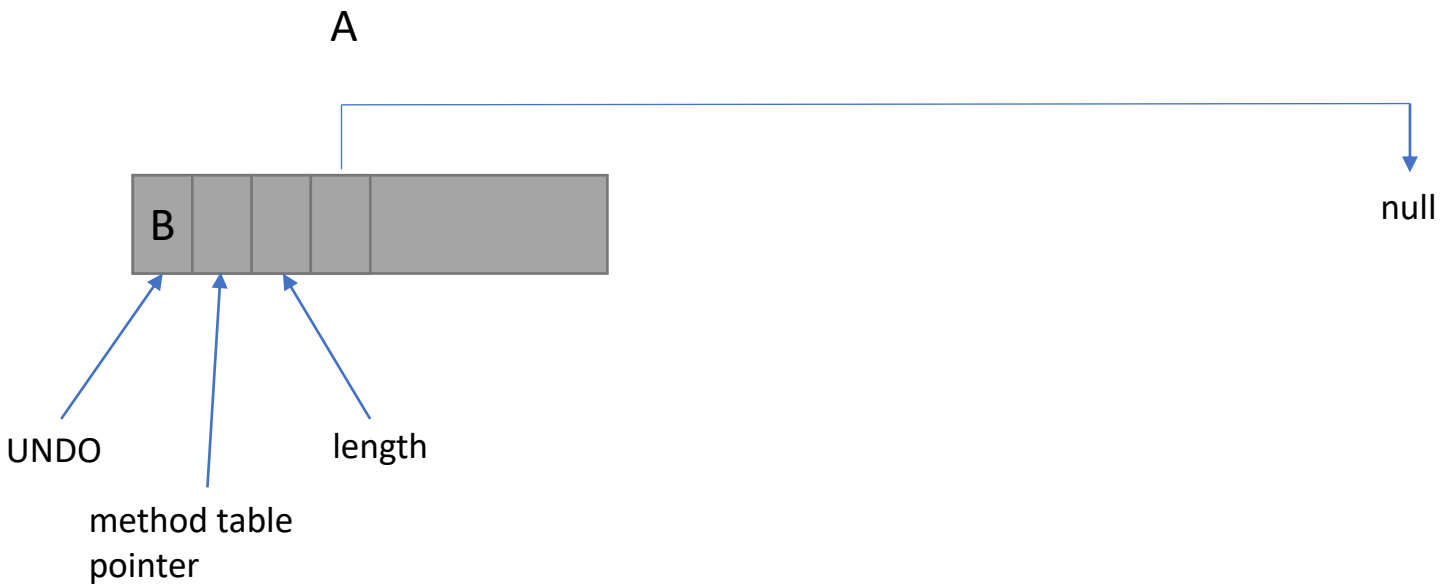
Taking B off the list



Taking C off the list



Now we decide not to compact



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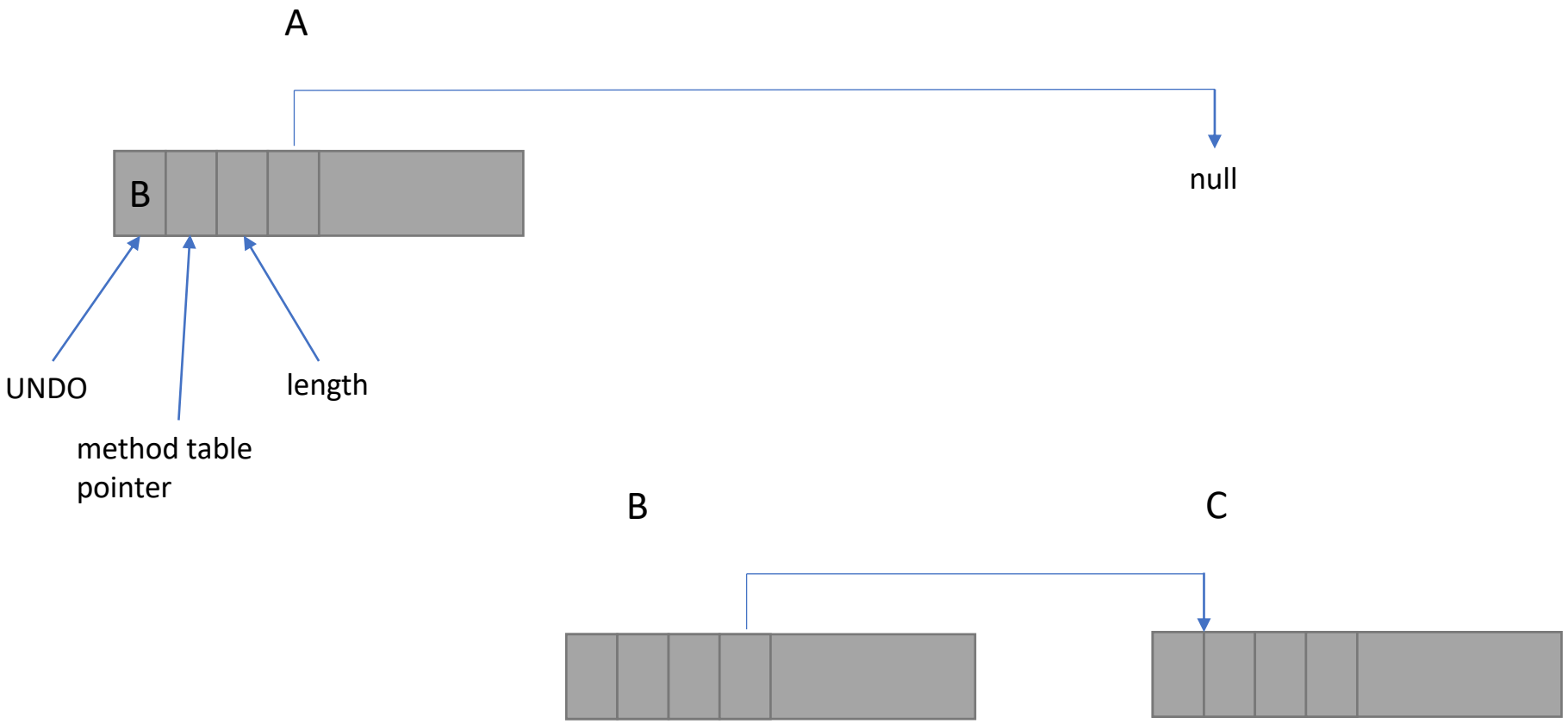

