

Dynamic Memory Allocation

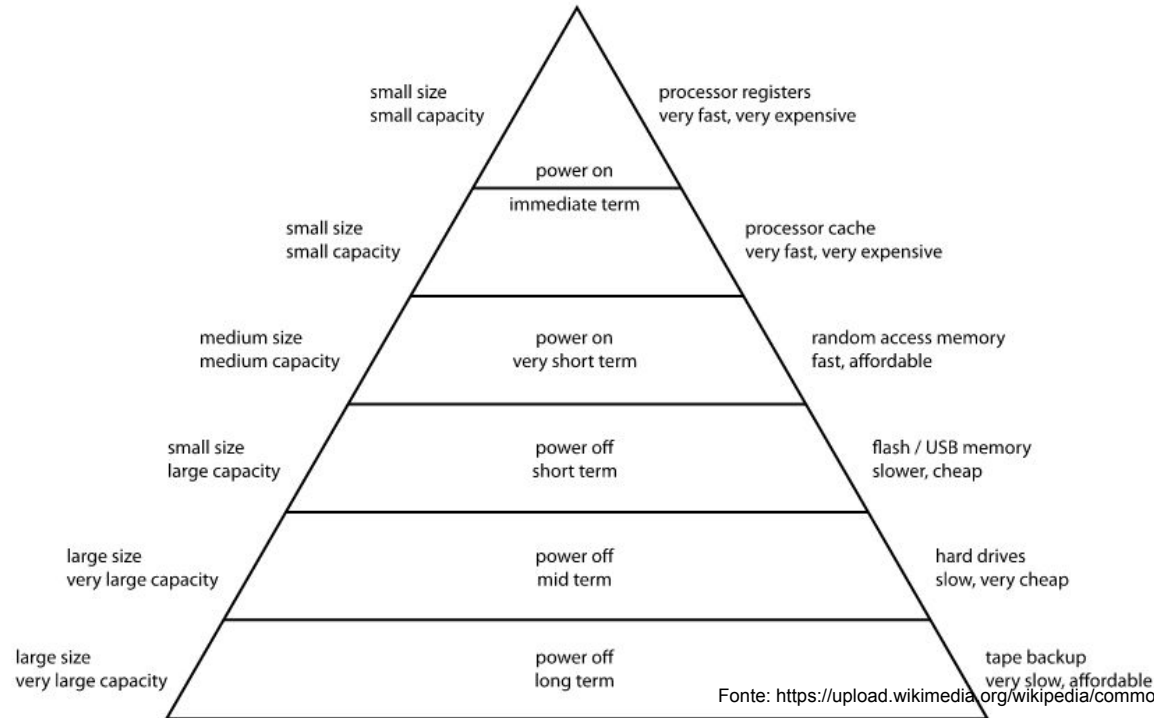
Tarcísio Fischer

Agenda

- Memory
- Data Segments
- Variable Scope
- Pointers & References
- Dynamic Memory Allocation
 - Malloc, Calloc, Realloc, free
 - New, New[], Delete, Delete[]
 - New/Delete vs Malloc/Free
- Memory Leaks & Other issues
- Stack vs Heap
- Stack Overflow
- Smart Pointers
- Garbage Collection
- Shared Memory

