Analysis of ptrstew.c

Matt Bishop

For ECS 36A, Fall Quarter 2019

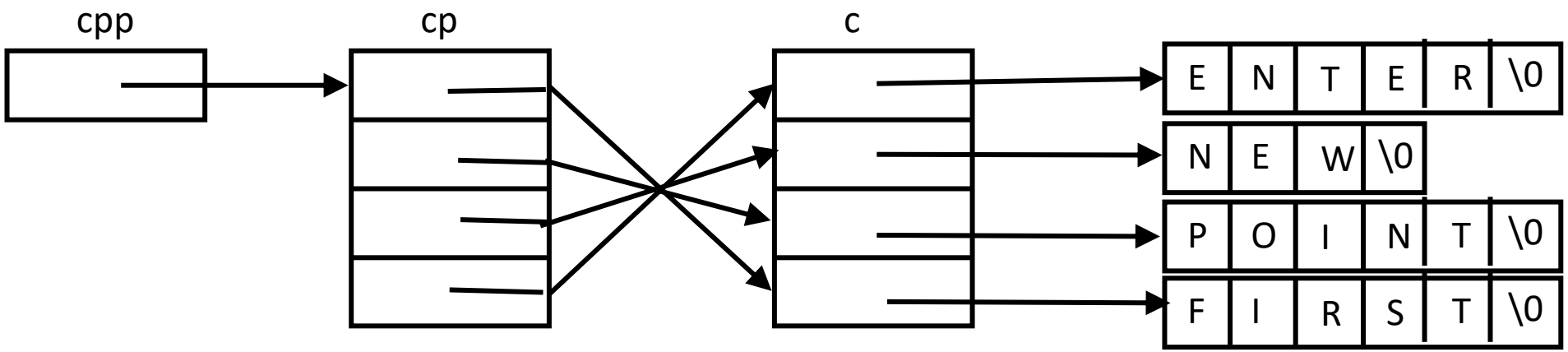
The Program

```
#include <stdio.h>

char *c[] = {
    "ENTER",
    "NEW",
    "POINT",
    "FIRST"
};
char **cp[] = {  c+3, c+2, c+1, c };
char ***cpp = cp;
int main(void)
{
    printf("%s", ***++cpp );
    printf("%s ", *--*++cpp+3 );
    printf("%s", *cpp[-2]+3 );
    printf("%s\n", cpp[-1][-1]+1 );
    return(0);
}
```