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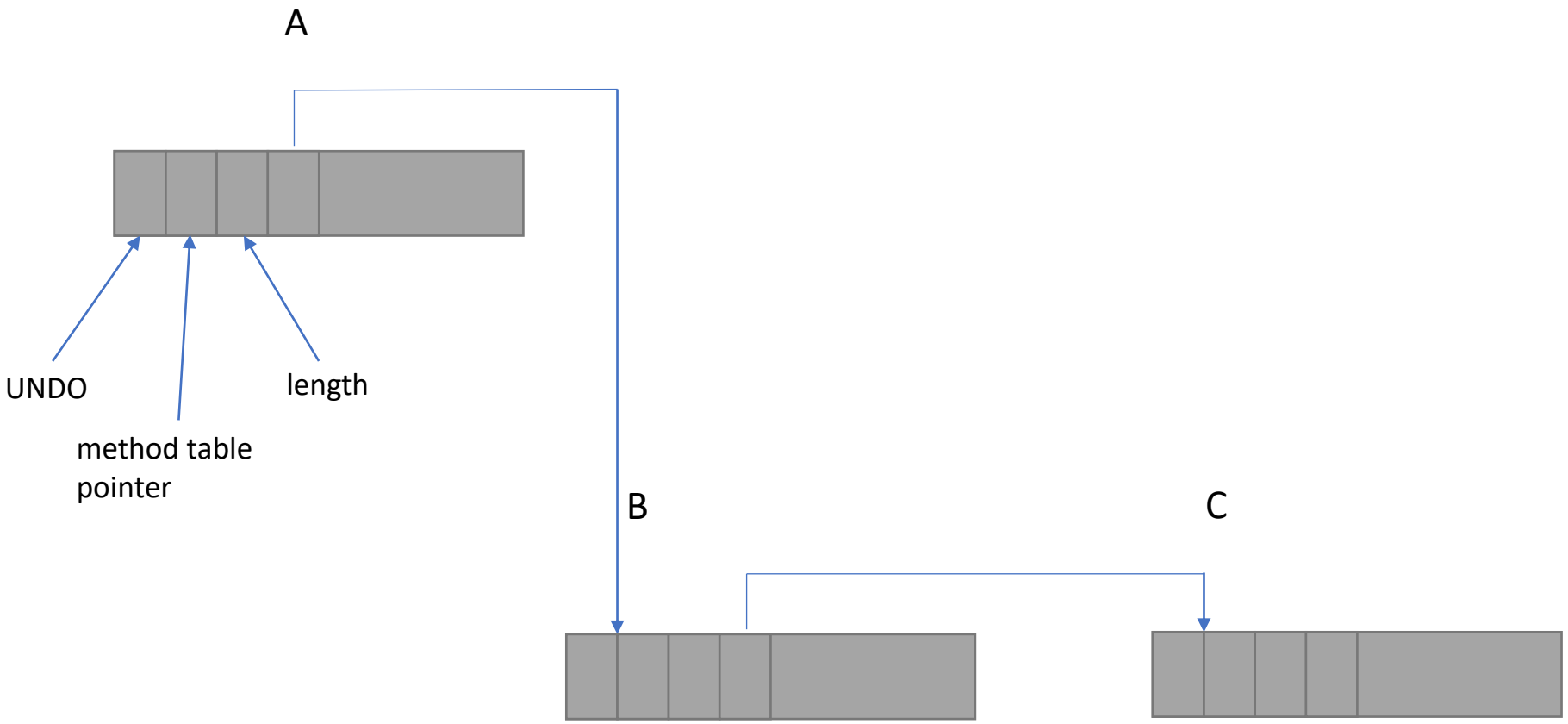

Questions?