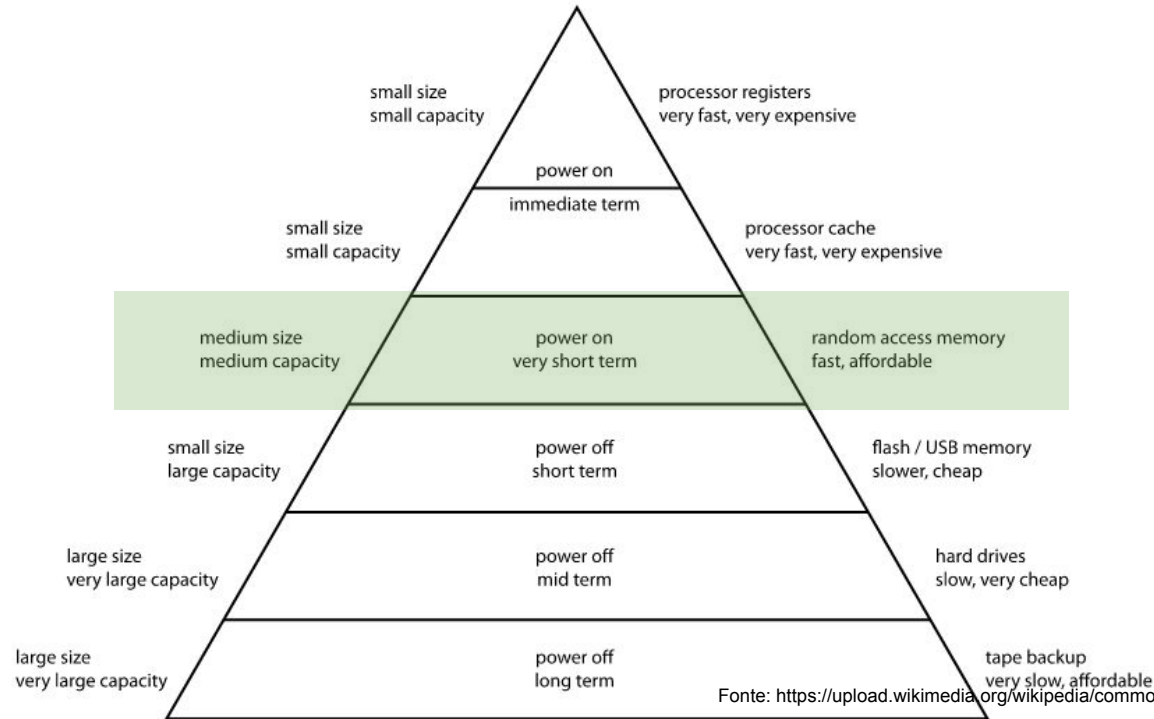
Memory

Computer Memory Hierarchy

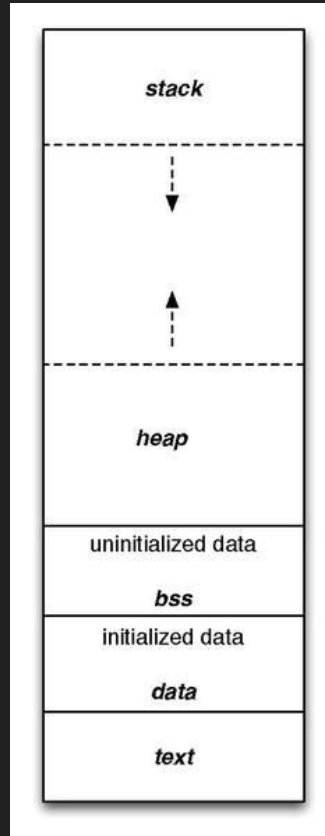


Memory

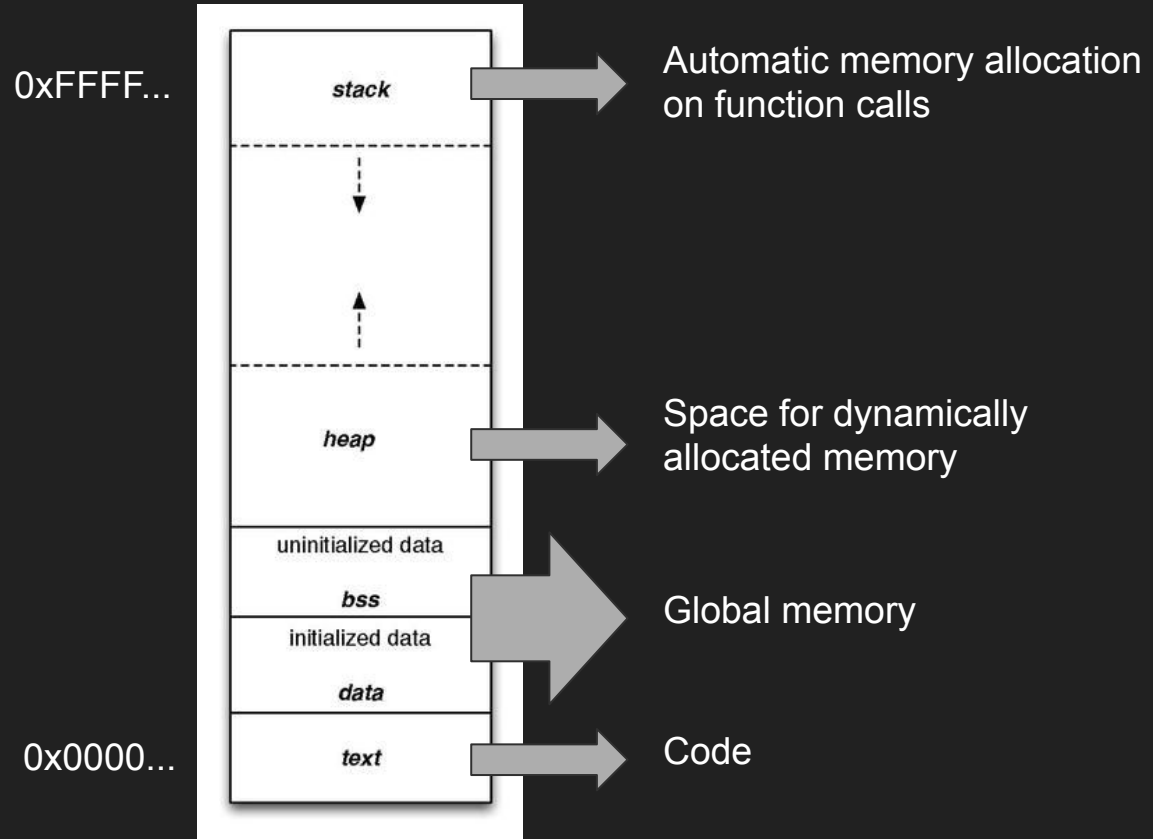
Computer Memory Hierarchy



Data Segments



Data Segments



Data Segments - Examples

01-BM_DynamicMemoryAllocation-DataSegments

02-BM_DynamicMemoryAllocation-DataSegmentsAndClasses

