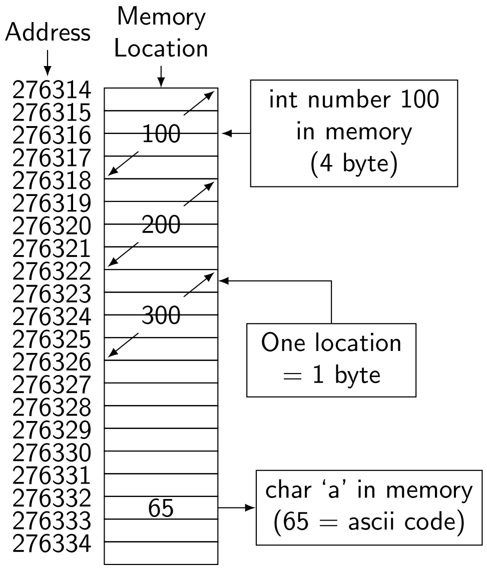
Lecture 6
Pointers and addresses

Test is coming
17'th of November

- Data types
- Functions
- I/O operations
- Branching (if, switch)
- Loops

The memory
Is where variables live



```
...
int  a=100;
int  b=200;
int  c=300;
char  d='a';
...
```

- Memory is continous
- All variables are stored in memory
- ... and functions

New data types - pointers
declared with a *

- For every type there is a pointer to it
- Use *
- Pointers are used to store **addresses** of variables
- Reside in memory, as any other variable

```
int *pi;
float *pf;
double *pd;
char *pc;
void *pv;
```

But also Pointer to pointer ...

```
int **ppi;
float ***pf;
...
void **pv;
```

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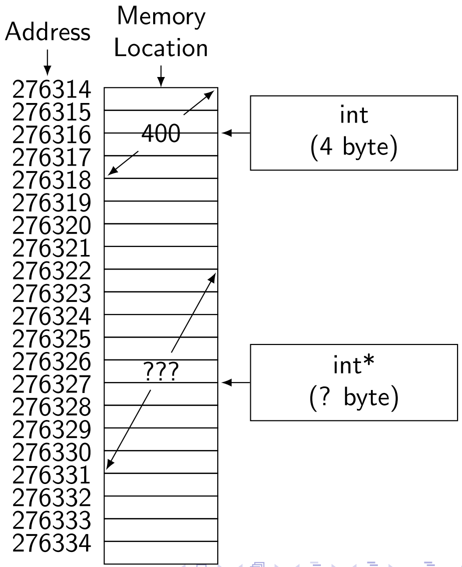
Pointers
sizeof

- What is *sizeof(int*)*
- and *sizeof(double*)*
- Examples follow
- Depends on a system ...

```
int a=400;
int *p = 10; //p points to
    memory address 10, can
    we access it?
```

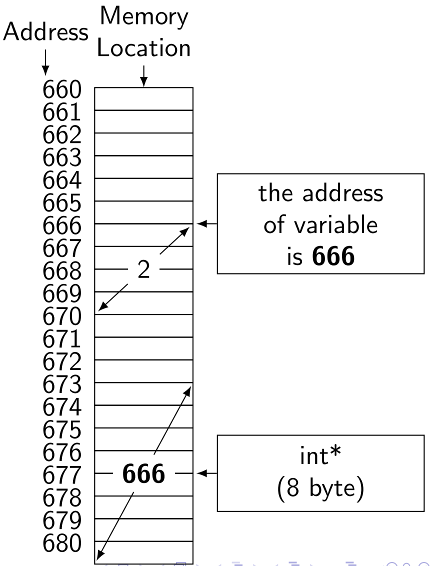


Retrieve the address

The & operator

- Remember the *scanf()*?
- & is used to retrieve an address of a variable in memory
- & returns the beginning of the space in memory where a variable is

```
int satan=2;//this is an evil int
int *p = &a; //p stores adress of s
```



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Retrieve the address

The & operator

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- & is used to retrieve an address of a variable in memory
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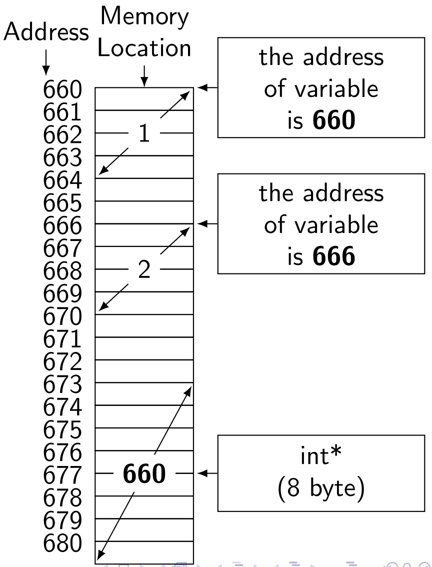
```
int satan=2;//this is an evil int
int *p = &a; //p stores adress of s

int good=1;//this is a good int
p=&good;//p stores adress of good
```