This very short, very confusing program is an excellent exercise in using pointers; if you can figure out what this prints, you will be able to understand (almost) any use of C pointers!

This is from Alan Feuer's marvelous book *The C Puzzle Book*

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char *c[] = {
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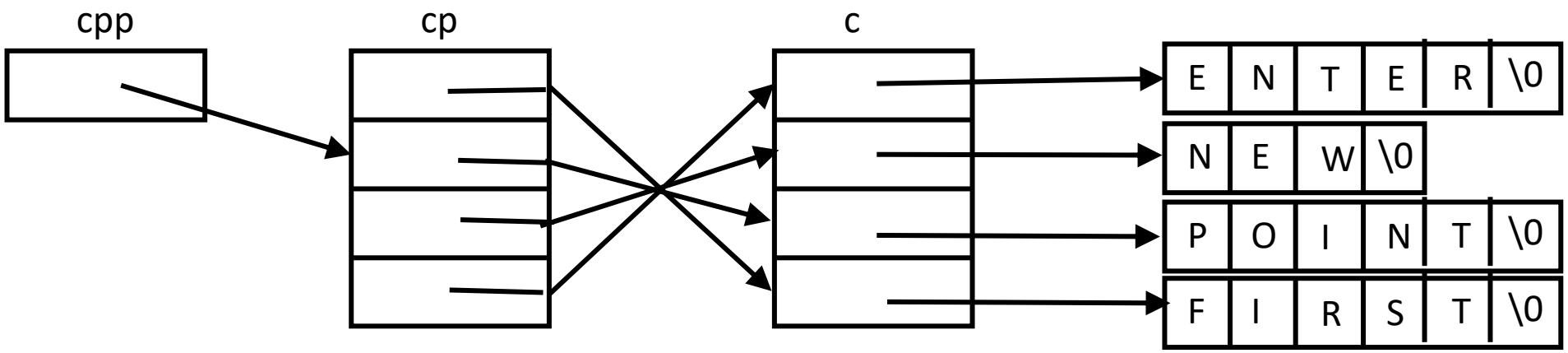
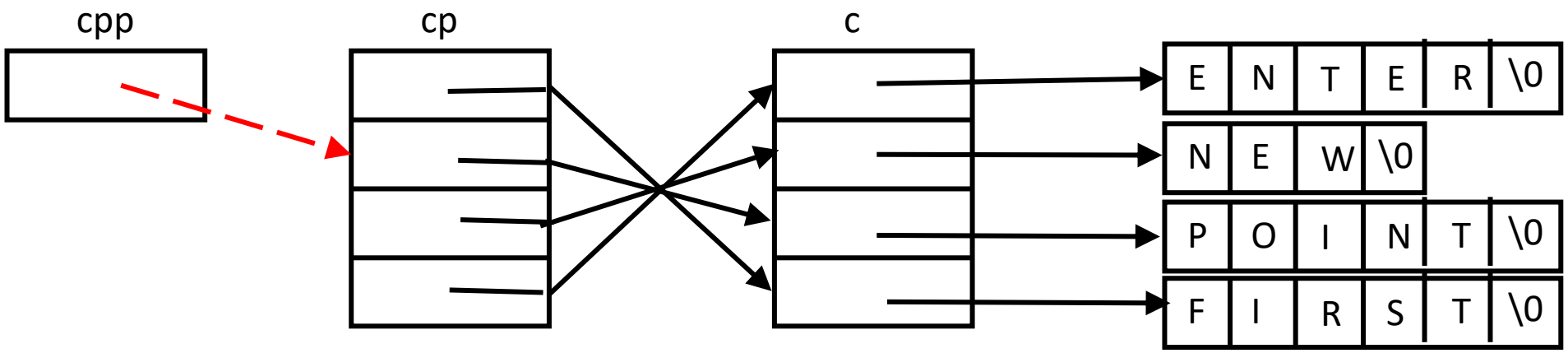
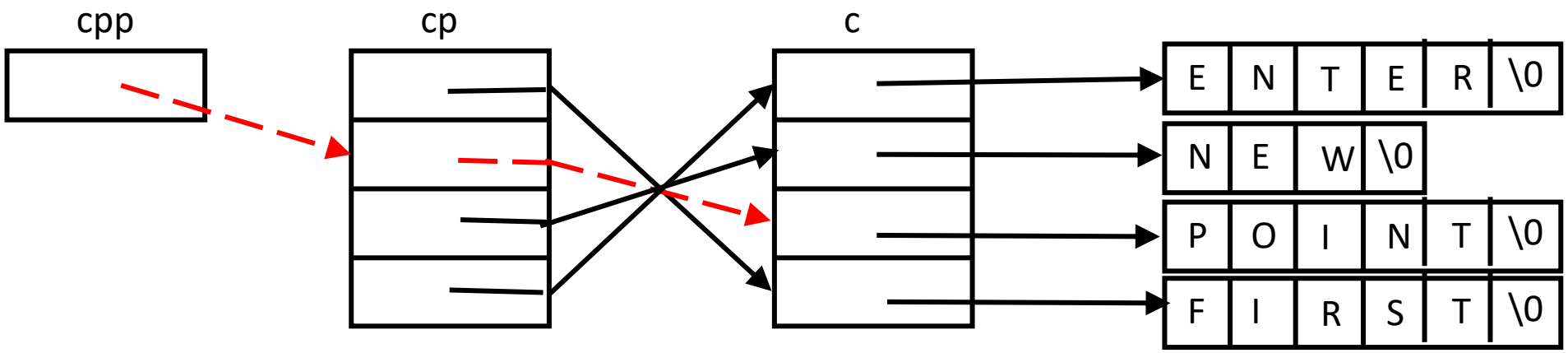
};
char **cp[] = {  c+3, c+2, c+1, c };
char ***cpp = cp;
```