Variable Scope

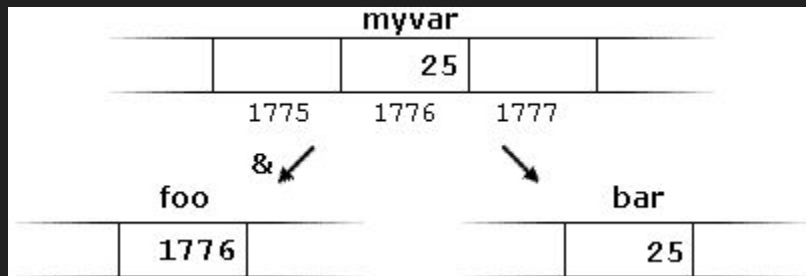
```
{  
  ...Code...  
}
```


Variable Scope - Examples

03-BM_DynamicMemoryAllocation-VariableScope

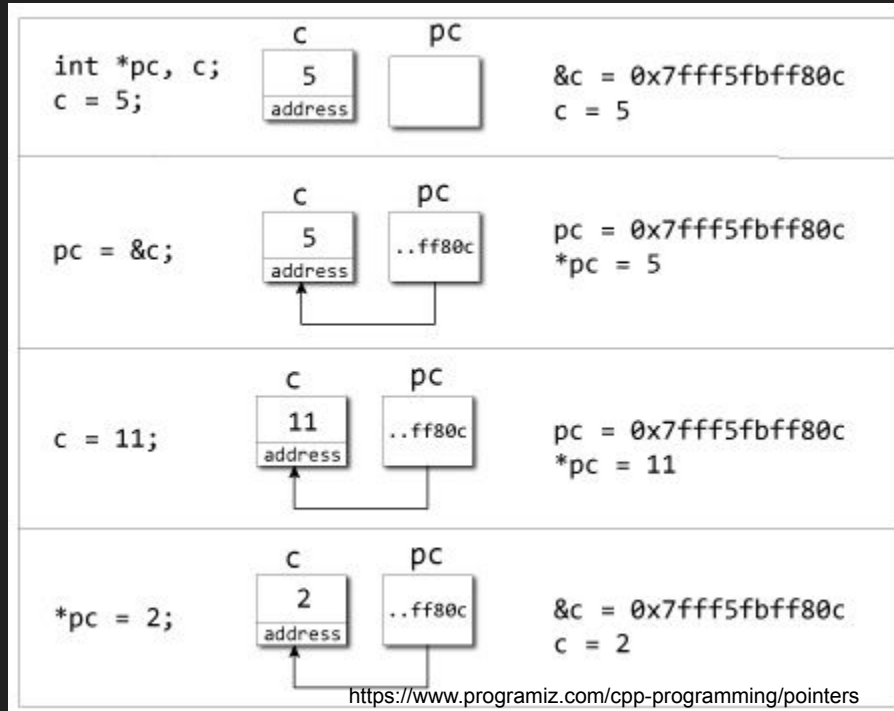
Pointers & References

```
{  
    int myvar = 25;  
    int* foo = &myvar;  
    int bar = myvar;  
}
```



