

15-410

“Don't make me stop the car...”

#define
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Outline

What's wrong with this picture?

Making friends with macros

Example 1

```
int scanbuf[64];

int getchar(void)
{
    ...
    if (++bufindex == 64)
        bufindex = 0;
    ...
}
```

Example 1 – Change Requirement

From: Dave Eckhardt

Subject: keyboard buffer size

Keyboard buffers must handle somebody placing a cat on the keyboard (the 101-key keyboard).

Option 1

```
int scanbuf[256];

int getchar(void)
{
    ...
    if (++bufindex == 64)
        bufindex = 0;
    ...
}
```

Option 2

```
int scanbuf[64];

int getchar(void)
{
    ...
    if (++bufindex == 256)
        bufindex = 0;
    ...
}
```

Option 3 – *Try This At Home!!!*

```
#define KSB_SIZE 256
int scanbuf[KSB_SIZE];

int getchar(void)
{
    ...
    if (++bufindex == KSB_SIZE)
        bufindex = 0;
    ...
}
```

Example 2

```
int scanbuf[64];

int getchar(void)
{
    ...
    if (bufindex == 63)
        bufindex = 0;
    ...
}
```


Example 2 – Truly Pernicious

How to fix *half* of the problem

```
% grep 64 *.c
```

Wrong *two* ways

- Won't find 63
- Will find random unrelated 64's

Example 3

```
#define CENTER_X 40  
#define CENTER_Y 12
```

...

```
set_cursor_pos ( CENTER_Y ,  
                CENTER_X ) ;
```

...

Example 3 – Change Requirement

From: Dave Eckhardt

Subject: new screen size

We have updated the VGA hardware initialization sequence. The new screen size will be:

```
#define CONSOLE_WIDTH 120
```

```
#define CONSOLE_HEIGHT 30
```

Example 4

```
case 0:
```

```
    p->regsave[-18] |= 0x402;
```

```
    ...
```

Don't make me stop the car.....

Macros - Example

```
if (isvalid(argptr, 1))  
    fprintf(fp, "'%c'",  
        *((char*)argptr));...
```

```
if (isvalid(argptr, 4)) fprintf  
    (fp, "%f", *((float*)argptr));...
```

```
/* and a dozen more like this */
```

- **Hard-to-read**
- **Tricky to maintain
(one behavior, three implementations)**
- **Just plain boring (Carpal Tunnel)**

Macros - Example

```
/* macro assumes argptr and fp are defined
   in context where macro is used */
#define CHECK_PRINT(ARG_TYPE,FORMAT_STRING) \
    if isvalid(argptr,sizeof(ARG_TYPE)) \
    fprintf(fp,FORMAT_STRING, \
            *((ARG_TYPE) *)argptr)

...
CHECK_PRINT(char,"%c");...
CHECK_PRINT(int,"%d");...
CHECK_PRINT(float,"%f");...
```

Macros - Caveat Haxor

The C preprocessor is a text substitution engine (copy-paste on steroids)

It can bend C in good ways!

It can bend C in monumentally broken ways

Macros – Caveat Haxor

What's wrong with this picture?

```
#define LINKLIST_WALK(LISTVAR) \  
    LISTVAR=LISTVAR->next
```


Macros – Caveat Haxor

```
linkedlist *curelem;
```

...

```
LINKLIST_WALK(curelem);
```

Okay!

```
linkedlist **curelemptr=&curelem;
```

...

```
LINKLIST_WALK(*curelemptr)
```

Uh oh...