**++cpp: configuration after ++cpp



**++cpp: configuration after *++cpp; red dashed arrow indicates the dereference (what *++cpp points to)

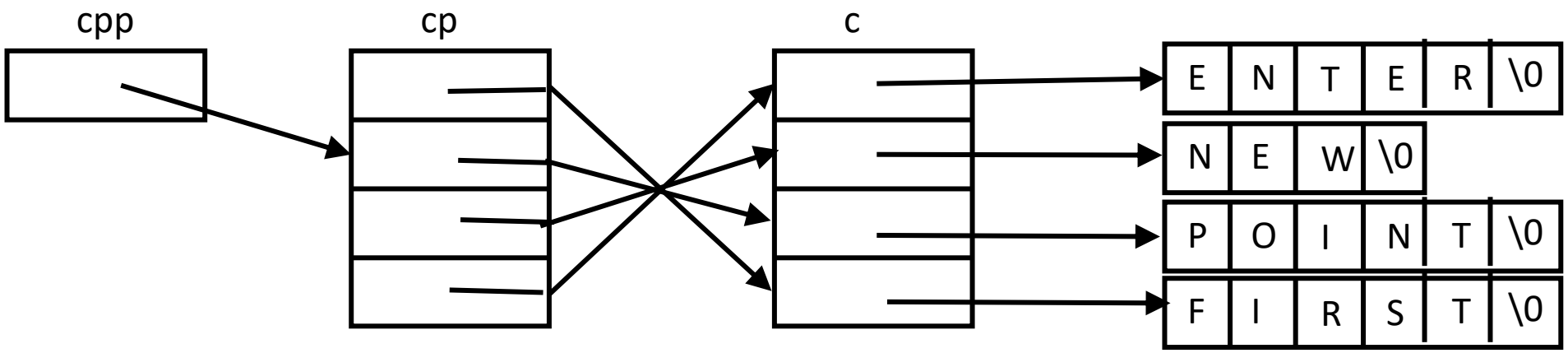


**++cpp: configuration after **++cpp; red dashed arrow indicates the dereferences, so **++cpp points to a pointer to “POINT”

So printf(“%s”, **++cpp) prints POINT

What is printed (in blue)

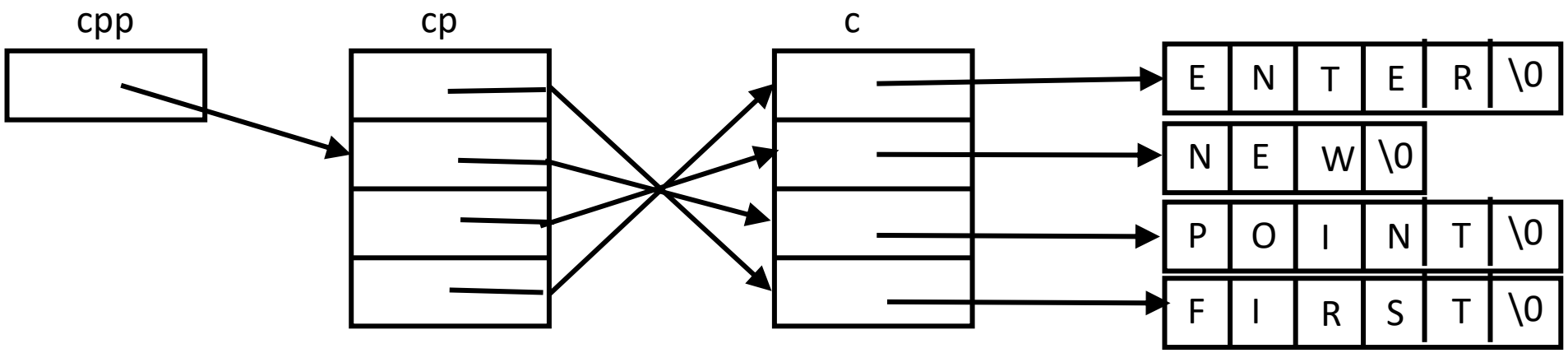
POINT



Configuration after previous printf; note cpp is *not* returned to its original value but remains pointing at the second element of cp (that is, cp[1])