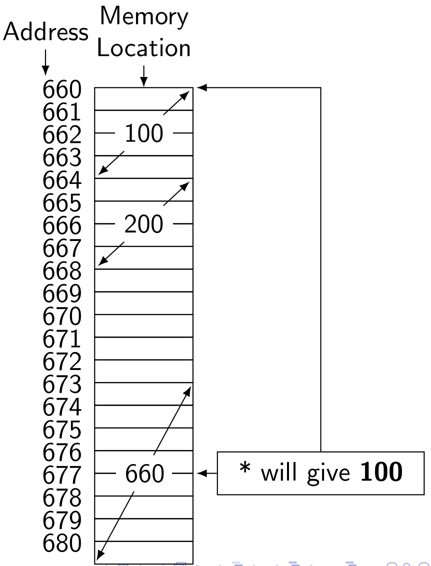
Retrive the variable

The * operator

- To get value, of variable, pointed by the pointer
- Use * operator on the pointer

```
int a=100;
int b=200;
int *p=&a;
printf("%d\n", *p);
```

So for *int *** (pointer to pointer) the **** will give a value ...

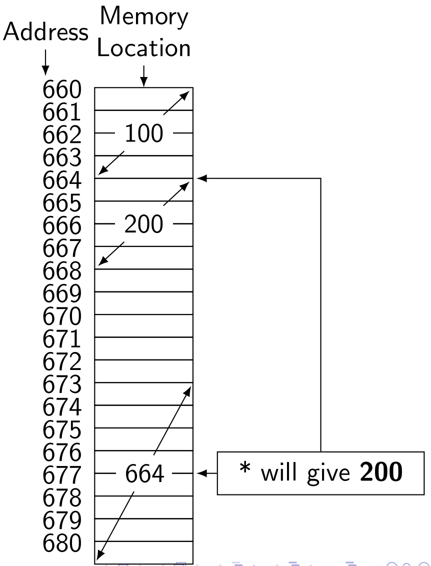


Retrieve the variable

The * operator

- To get value, of variable, pointed by the pointer
- Use * operator on the pointer

```
int a=100;
int b=200;
int *p=&a;
printf("%d\n", *p);
p=&b;
printf("%d\n", *p);
```

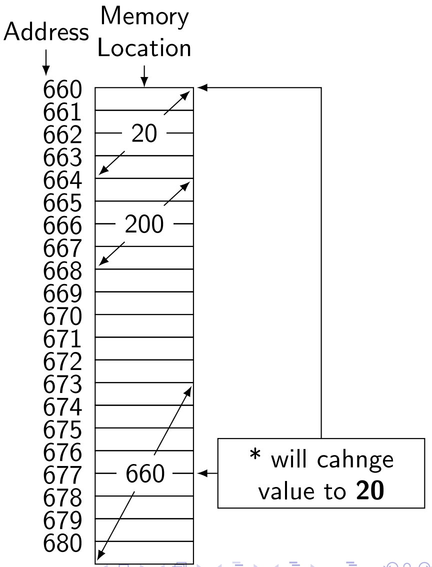


Change the variable

The * operator

- * can be used to change value pointed by the pointer
- Use * operator on the pointer and ...

```
int a=100;
int b=200;
int *p=&a;
printf("%d\n", *p);
*p = 20;
printf("%d\n", *p);
```

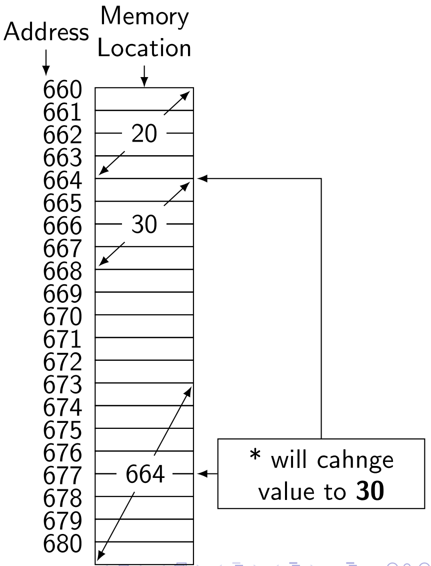


Change the variable

The * operator

- * can be used to change value pointed by the pointer
- Use * operator on the pointer and ...

```
int a=100;
int b=200;
int *p=&a;
printf("%d\n", *p);
*p = 20;
printf("%d\n", *p);
p=&b;
*p=30;
```



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Printing the address stored by a pointer
%p ... or %d

```
int a=10;
printf("%p\n", &a);
int *p = &a;
printf("%p\n", p)

printf("%p\n", &p);??
```

