

MerGe Sort



SUBMITTED BY:

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Merge sort

- Merge sort is a sorting technique based on divide and conquer technique. With worst-case time complexity being $O(n \log n)$, it is one of the most respected algorithms.
- Merge sort first divides the array into equal halves and then combines them in a sorted manner.

In the Beginning...



Invented by
John von Neumann
(1903-1957)

- ◉ Follows divide and conquer paradigm.
- ◉ Developed merge sort for EDVAC in 1945

Divide And Conquer

- 1.Divide: Divide the unsorted list into two sub lists of about half the size.
- 2.Conquer: Sort each of the two sub lists recursively until we have list sizes of length 1,in which case the list itself is returned.
- 3.Combine: Merge the two-sorted sub lists back into one sorted list.

MERGE SORT ALGO

- **MERGE SORT (A, p, r)** //divide
if $p < r$
then $q = \lfloor (p + r) / 2 \rfloor$
 MERGE SORT(A, p, q)
 MERGE SORT($A, q + 1, r$)
 MERGE(A, p, q, r)

Merge(array A, int p, int q, int r)

{

array B[p..r]

//temp array taken

i = k = p

// initialize pointers

j = q+1

while (i <= q and j <= r)

{

if (A[i] <= A[j]) B[k++] = A[i++]

else B[k++] = A[j++]

}

while (i <= q)

B[k++] = A[i++]

// copy any leftover to B

while (j <= r)

B[k++] = A[j++]

for i = p to r

A[i] = B[i]

// copy B back to A

}

Merge Sort Example

99	6	86	15	58	35	86	4	0
----	---	----	----	----	----	----	---	---

Merge Sort Example

99	6	86	15	58	35	86	4	0
----	---	----	----	----	----	----	---	---

99	6	86	15
----	---	----	----

58	35	86	4	0
----	----	----	---	---

Merge Sort Example

99	6	86	15	58	35	86	4	0
----	---	----	----	----	----	----	---	---

99	6	86	15
----	---	----	----

58	35	86	4	0
----	----	----	---	---

99	6
----	---

86	15
----	----

58	35
----	----

86	4	0
----	---	---

Merge Sort Example

99	6	86	15	58	35	86	4	0
----	---	----	----	----	----	----	---	---

99	6	86	15
----	---	----	----

58	35	86	4	0
----	----	----	---	---

99	6
----	---

86	15
----	----

58	35
----	----

86	4	0
----	---	---

99

6

86

15

58

35

86

4	0
---	---

Merge Sort Example

99	6	86	15	58	35	86	4	0
----	---	----	----	----	----	----	---	---

99	6	86	15
----	---	----	----

58	35	86	4	0
----	----	----	---	---

99	6
----	---

86	15
----	----

58	35
----	----

86	4	0
----	---	---

99

6

86

15

58

35

86

4	0
---	---

4

0

Merge Sort Example



99

6

86

15

58

35

86

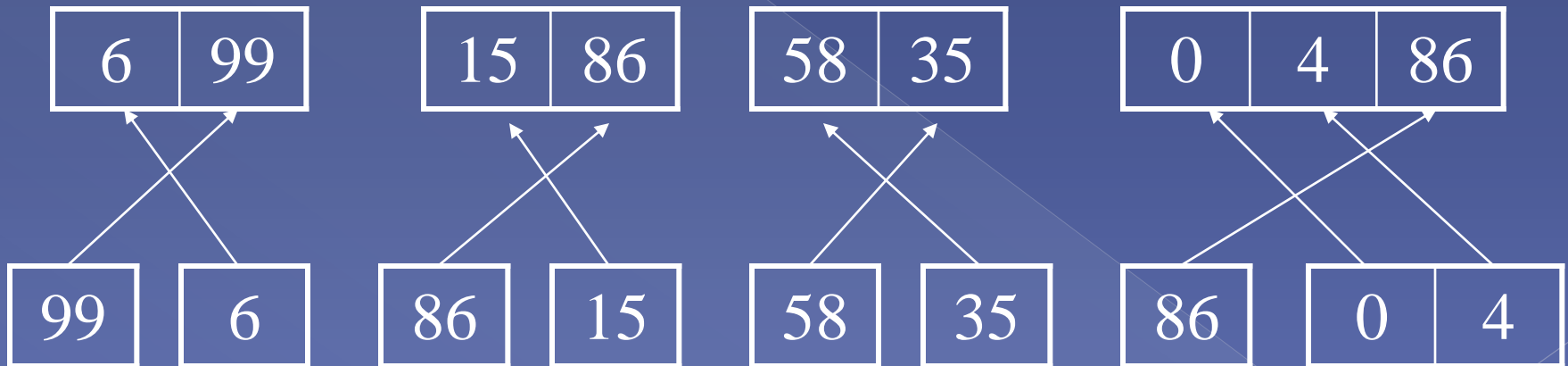
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Merge