What is printed (in blue)

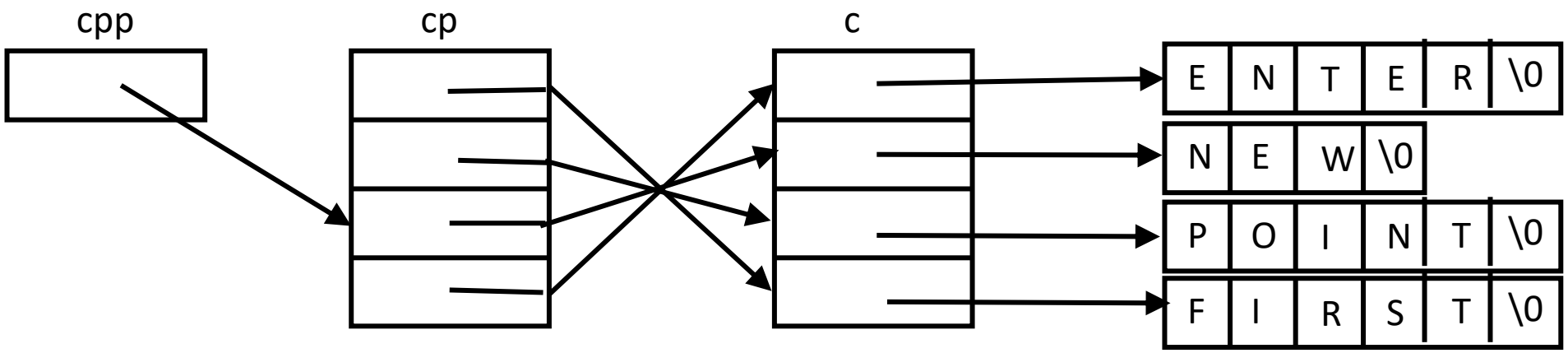
POINT



--++cpp+3: parenthesized, (*(--(*(++(cpp)))))+3
This shows the order of precedence

What is printed (in blue)

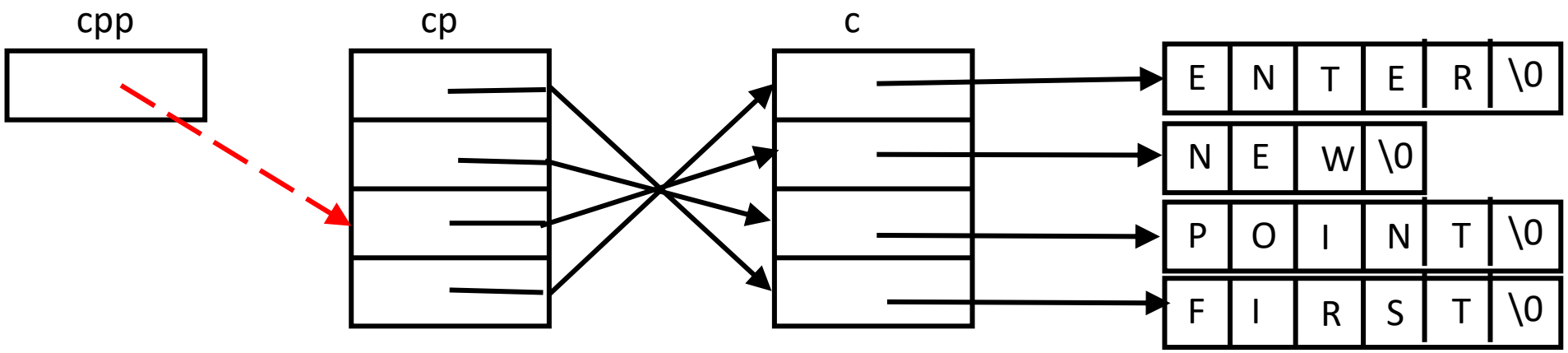
POINT



--++cpp+3: parenthesized, (*(--(*(++(cpp)))))+3
After ++(cpp)

What is printed (in blue)

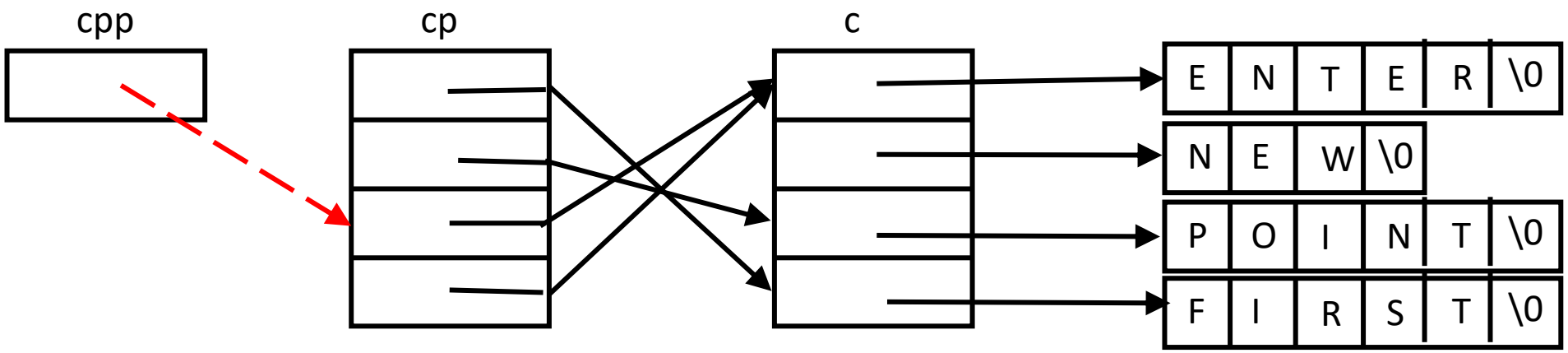
POINT



--++cpp+3: parenthesized, (*(--(*(++(cpp)))))+3
