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Memory in C

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- Malloc, how we request memory from the operating system
- Static vs Dynamic Memory, and why you would use one over the other

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- Data items and structures such as, arrays, variables and pointers declared in your program are stored in this section of memory.
- Programs are not allowed to touch memory outside of what has been allocated by the operating system. If they do a segmentation fault occurs.

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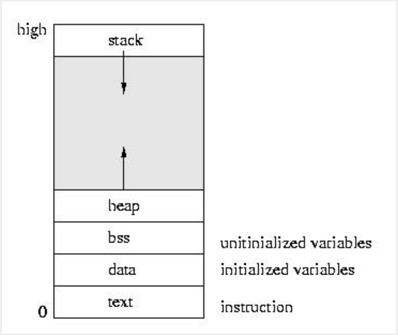
- 

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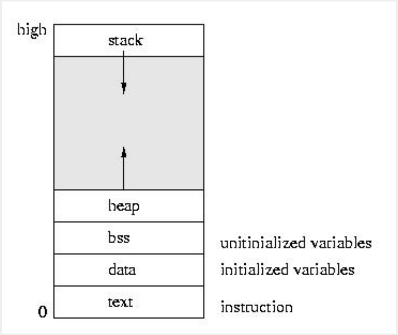
- 

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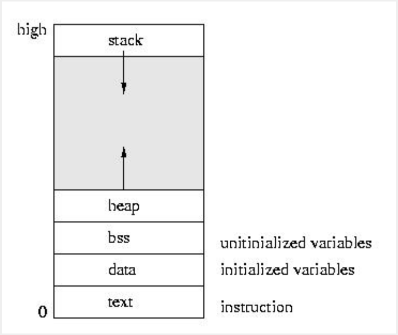
- 

- As data is stored on the Stack it grows down in memory towards the Heap. Increasingly higher valued addresses are used.
- As data is stored on the Heap it grows up in memory towards the Stack. Increasingly lower valued addresses are used.

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- We can use the memory given by malloc to store data on the heap.

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- You also have the option of letting the compiler control it for you.
- These two dynamics exposed in C are called Static and Dynamic Memory.

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- When you are declaring variables, arrays, and structs, these data items are stored on the Stack.
- The memory is allocated for them by the compiler when they come into scope, and it is deallocated when they fall out of scope.
- These variables would be statically allocated on the stack

```c
int i = 0;
int arr[10];
```

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- Dynamic memory is powerful because it allows you to utilize memory programmatically.
- You can create data structures that grow and shrink in response to different situations in your program.
- It is what allows C to outperform other higher level languages. Greater control means greater optimization opportunities.

Static vs Dynamic Memory

- Static memory is simpler to use over dynamic memory. No need to worry about allocating or deallocating means less programmer overhead.
- Static memory is limited. We cannot adjust the amount of memory allocated for a static structure such as an array. This potentially creates a lot of wasted space.
- Dynamic memory is complicated. There is a lot of opportunities to make mistakes.
- Dynamic memory is flexible. We can adjust the amount of memory allocated to a structure on the fly.
- Dynamic memory also allows us to be far more efficient then higher level languages.

Thanks For Watching

Hopefully you've gained a high level overview of the memory structure of a C program and are prepared to go more in depth into memory and pointers.