Principles & Concepts Pr. based M.Pr O.S

Architectural Requirement

UNIX | WIN
MAC

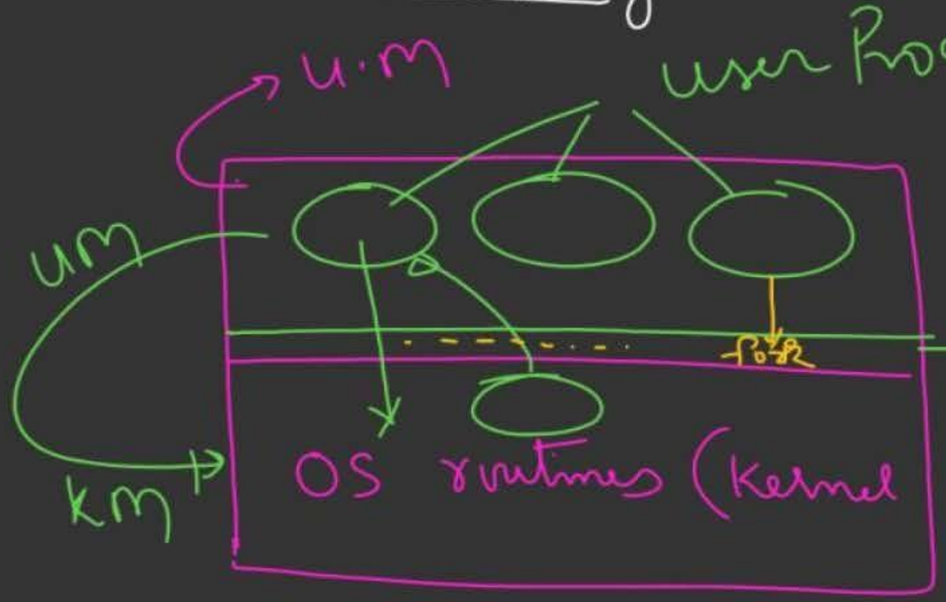
(i) I/O (Sec. Storage) : DMA

(ii) Mem : Address Translation
MMU

(iii) CPU : Dual Mode :

- Mode bit
- (Pr. Mode)
- UM
- KM
- Pre Emptive
- Non-Atomic
- user programs
- OS programs
- Atomic

⊛ Mode Shifting :



→ S.C.I / A.P.I

fork() : create a Process

System call

is an OS Service

* System Call Activation (UDF & PDFs) → UM

```
main()
{
  int a, b, c;
  1. a = 1;
  2. b = 2;
  3. c = a+b;
  4. fork();
  5. f(c);
}
```

Steps 1–3: UM

c = a+b; → N. Privi

```
Load R1, a
Load R2, b
Add R1, R2
Store c, R1
```

```
f(int k)
{
  printf("%d", c);
}
```