After *(++(cpp)); red dashed arrow indicates the dereference (what *++cpp points to)

What is printed (in blue)

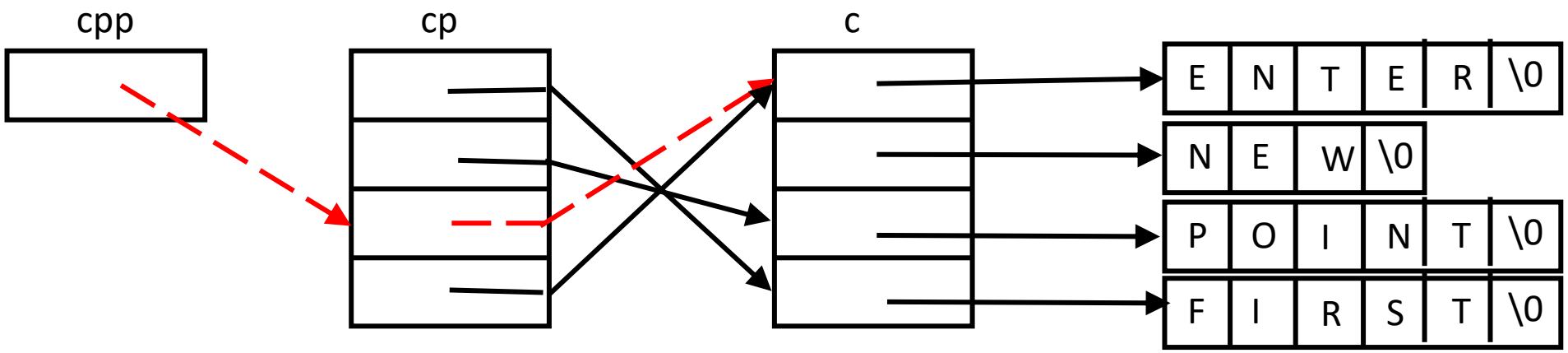
POINT



--++cpp+3: parenthesized, (*(--(*(++(cpp)))))+3
After --(*(++(cpp))); red dashed arrow indicates the dereference (what *++cpp points to)

What is printed (in blue)

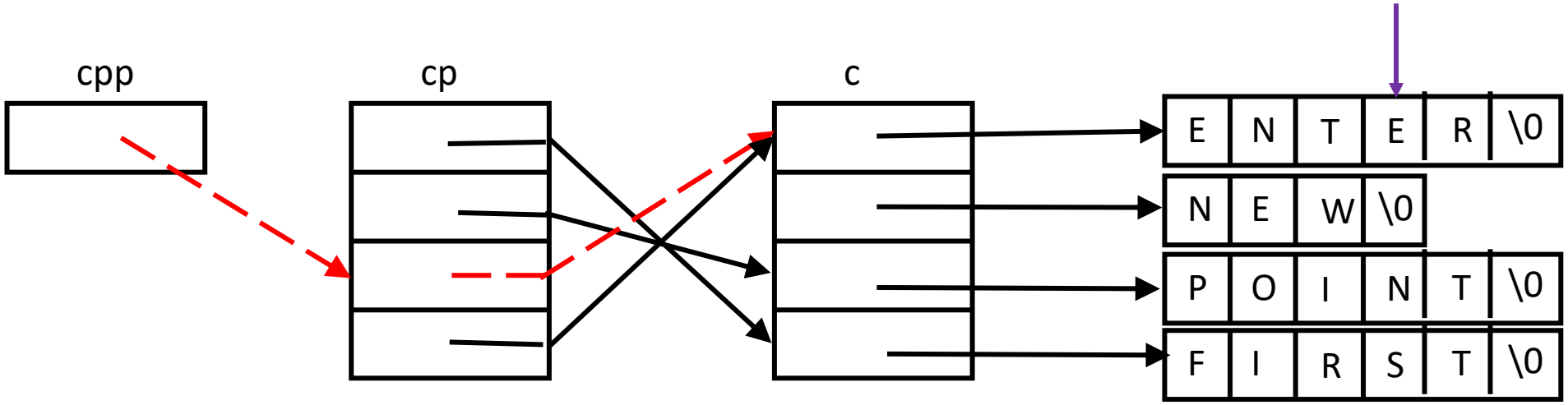
POINT



--++cpp+3: parenthesized, (*(--(*(++(cpp)))))+3
After *(--(*(++(cpp)))); red dashed arrow indicates the dereferences

What is printed (in blue)

POINT

