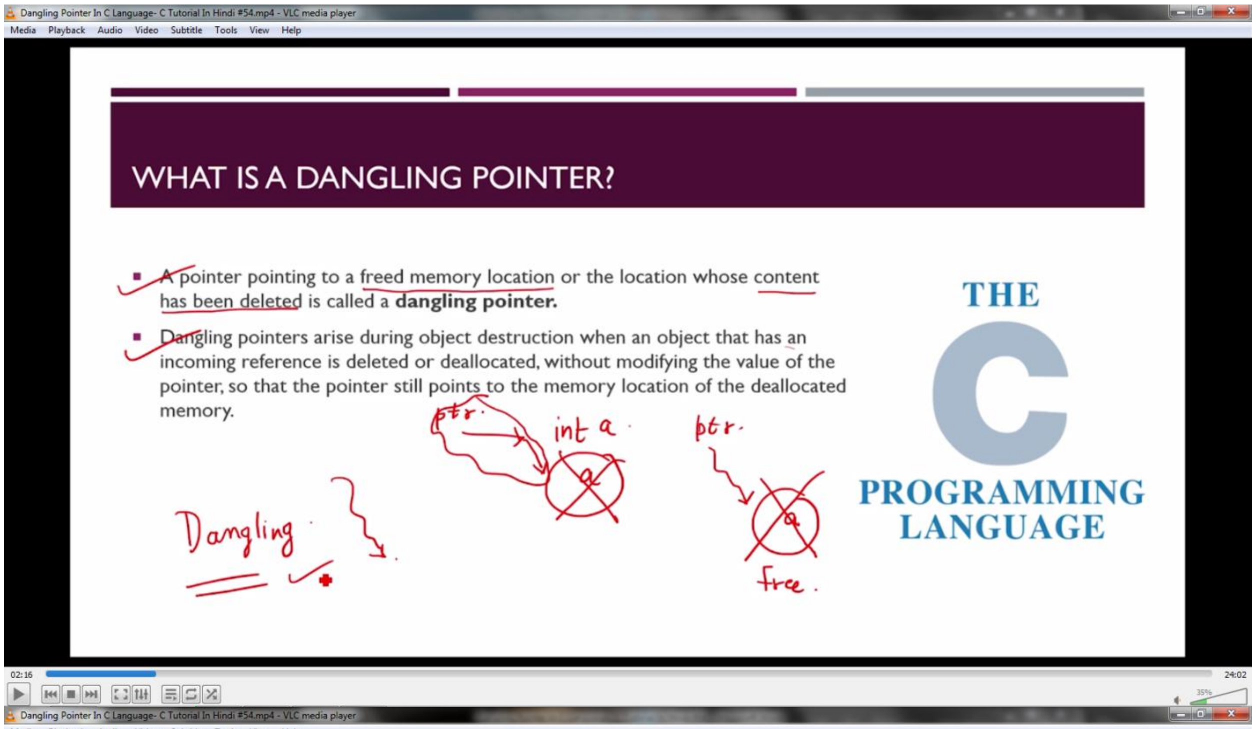

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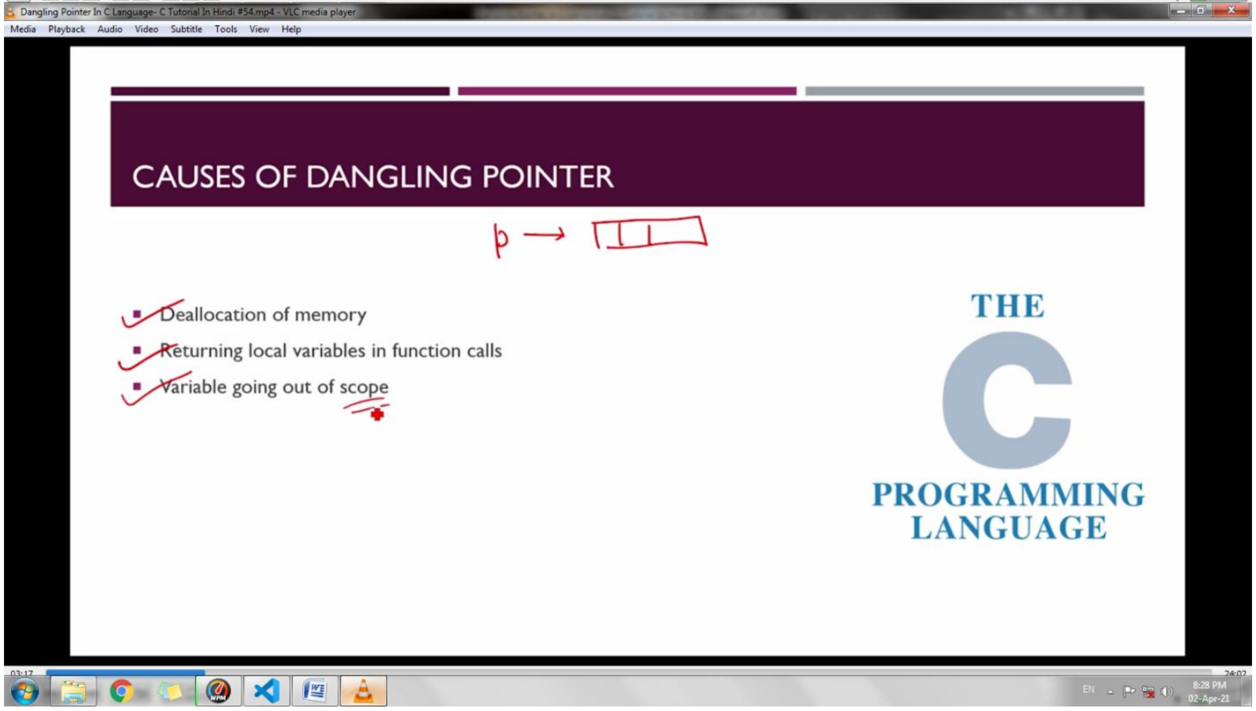
WHAT IS A DANGLING POINTER?

- A pointer pointing to a freed memory location or the location whose content has been deleted is called a **dangling pointer.**
