Operating systems

Programming languages
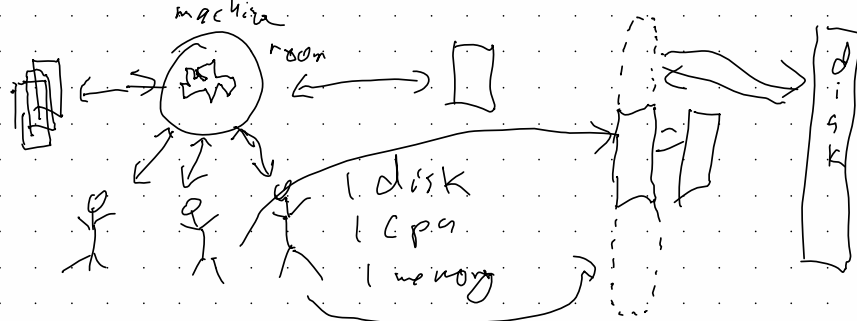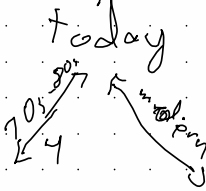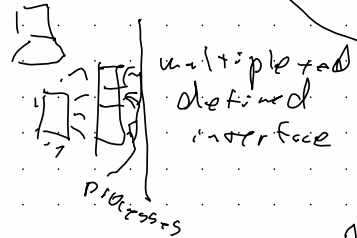
theory { Syntax
          Semantics

implementation { compilers
                 interpreters
                 runtimes (RTS)

OS RTS
language semantics

multiplexed defined interface

today

OS ↗ compiler

processes

machine room

1 disk
1 CPU
1 memory

disk

Lisp Machines

Fast (Lisp) | easy to modify

| G.P. processor | μ-coded

lisp object

| 5 | 24 |
└ 29-bit₀₀ ptr

Pointer

(+ x y)
  ⌜ (fixnum? +) ⇒ error
   (invisible? x) ⇒ (+ (deref x) y)

int
pointer
cons
array
ints

memory
+ long ⊆) incremental
                  GC
disk
  ⇒ t. messages
  ⇒ paging in μ-code
  ⇒ "worlds"

↓ processor time
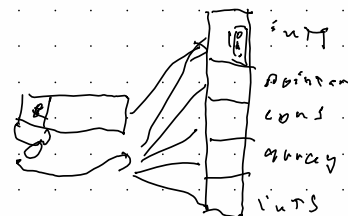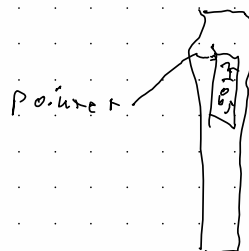
scheduler
(declim (yield)
  (switch-stack ss))
(loop (stack "reff~fn(;
  (switch-stack stack))

Smalltalk   everything is an object

1970s

   72, 74 = interpreted | how to read messages — on AP token games

   76 — byte code virtual machine

context   repeat [[current (← ← ← character (tx array))

        [[curr lip)

        (curr lip ←→ next (tx))

                      as Float
                          v

Text Image > scroll Up

      self scrollBy (delta) / self line height)
                    w

ALGOL

interfaces

Code

i

declarations
-Type - functions

Protection
⮑ defensive

user

plug in

i.o.t.
split span
⮑ cycle
⮑ trigger

0.

The form of century

networking

$\downarrow$

internetworking

$\downarrow$

>>> attack surface

$\downarrow$

~~defensive protection~~
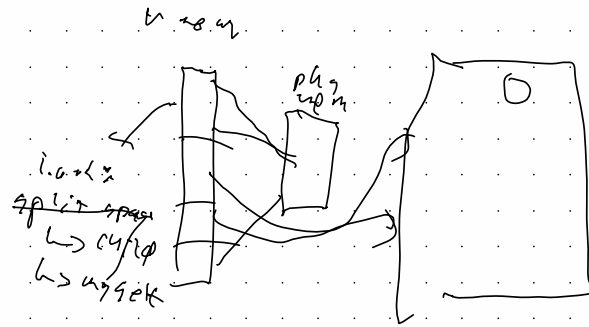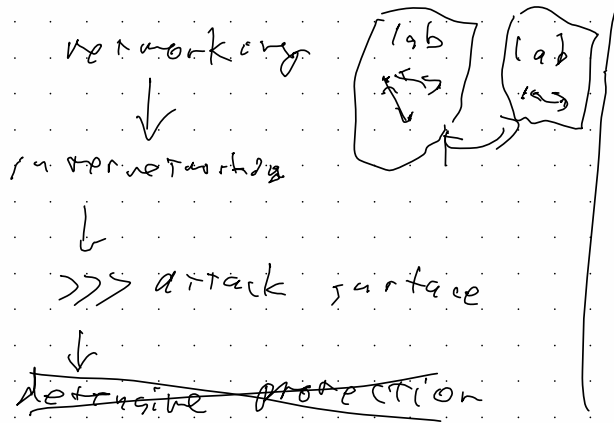
diversity $\longrightarrow$ enforcement