Fonte: <http://www.cplusplus.com/doc/tutorial/pointers/>

Pointers & References



Pointers & References - Examples

04-BM_DynamicMemoryAllocation-Pointers
04b-BM_DynamicMemoryAllocation-ReferencesOnFunctions
05-BM_DynamicMemoryAllocation-PointersPointers
05b-BM_DynamicMemoryAllocation-PointersVsReferences
05c-BM_DynamicMemoryAllocation-PointerToDataStructure

04-BM_DynamicMemoryAllocation-Pointers

Addr	Name	Value
0x0000	i	1
0x0004	j	2
0x0008	k	3
0x000c	xx[0]	4
0x0010	xx[1]	5
0x0014	xx[2]	6
0x0018	xx[3]	7
0x001c	xx[4]	8
...

04-BM_DynamicMemoryAllocation-Pointers

Addr	Name	Value
0x0000	i	1
0x0004	j	2
0x0008	k	3
0x000c	xx[0]	4
0x0010	xx[1]	5
0x0014	xx[2]	6
0x0018	xx[3]	7
0x001c	xx[4]	8
...

```
int* ptr = &i;
```

0x4000	ptr	0x0000
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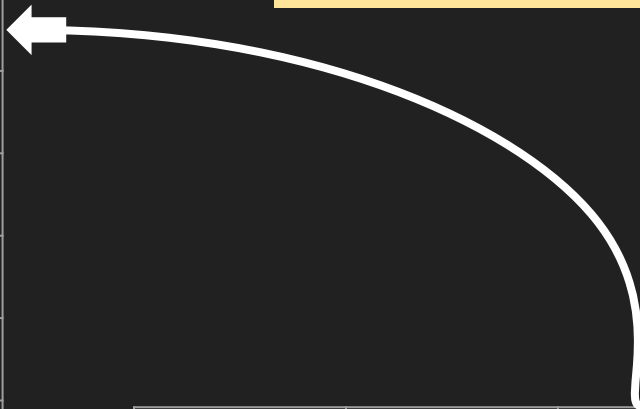


04-BM_DynamicMemoryAllocation-Pointers

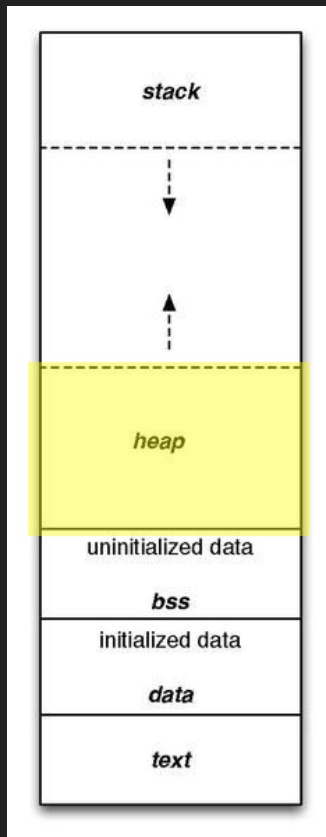
Addr	Name	Value
0x0000	i	1
0x0001	i	0
0x0002	i	0
0x0003	i	0
0x0004	j	2
0x0005	j	0
0x0006	j	0
0x0007	j	0
...

```
char* other_ptr = &i;
```

0x4004	other_ptr	0x0000
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Dynamic Memory Allocation



Malloc, Calloc, Realloc, free

06-BM_DynamicMemoryAllocation-MallocAndFriends
07-BM_DynamicMemoryAllocation-MallocObjects

New, New[], Delete, Delete[]

08-BM_DynamicMemoryAllocation-NewDelete