fork() → C.T → SVC → R.T → generate S/w Interrupt → ISR

SVC: Supervisory Call

Privileged Instn

S/w Interrupt Instn

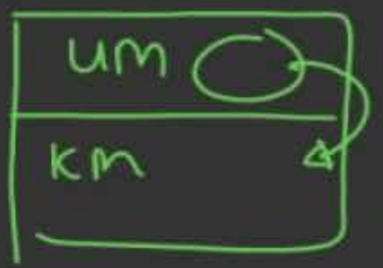
ISR: Interrupt Service Routine

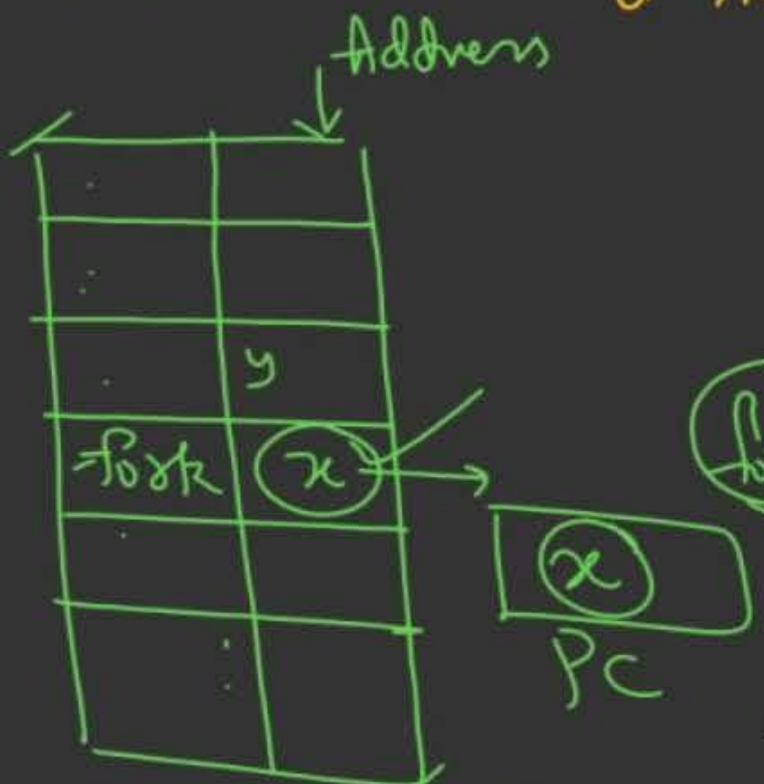
fork is impl. in O.S Kernel

User Program gets Blocked

PC: Program Counter register

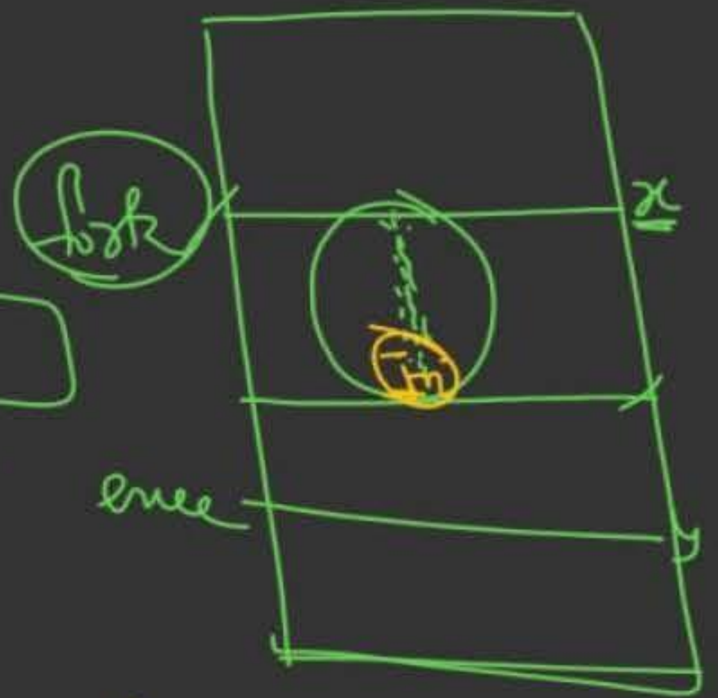
1) change the Mode bit: U→K





Atomic

OS Area



(In: privileged Instn: K→U)

Important points

1. Sys. Calls are activated thru a privileged Instn (S/w Int. Instn) that generate S/w Interrupt
2. (ISR) changes the mode bit (U → K) & locate the Sys. Call thru dispatch table.
3. User Process gets Blocked
4. Sys. Call routines executes atomically
5. Last Instn of Sys. Call, changes the mode (K → U) & unblock the user program that activated the Sys. Call

Interrupts
- H/W : generated by H/w devices; CPU; IOD
- S/W : execution of Instn's

c = a / b ;

b = 0

divide overflow

S/w Int.

II. PROCESS MANAGEMENT (Mgmnt of CPU)

1. (*) Process Concepts:

→ Program vs Process ?

Program ↓

(Machine language Program) executable (.exe)

- Instr's (code)
- Data
  - STATIC: fixed Size Known & Mem alloc. takes place b/f R.T (load time)
  - DYNAMIC: Not Known Size & Alloc takes place @ R.T

int (a, b, c) — Data

C = a+b → HLL

Instrs:

```
Load R1, a
Load R2, b
Add R1, R2
Store c, R1
```

int a, b, c;