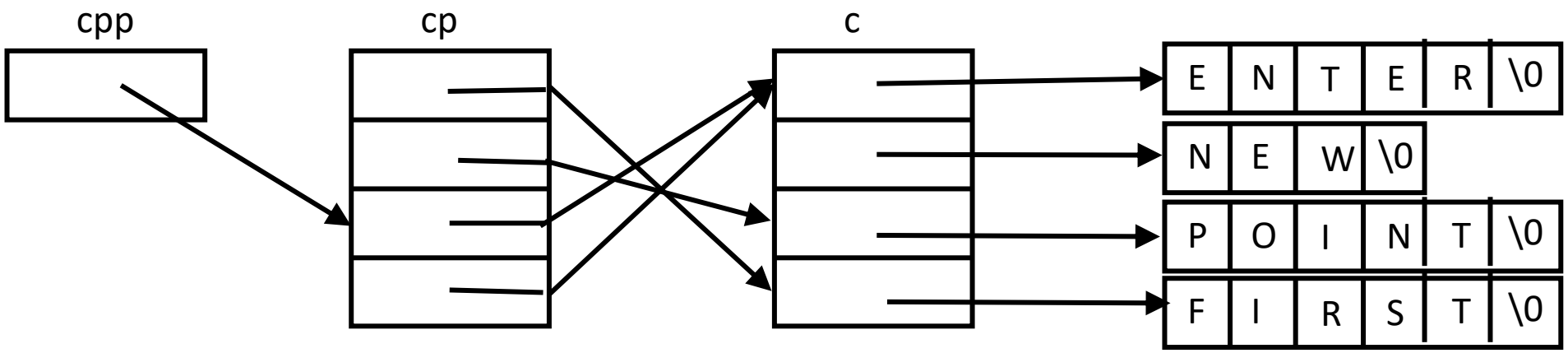


--++cpp+3: parenthesized, (*(--(*(++(cpp)))))+3
After *(--(*(++(cpp))))+3; red dashed arrow indicates the dereferences, the purple arrow after the "+3", so this points to "ER"

So printf("%s ", *--*++cpp+3) prints ER_
where _ represents a blank

What is printed (in blue)

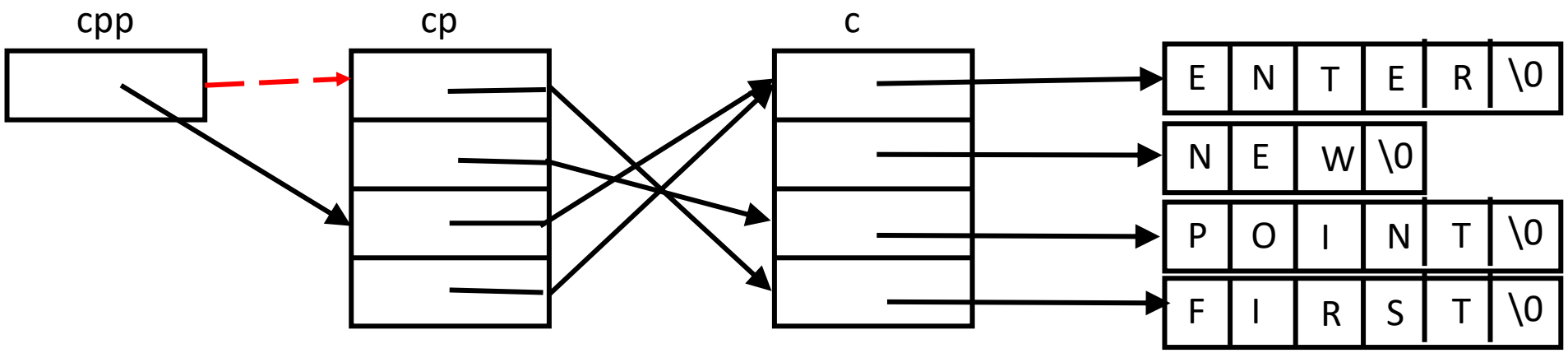
POINTER_



Configuration after previous printf; note cpp is *not* returned to its original value but remains pointing at the third element of cp (that is, cp[2])

