Today

C: wrap up?

- [More Types]
- [Tools]
- [A few more things in C]

Types

=> int char

signed

int

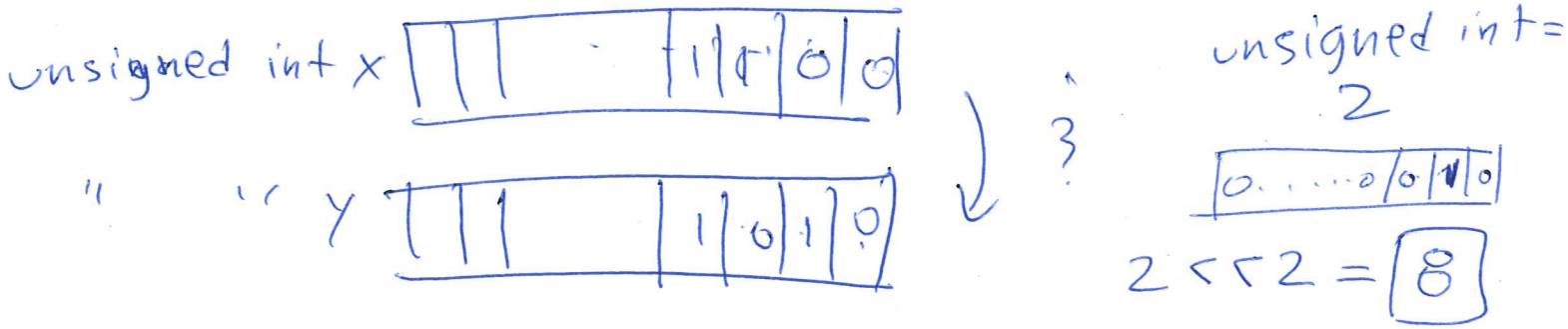
- ⟶ +

=> unsigned

operators:

bitwise and, or, not, xor

& | ~ ^



shift : << >>

Types:

purpose of type systems?

=> check "consistency"

=> increase chances of correctness

Undefined Behavior

Performance / Speed

=> expose hardware

=> Compiler optimization

=> -O (opt flag) matters

~~void~~

Summary:

=> be careful when mixing types

(float / int)

always use double (if can) not float

=> corner case => undefined

=> be wary

int

type : void *

malloc => returns this

```
int *x = malloc(sizeof(int));

char *x = malloc(10*sizeof(char));
```

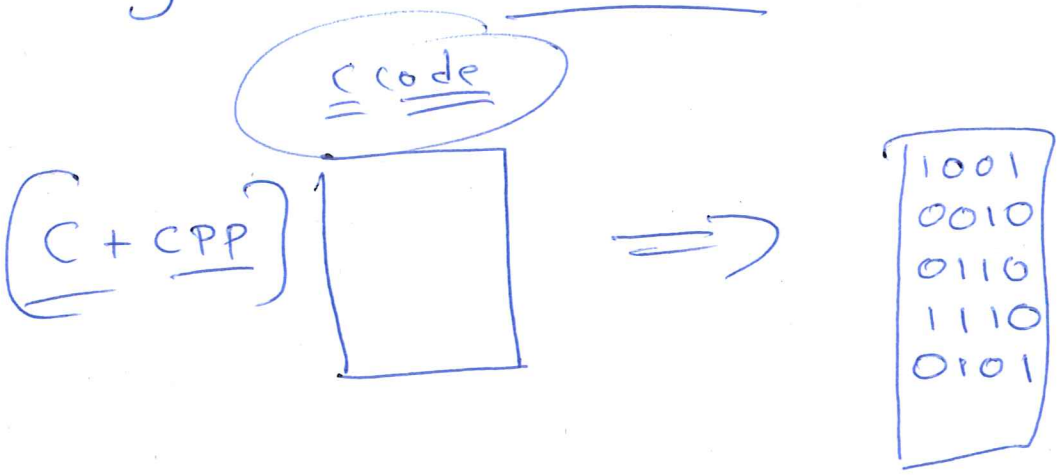
generic data structures:

```
list_t *L
list_insert(  , int key,
              void* value);

node_t *n = malloc(...)
n->key = key;
n->value = value;
n->next = NULL;

void * lookup(list_t *L, int key);
```