a [ ] ↓ 2B — B.R.T

Program / Job ✓ / Application ✓ / Task ✓ — Synonyms

c/c++

```
int n, A[n];
scanf("%d", &n);
```

X

Dynamic array

Can we Implement a dynamic array thru other means in c/c++

↳ ptrs & DMA

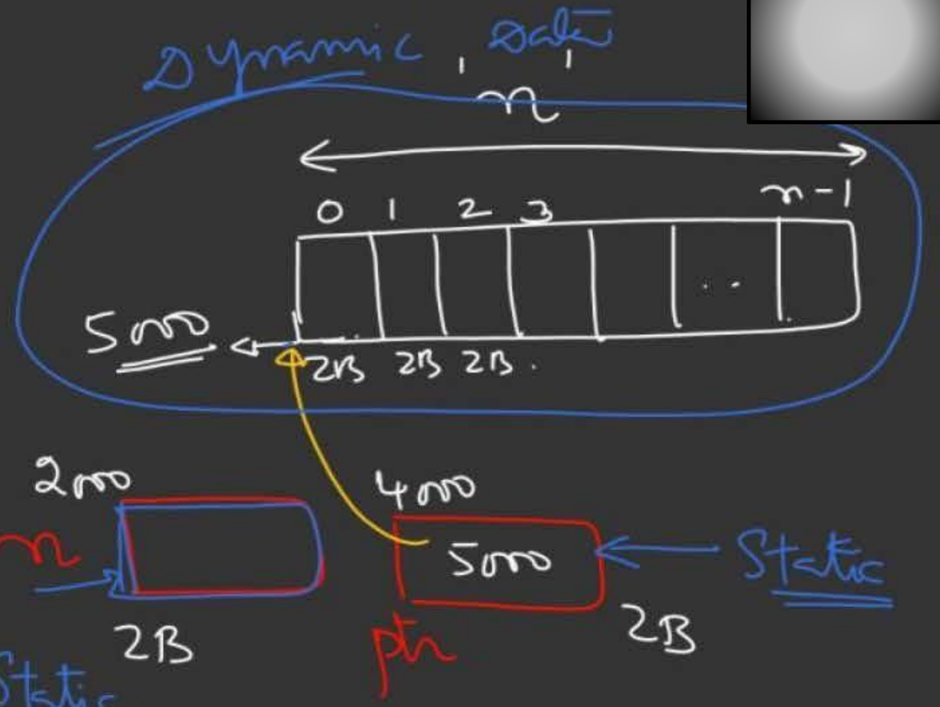
malloc

```
int n, *ptr;
scanf("%d", &n);
ptr = (int *) malloc(sizeof(int) * n);
```

int 2B

n = 5

Dynamic (R.T)