What is printed (in blue)

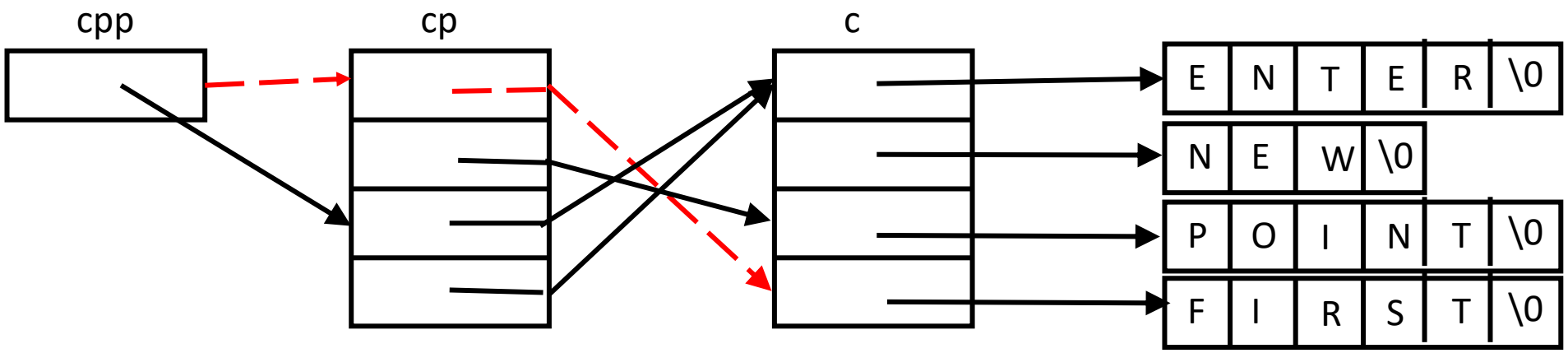
POINTER_



cpp[-2]+3: parenthesized, ((cpp[-2]))+3
Red dashed arrow shows cpp[-2]

What is printed (in blue)

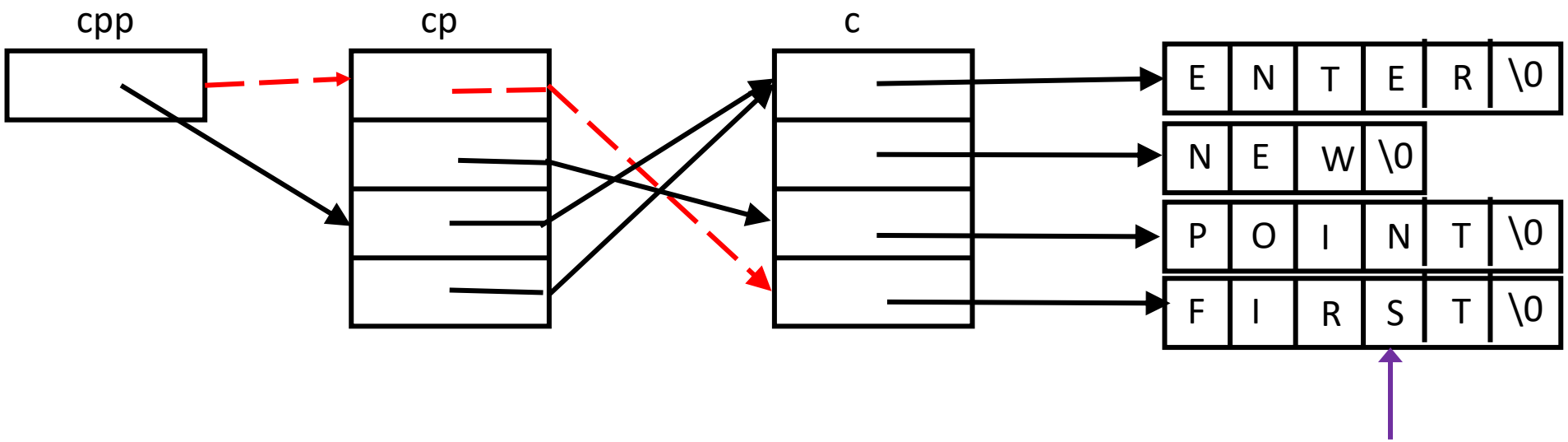
POINTER_



cpp[-2]+3: parenthesized, ((cpp[-2]))+3
Red dashed arrow shows (*(cpp[-2]))

What is printed (in blue)

POINTER_

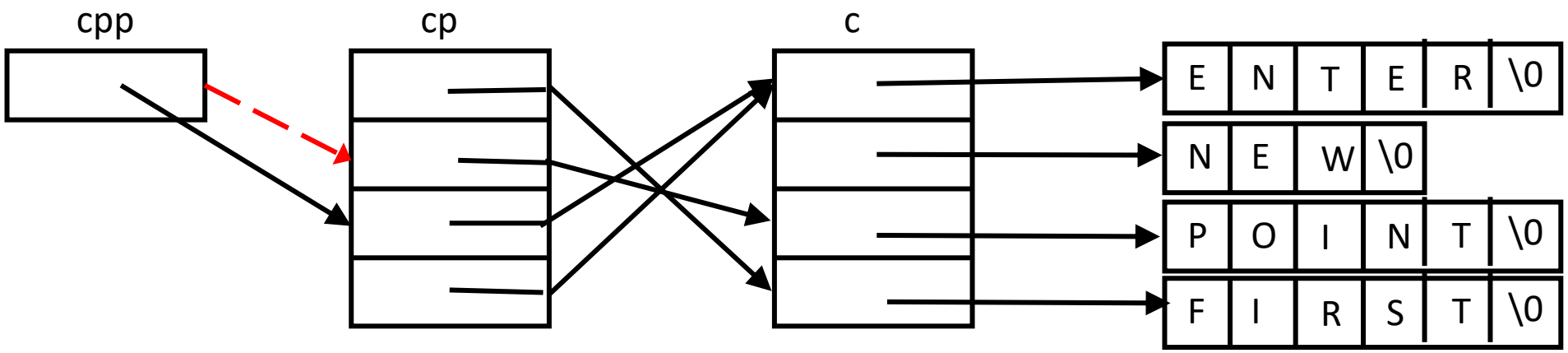


cpp[-2]+3: parenthesized, ((cpp[-2]))+3
Purple arrow shows (*(cpp[-2]))+3

So printf("%s", *cpp[-2] + 3) prints ST