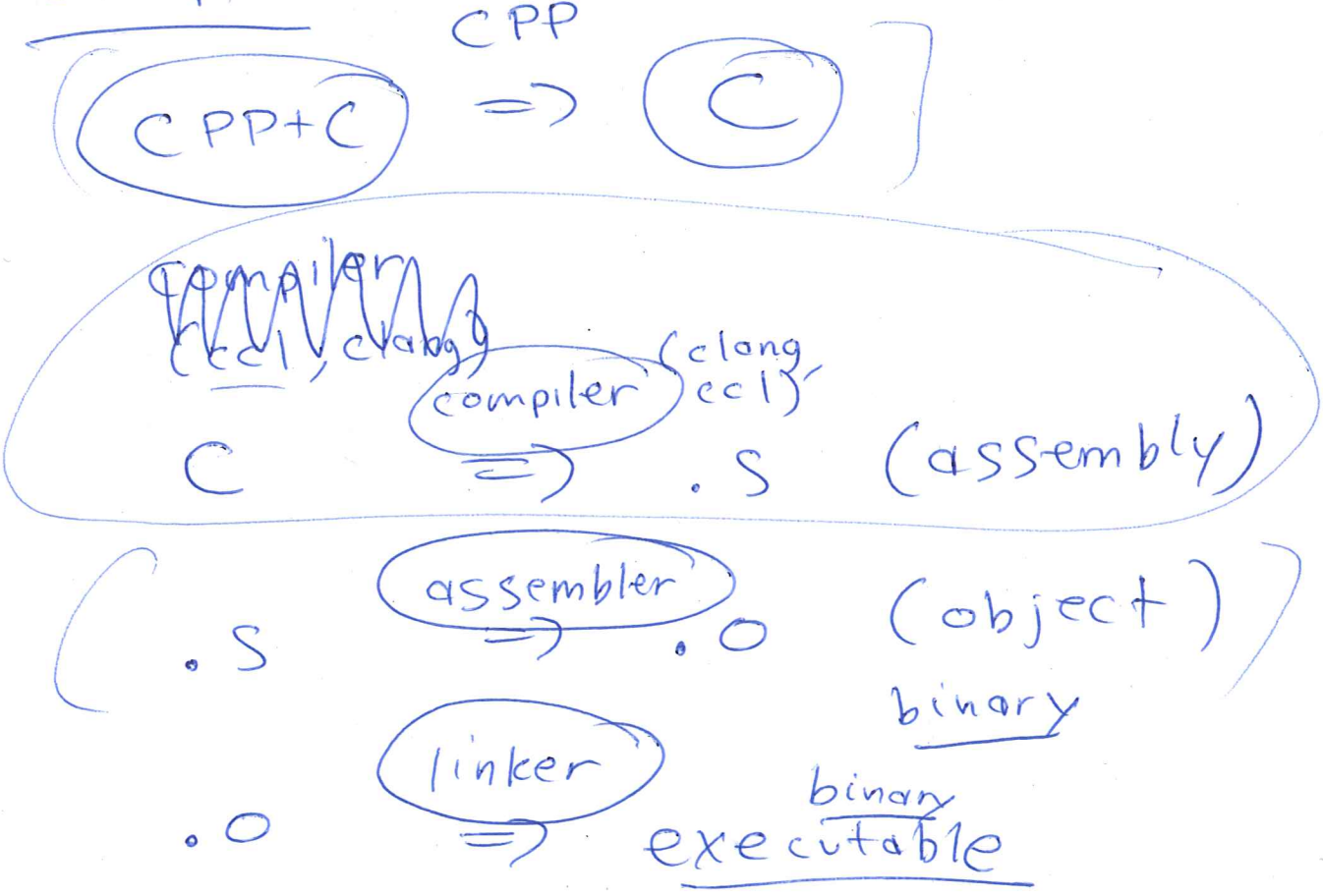
Tools

gcc	compiler driver
makefile	build code w/o gcc...
valgrind	memory bugs
gdb	debugger

gcc : compiler driver

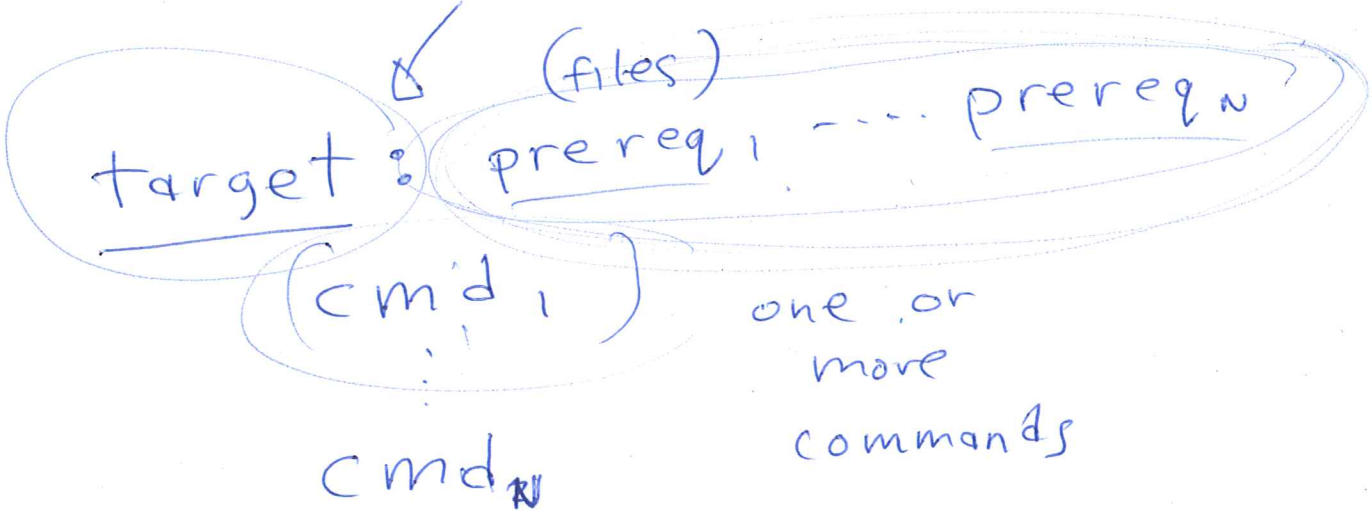


steps :