int = 2B

Assumption

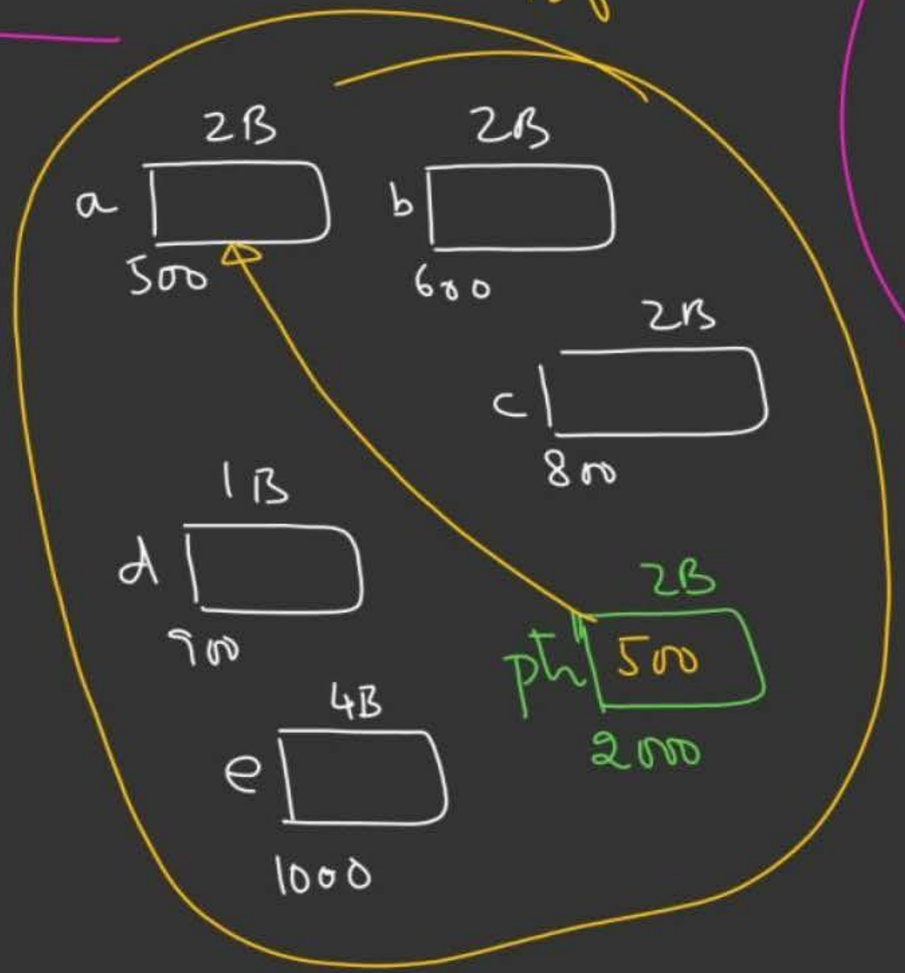
pointer is 2B

Total No of Bytes = 13 Bytes

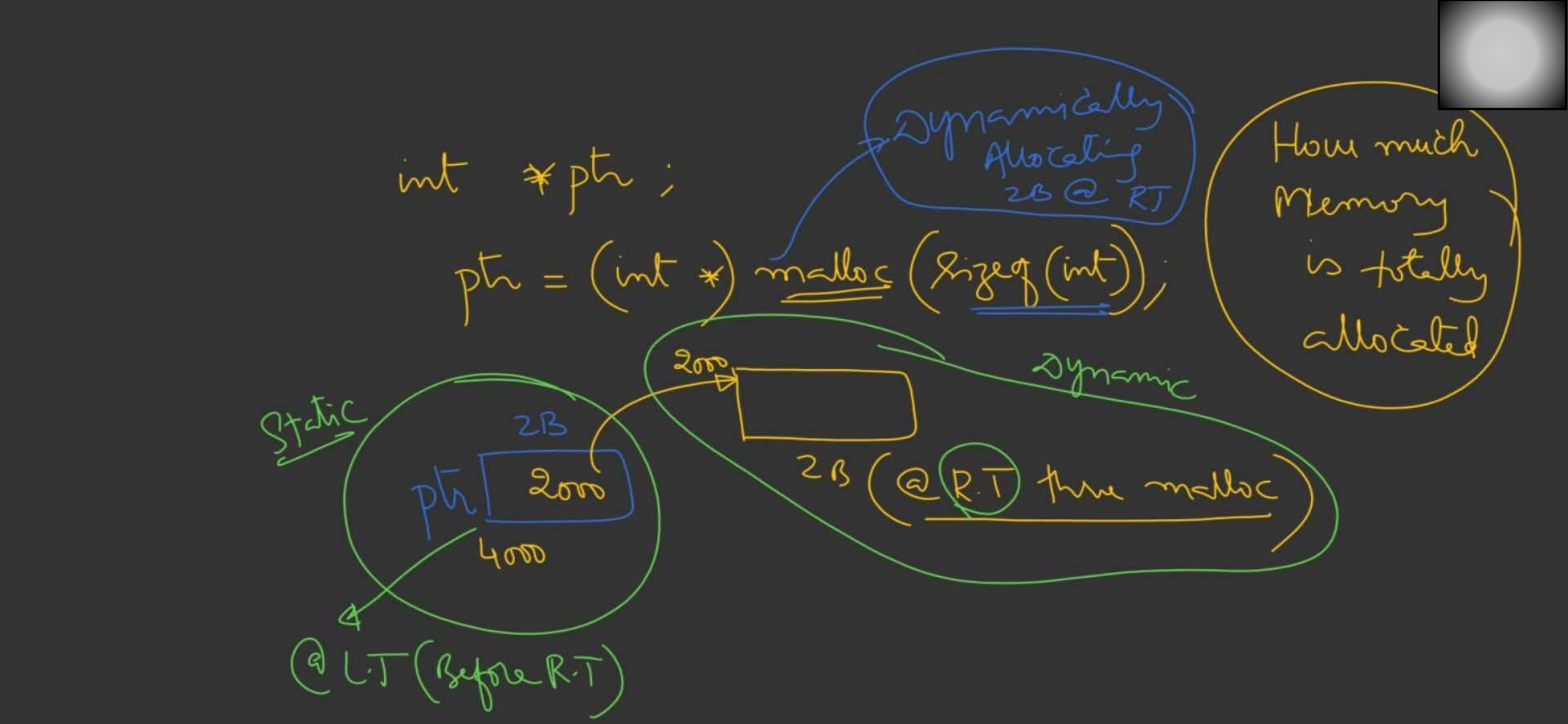
```
int a, b, c;
char d;
float e;
int *ptr;
ptr = &a;
```

hold address of an Integer

Before R.T



int = 2B
char = 1B
float = 4B
every pointer = 2B


int *ptr;
ptr = (int *) malloc (sizeof(int));
Dynamically Allocating 2B @ RT
How much Memory is totally allocated
Static
2B
ptr
2000
4000
@ L.T (Before R.T)
2000
Dynamic
2B (@ R.T thru malloc

1) Known Size + S.A

2) Known Size + D.A

3) Unknown Size + DA

```
int n, *ptr;
scanf("%d", &n);
ptr = (int *) malloc (sizeof(int) * n);
```

dynamic

sizeof(int) = 2B

2B * n = 2nB