What is printed (in blue)

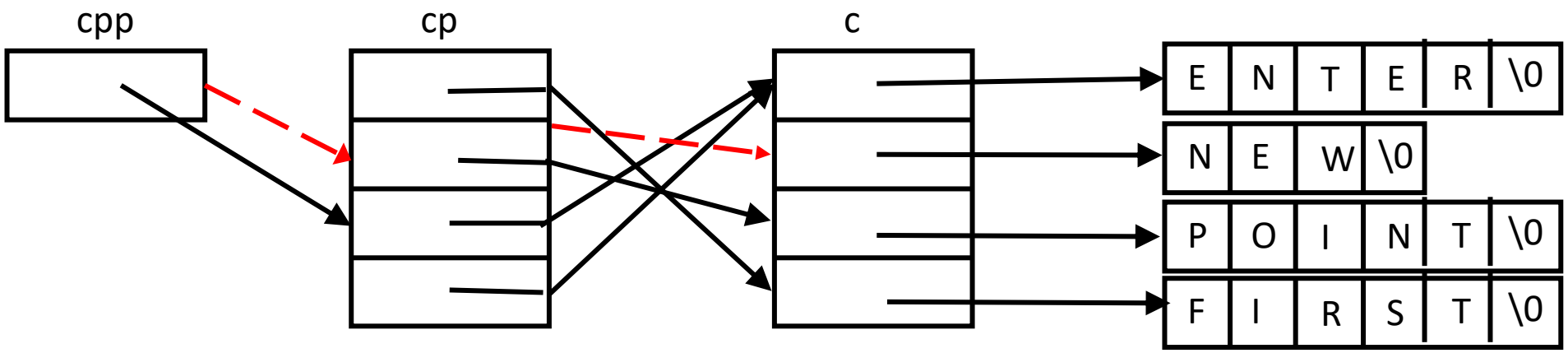
POINTER_ST



cpp[-1][-1]+1: red arrow shows deference of cpp[-1]

What is printed (in blue)

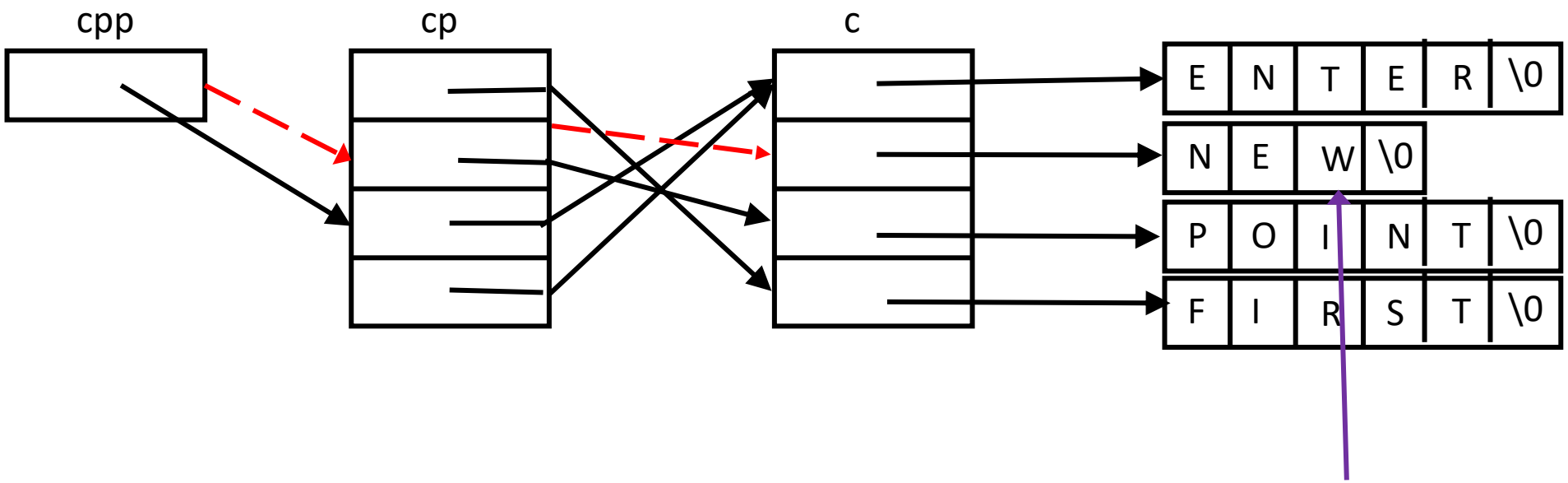
POINTER_ST



cpp[-1][-1]+1: red arrow shows deference of cpp[-1][-1]

What is printed (in blue)

POINTER_ST



cpp[-1][-1]+1: this shown the final result, with the purple arrow after the “+1”, so this points to “ER”

So printf(“%s ”, cpp[-1][-1]+1) prints EW

What is printed (in blue)

POINTER_STEW