- Dangling pointers arise during object destruction when an object that has an incoming reference is deleted or deallocated, without modifying the value of the pointer, so that the pointer still points to the memory location of the deallocated memory.



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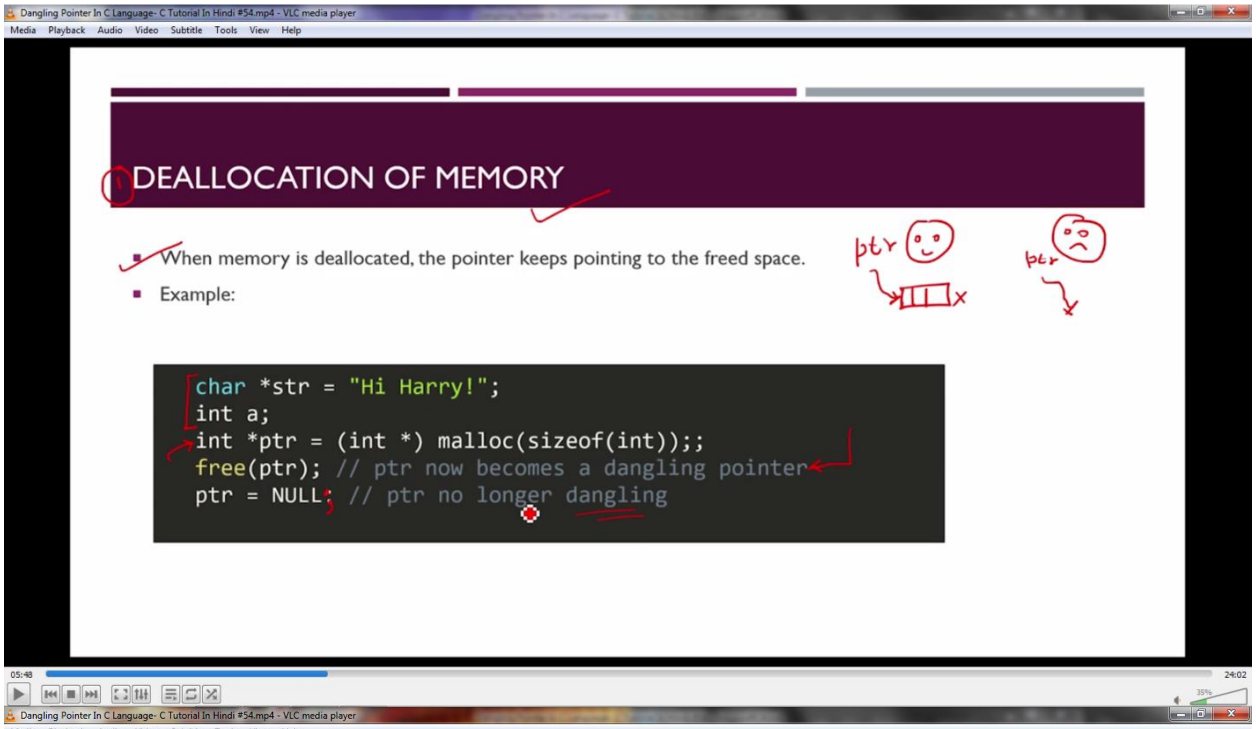
CAUSES OF DANGLING POINTER

