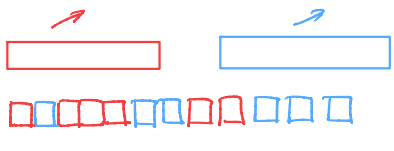
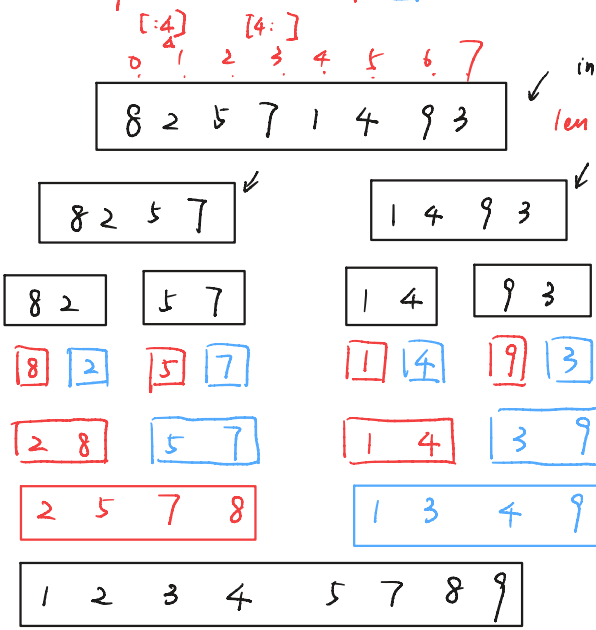
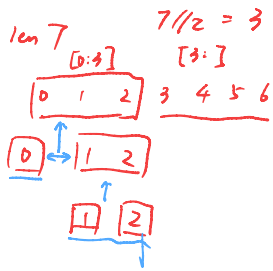
Mergesort Explained

Merge two sorted list



Two singleton list : each is sorted





split

base case !

Merge .

Merge

Final sorted list

FYI : Merge (list1, list2) $O(n+m)$ (n, m)

Complexity analysis
COMP 2119

$$T(n) = 2T(n/2) + O(n) \rightarrow c \cdot n$$

$$= 2\left(2T(n/4) + c \cdot n/2\right) + c \cdot n$$

$$= 2^2 T(n/2^2) + 2cn = 2^2\left(2T(n/2^3) + c \cdot n/2^2\right) + 2c \cdot n$$

$$= 2^3 T(n/2^3) + 3cn$$

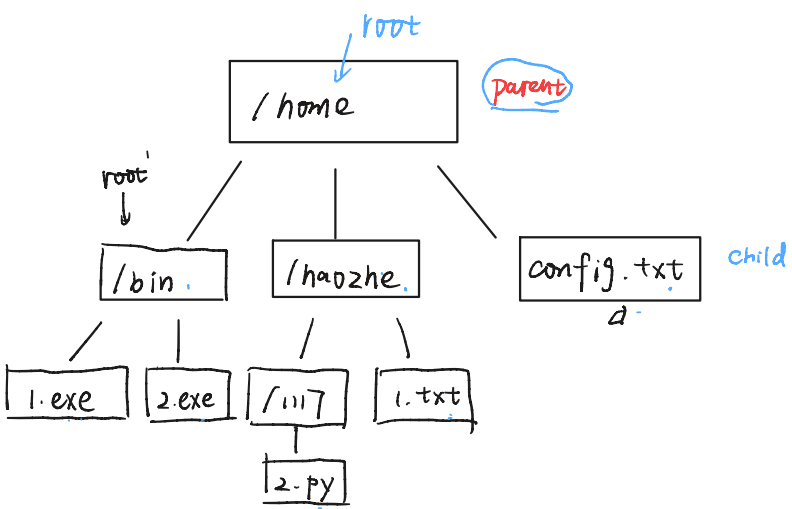
$$= 2^k T(n/2^k) + kcn$$

if $n = 2^k$ $k = \log n$ $T(1) = O(1)$ const.

($\log = \log_2$)

$$T(n) = n + cn\log n \Rightarrow T(n) = O(n\log n)$$

File system traversal (Tree traversal)



pseudo code.

```
Traverse (root):
    if root is not directory:
        return root
    for branch in root:
        traverse (branch)
```

$a_n = a_{n-1} + a_{n-2}$ $n \geq 2$ $a_0 = 0$ $a_1 = 1$

Recall fib