Pointers and Memory
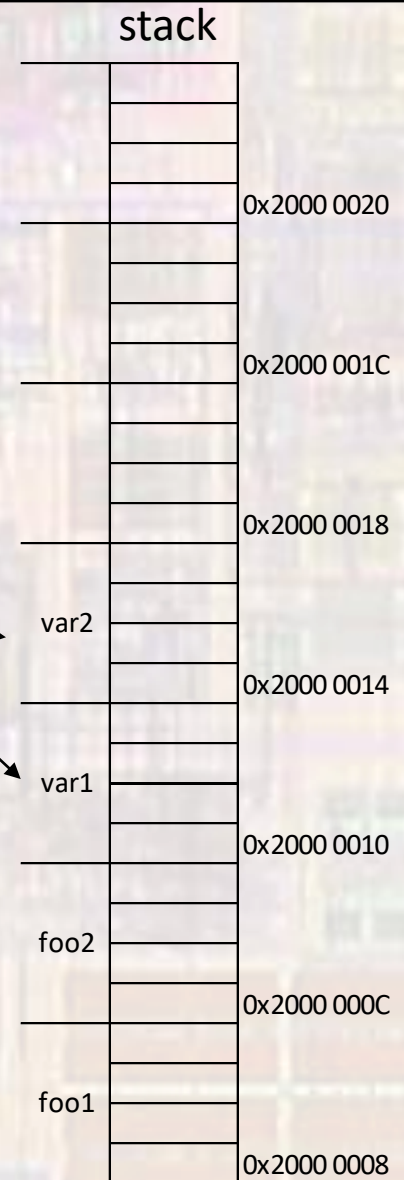
Last updated 6/28/24

These slides show how pointers are treated in memory

Pointers and Memory

- Example

```
int foo1;              // declared earlier
float foo2;



int var1;              // declare a variable of type int
float var2;            // declare a variable of type float
```

stack

	0x2000 0020
	0x2000 001C
	0x2000 0018
var2	
	0x2000 0014
var1	
	0x2000 0010
foo2	
	0x2000 000C
foo1	
	0x2000 0008

Pointers and Memory

• Example

int foo1;   // stored earlier so not visible
float foo2;   // in this section of the stack

int var1;   // declare a variable of type int
float var2;   // declare a variable of type float

var1 = 5;   // assign 5 to var1 (0x2000 0010)
var2 = 12.0;   // assign 12.0 to var2 (0x2000 0014)

stack

0x2000 0020

0x2000 001C

varX

0x2000 0018

var2   12.0

0x2000 0014

var1   5

0x2000 0010

foo2

0x2000 000C

foo1

0x2000 0008

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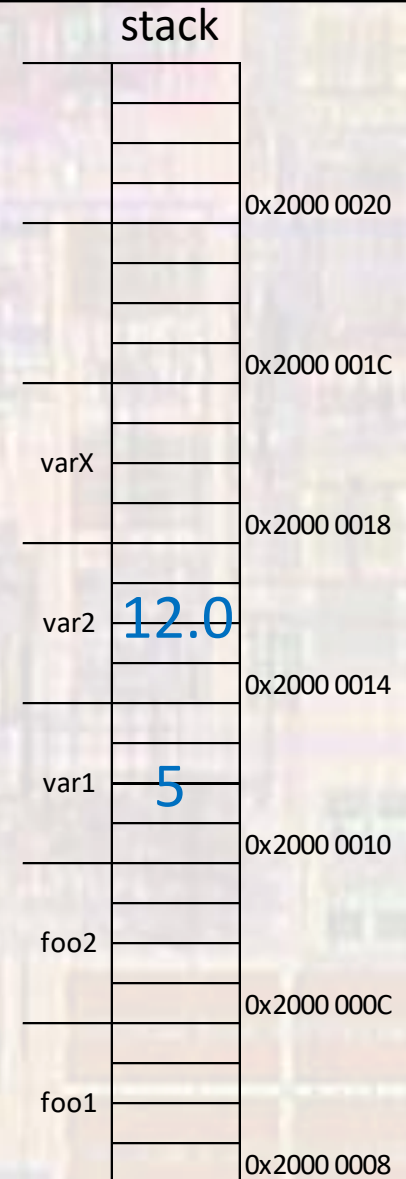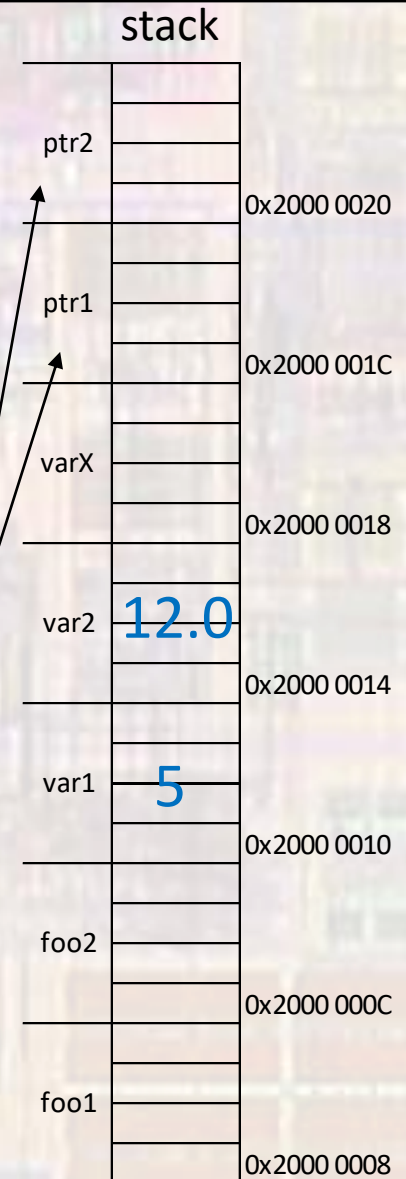# Pointers and Memory