- Deallocation of memory
- Returning local variables in function calls
- Variable going out of scope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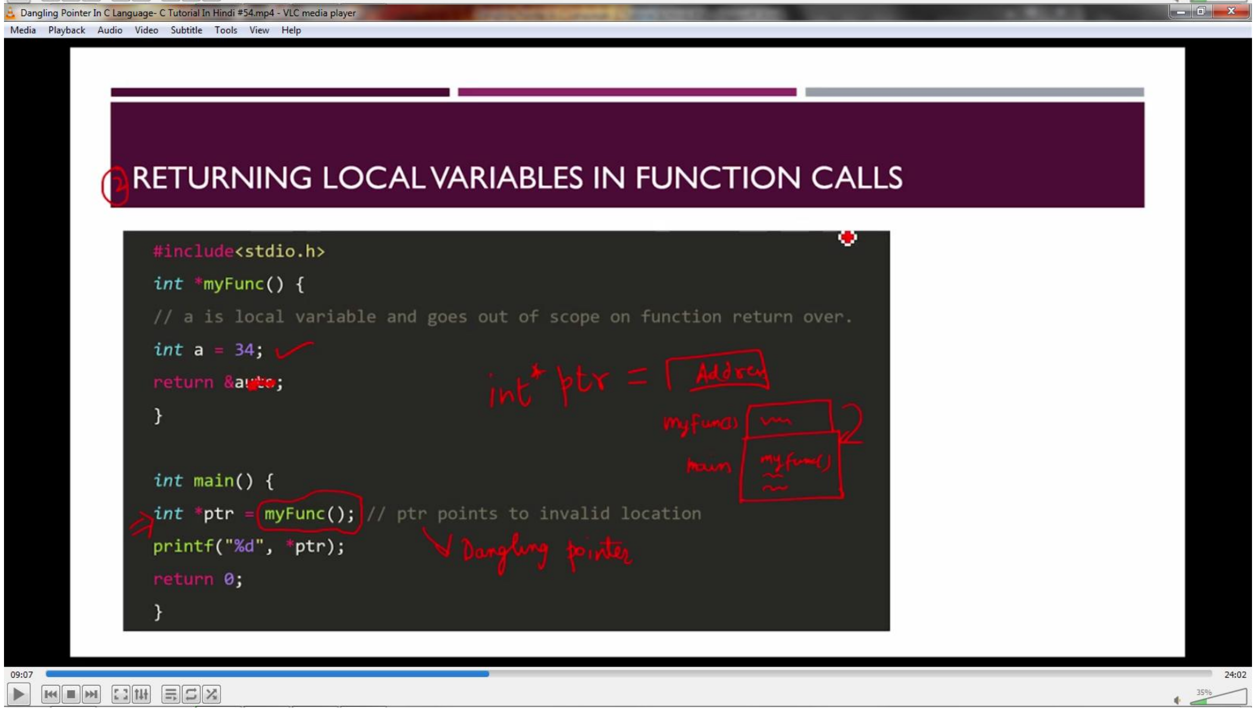
1
ptr
x
ptr
05:48
24:02

