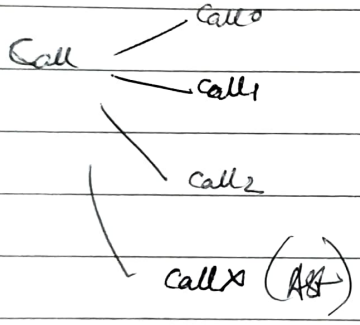
auto-ptr, unique-ptr, shared-ptr, weak-ptr.

string {
*data
capacity
size
}

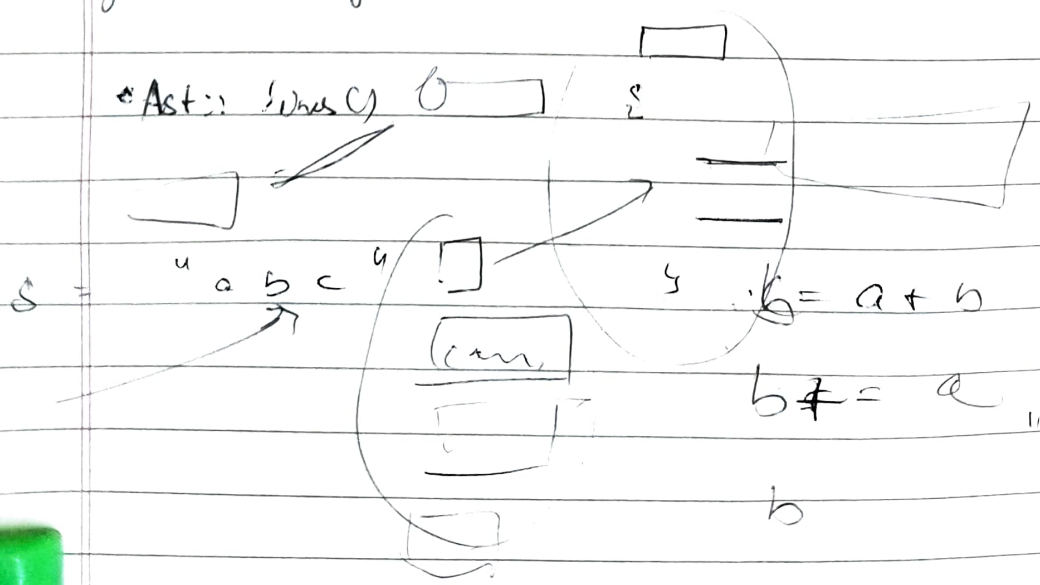
Value x = {
"hello"
}
y = 1

function call, expressions



① take AST → transform.

② generate ready AST



FUNCTION f (_, _)

END SUB

IF c THEN t ELSE e

↳ CGOTO !c e callo.

t

GOTO end

e

end. 3AC

PRINT &n env.

pc

ra stack.

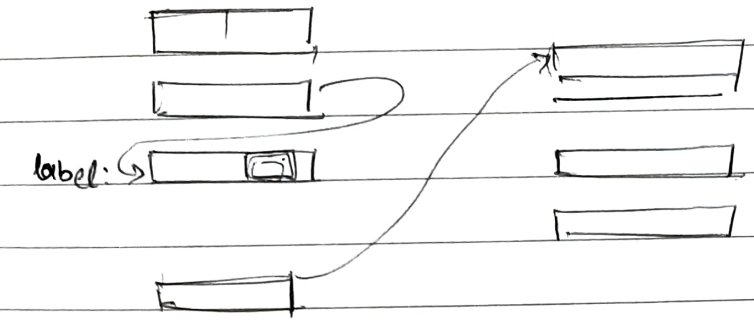
fn0

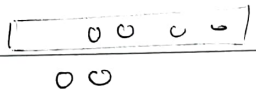
fn1

fnv.

fnc

① LOAP that takes an executable tree and performs the execution.





lines

FUNCTION x - y = z -
SHARED a - b -

envi
(a b) x y z

In -> exec
(callstack)
estack
e

rstack
raddr
renv.
rlabels
rf0map
rf2map.
rfxmap.

get set
watch () -> variable.
set

into
step()
watch point
vars:

stepover()

breakpoint.
break if.

what is a program ?

a set of functions. (map).

map <string, Function> program

what is a function. ?

a set of steps
vector <Step>

} and also shared (ref).
variables.

what is execution context ?

program.
stack
address
environment.
breakpoints.
watches.
~~error~~ file nos.

} stepInto
stepOver
~~step~~ continue ( )
exec ( ).
addbreak.

label → step 1
line → step 2
step 3
} int

'break point
line
~~label~~ → line → step.

conditions.

Ast.

while loop X tree

Step	Ast
~~type~~	~~type~~
fields.	
	Ast ↓ to Step
TGOTO	
FGOTO	
PCALL	
PRET	Step multiple types.
GOTO	
GOSUB	Gosub is different in
RETURN	syntax (AST) - label
LET, PLET	
CALL0	and different in step
CALL1	(step).
CALL2	

1) id → id || callp || call 0.

(goto label)

```
while i < 10        →  gotof #1
    print x
    print i             gotof i<10 #1
wena                #2: print x
label:                  print y
                        goto #2
                    #1
```

STAGES

① flex (scanner) types.
label. (a)

② bison (parser) id can include '.'

③ AST (mast)

④ AST code (mast.cpp)

⑤ AST transformations

- given a set of functions convert IDs to functions calls.

⑥ AST program block.

- transform calls to calln / callp.

- transform AST to calln.

- transform INPUT, PRINT, LET

- transform LOOPS to cgotos.

- transform select case to cgotos.

- transform program to steps.

- labels to step (procedures).
- function to step

- run program.