- Example

```
int foo1;            // stored earlier so not visible
float foo2;          // in this section of the stack


int var1;            // declare a variable of type int
float var2;          // declare a variable of type float

var1 = 5;            // assign 5 to var1 (0x2000 0010)
var2 = 12.0;         // assign 12.0 to var2 (0x2000 0014)


int * ptr1;          // declare a pointer variable to a variable of type int
float * ptr2;        // declare a pointer variable to a variable of type float
```

stack

label	value	address
ptr2		
		0x2000 0020
ptr1		
		0x2000 001C
varX		
		0x2000 0018
var2	12.0	
		0x2000 0014
var1	5	
		0x2000 0010
foo2		
		0x2000 000C
foo1		
		0x2000 0008

Pointers and Memory

- ## Example
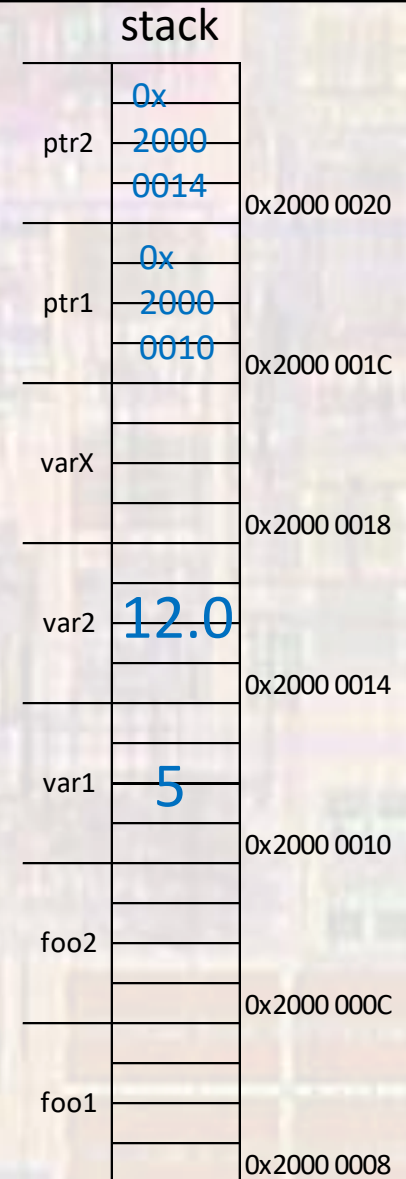
	stack	

int foo1;   // stored earlier so not visible
float foo2;   // in this section of the stack

int var1;   // declare a variable of type int
float var2;   // declare a variable of type float

var1 = 5;   // assign 5 to var1 (0x2000 0010)
var2 = 12.0;   // assign 12.0 to var2 (0x2000 0014)

int * ptr1;   // declare a pointer variable to a variable of type int
float * ptr2;   // declare a pointer variable to a variable of type float

ptr1 = &var1;   // set ptr1 to the address of var1 (0x2000 0010)
ptr2 = &var2;   // set ptr2 to the address of var2 (0x2000 0014)

Stack diagram (right side):