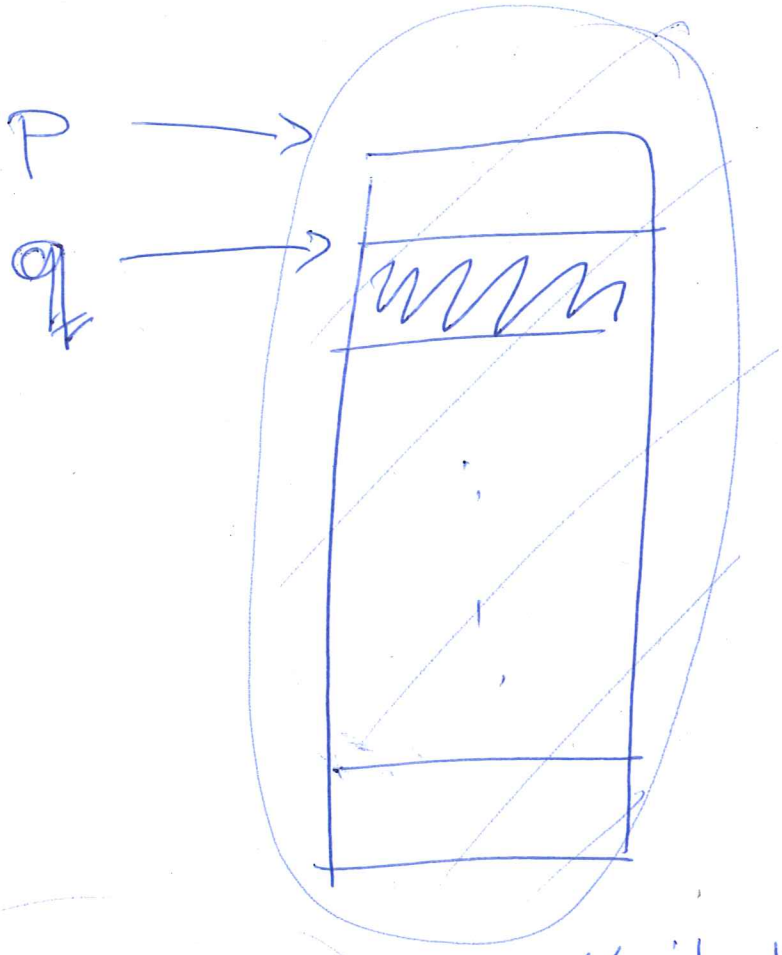
Makefile

often: file , OR abstract



valgrind

=> binary instrumentation



free(p) // it knows how big alloc was

Debugger

Debugging : Art / Science

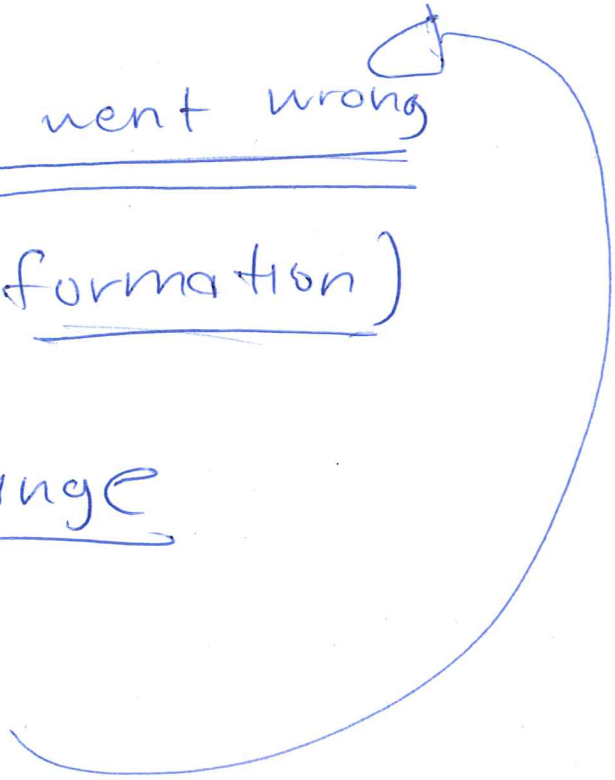
Logic :

Be Methodical

=> Have Expectation

=> Guess : what went wrong

(Gather information)

=> Make change

=> Check