impossible to build a whole system

general purpose

$\downarrow$

special domains

MrEd: 1999

safety

__memory__
easy to
enforce
in
C#

__rice__
~~while~~ while (1) close   no. fixed

thread
c | 1 | 2 | 17 | ← bug handler   event spaces } owned memory
v   thread   } custodians by threads
- preemptive
- OS Thread

od — event space   user — custodian | p val e:
  ↓ handled   ↓ Supervises | [param ((time—cost user))
     by   uses   user — event space | (post—message user—evs
  main evt   ←   ↓ handled | |(e))]
                        user — Thread | roger:
                                                 | ((fast—shot—all   user—cust)
                                                 | [param   ((time—cost user—call))
                                                 | (rest) user—evs (user—evs)

① Operating System Extensions

user code

(monolithic)

user code

(M-kernel service(r))

Modular-3

user code / ← modula-3

(modular)

most of OS
(kernel)
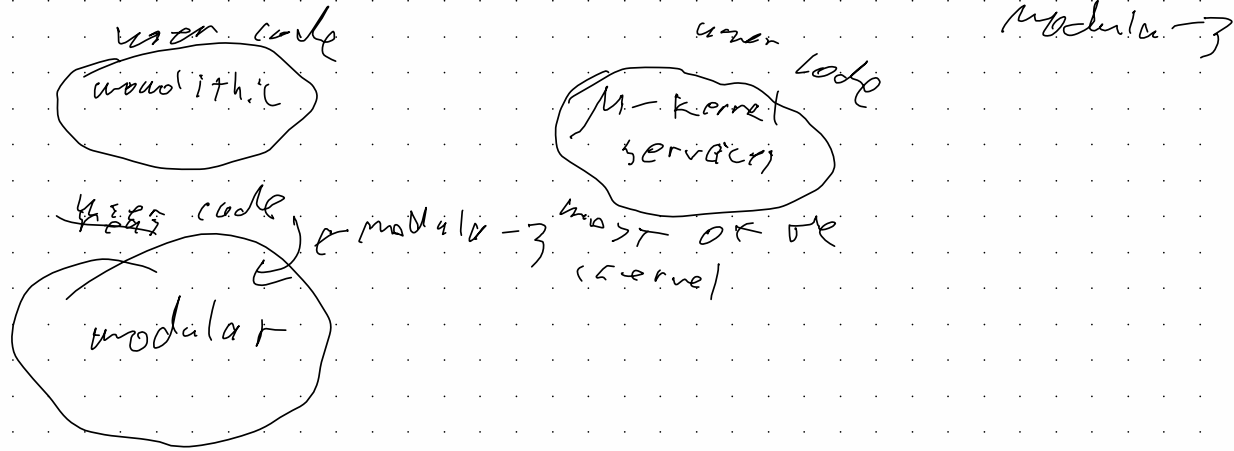
Capability

⇒ unforgeable pointer

⇒ [HERE]

Mk inserts

[abstract type cap]

| K1 | K 2 | [K 3 | K1 |
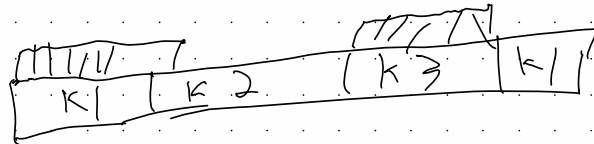
OS &TT (cont)

Tock (17)   embedded systems

μC-mcu

tock
kernel

Process
tape
system

user

radiation
gas engine
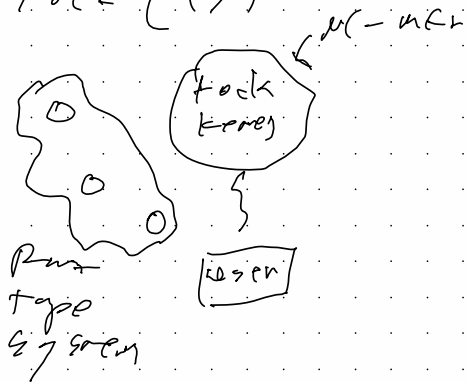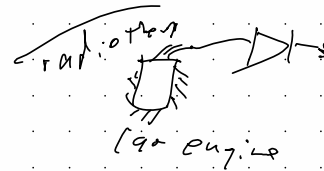
struct DMAChannel {
    buffer: &'static [u8];
}

Singularity