- ptr2: 0x 2000 0014 — 0x2000 0020
- ptr1: 0x 2000 0010 — 0x2000 001C
- varX: — 0x2000 0018
- var2: 12.0 — 0x2000 0014
- var1: 5 — 0x2000 0010
- foo2: — 0x2000 000C
- foo1: — 0x2000 0008

Pointers and Memory

- Example

	stack
ptr2	0x 2000 0014
ptr1	0x 2000 0010
varX	
var2	12.0
var1	5
foo2	12.0
foo1	5

0x2000 0020
0x2000 001C
0x2000 0018
0x2000 0014
0x2000 0010
0x2000 000C
0x2000 0008

```
int foo1;          // stored earlier so not visible
float foo2;                    // in this section of the stack

int var1;          // declare a variable of type int
float var2;        // declare a variable of type float

var1 = 5;          // assign 5 to var1 (0x2000 0010)
var2 = 12.0;       // assign 12.0 to var2 (0x2000 0014)

int * ptr1;        // declare a pointer variable to a variable of type int
float * ptr2;      // declare a pointer variable to a variable of type float

ptr1 = &var1;      // set ptr1 to the address of var1 (0x2000 0010)
ptr2 = &var2;      // set ptr2 to the address of var1 (0x2000 0014)

foo1 = *ptr1;      // set foo1 to the value pointed to by ptr1 (5)
foo2 = *ptr2;      // set foo2 to the value pointed to by ptr2 (12.0)
```
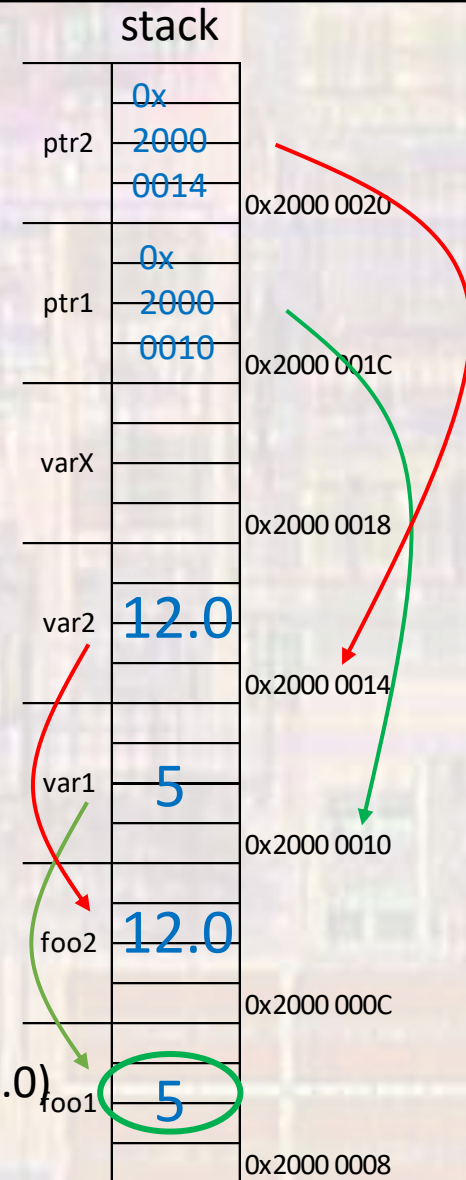
Pointers and Memory

- Example

```
int foo1;
float foo2;


int var1;              // declare a variable of type int
float var2;            // declare a variable of type float

var1 = 5;              // assign 5 to var1 (0x2000 0010)
var2 = 12.0;           // assign 12.0 to var2 (0x2000 0014)
```

int * ptr1;   // declare a pointer variable to a variable of type int
float * ptr2;   // declare a pointer variable to a variable of type float

ptr1 = &var1;   // set ptr1 to the address of var1 (0x2000 0010)
ptr2 = &var2;   // set ptr2 to the address of var1 (0x2000 0014)

foo1 = *ptr1;   // set foo1 to the value pointed to by ptr1 (5)
foo2 = *ptr2;   // set foo2 to the value pointed to by ptr2 (12.0)

Note: &ptr1   // the address of ptr1 (0x2000 001C)
           &ptr2   // the address of ptr2 (0x2000 0020)

stack

ptr2	0x 2000 0014
	0x2000 0020
ptr1	0x 2000 0010
	0x2000 001C
varX	
	0x2000 0018
var2	12.0
	0x2000 0014
var1	5
	0x2000 0010
foo2	12.0
	0x2000 000C
foo1	5
	0x2000 0008