DEALLOCATION OF MEMORY

- When memory is deallocated, the pointer keeps pointing to the freed space.
- Example:

```
char *str = "Hi Harry!";
int a;
int *ptr = (int *) malloc(sizeof(int));;
free(ptr); // ptr now becomes a dangling pointer
ptr = NULL; // ptr no longer dangling
```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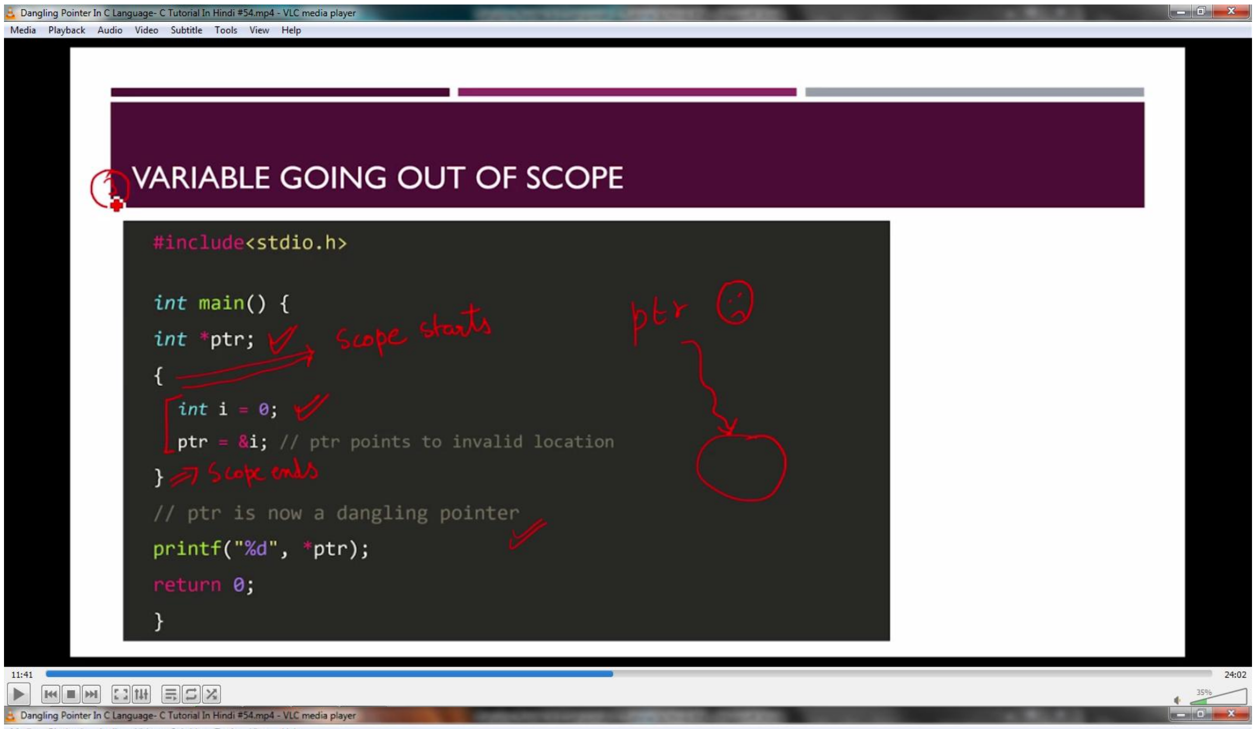
2
int* ptr = Address
myFunc()
main
myFunc()
2
Dangling pointer
09:07
24:02