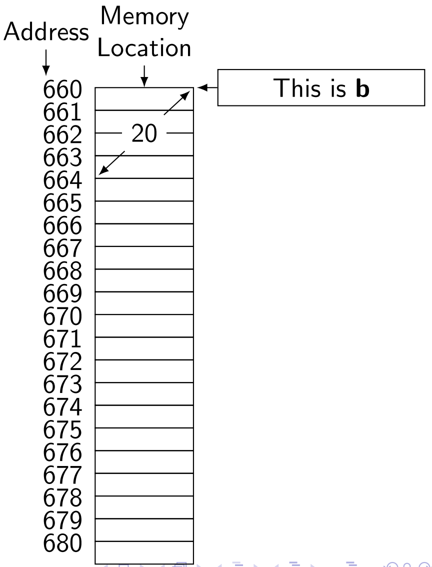
Pointer arithmetic
+ -

```
int a=10;
printf("%p\n", &a);
int *p = &a;
printf("%p\n", p+1)?
```

How many *ints* I could hide in a single *double* ...
I should not ...

Function with arguments

Passed by value



- Only the value is send to a function

```
void fun(int a){
  a = 500;
}

int main(){
  inb b=20;
  fun(b);
  //b?
}
```

Function with arguments
Passed by value

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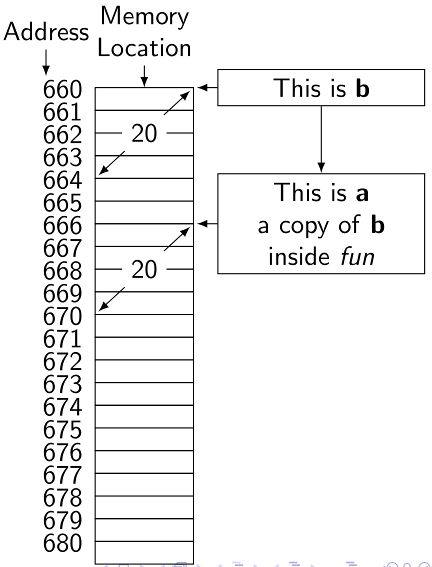

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Function with arguments

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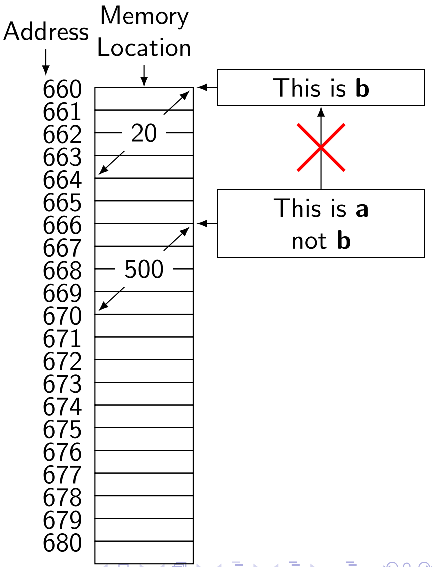
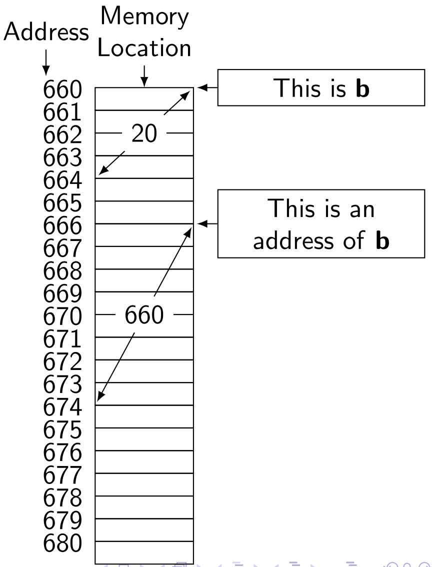


Function with arguments
Pass an address?

- What if we pass an address to a variable
- Than the function "knows" where the variable is stored
- The function works on tha variable
- ... not a copy

```
void fun(int* a){
  *a = 500;
}

int main(){
  inb b=20;
  fun(&b);//like scanf
  //b?
}
```



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Function with arguments

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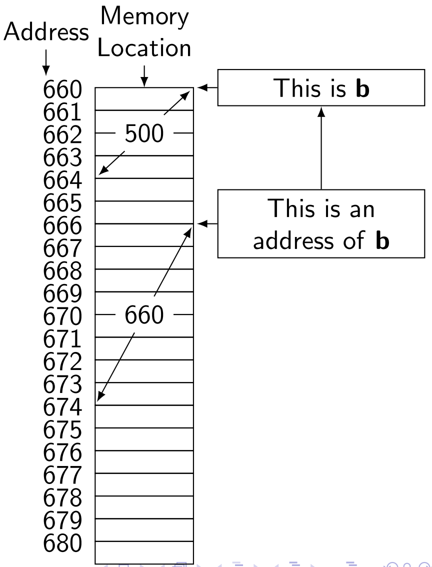
Address
Memory Location
660
661
662
663
664
665
666
667
668
669
670
671
672
673
674
675
676
677
678
679
680
500
660
This is **b**
This is an address of **b**