RETURNING LOCAL VARIABLES IN FUNCTION CALLS

```
#include<stdio.h>
int *myFunc() {
// a is local variable and goes out of scope on function return over.
int a = 34;
return &a[illegible];
}

int main() {
int *ptr = myFunc(); // ptr points to invalid location
printf("%d", *ptr);
return 0;
}
```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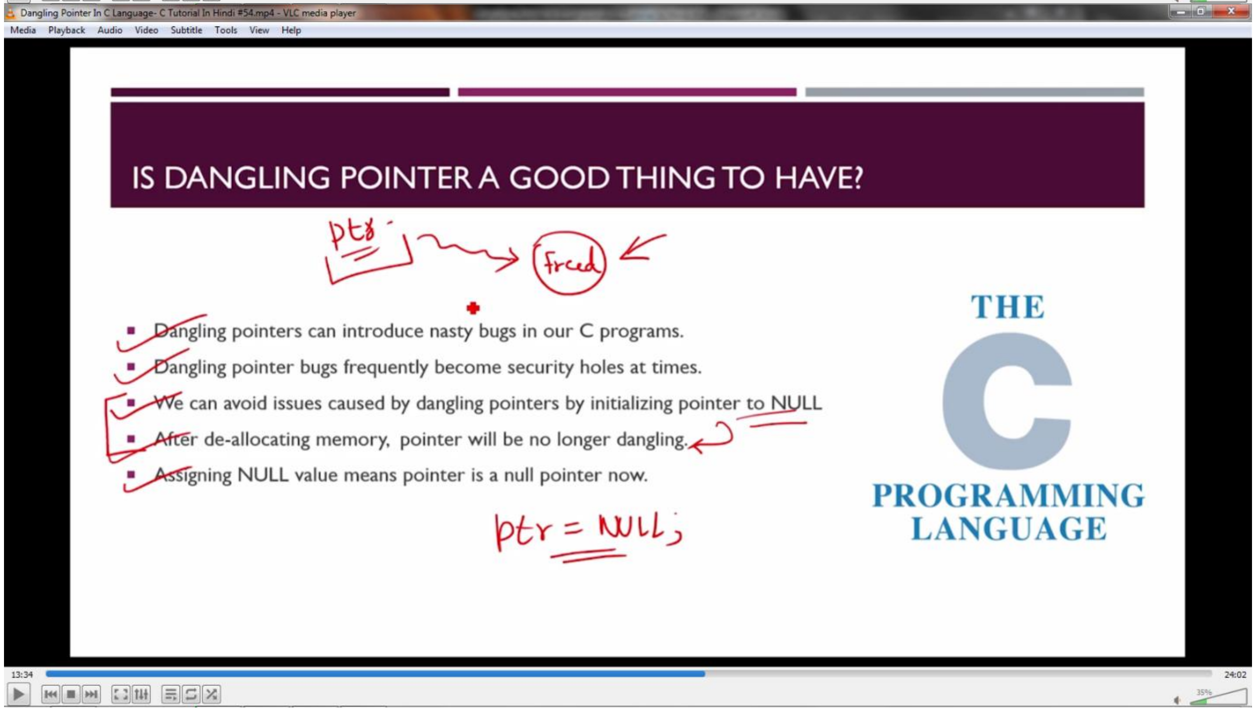
11:41
24:02
scope starts
scope ends
ptr

VARIABLE GOING OUT OF SCOPE

```
#include<stdio.h>

int main() {
int *ptr;
{
  int i = 0;
  ptr = &i; // ptr points to invalid location
}
// ptr is now a dangling pointer
printf("%d", *ptr);
return 0;
}
```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13:34
24:02
ptr
freed
THE C PROGRAMMING LANGUAGE

IS DANGLING POINTER A GOOD THING TO HAVE?

- Dangling pointers can introduce nasty bugs in our C programs.
- Dangling pointer bugs frequently become security holes at times.
- We can avoid issues caused by dangling pointers by initializing pointer to NULL
- After de-allocating memory, pointer will be no longer dangling.
- Assigning NULL value means pointer is a null pointer now.

ptr = NULL;