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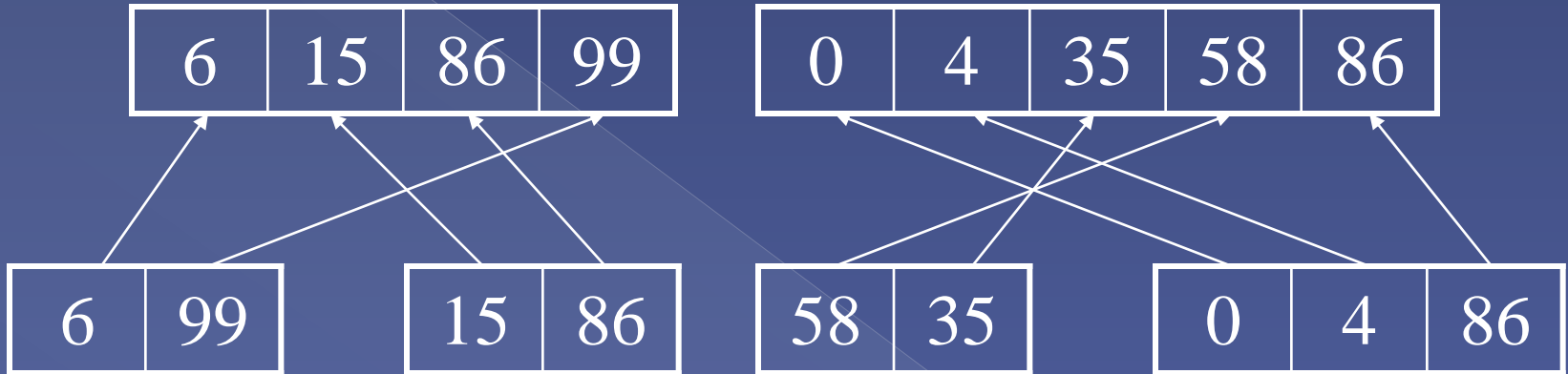
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Merge Sort Example



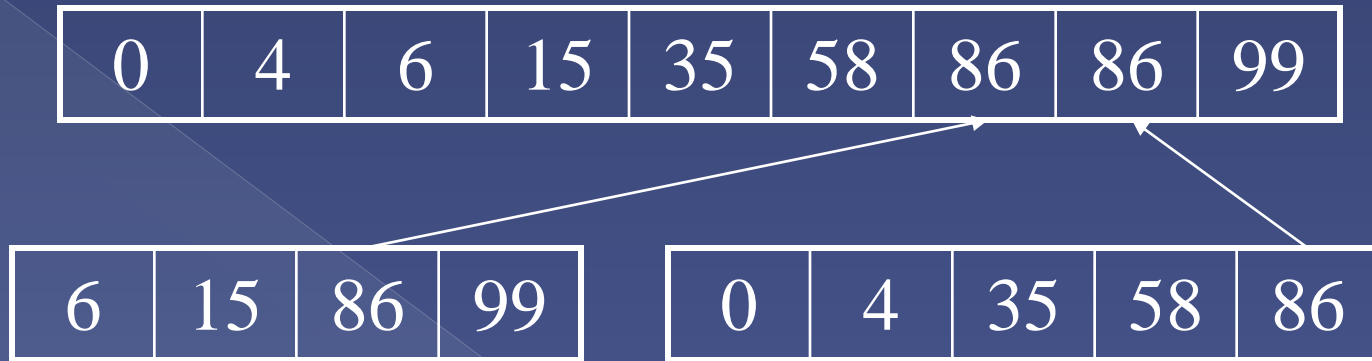
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Merge Sort Example



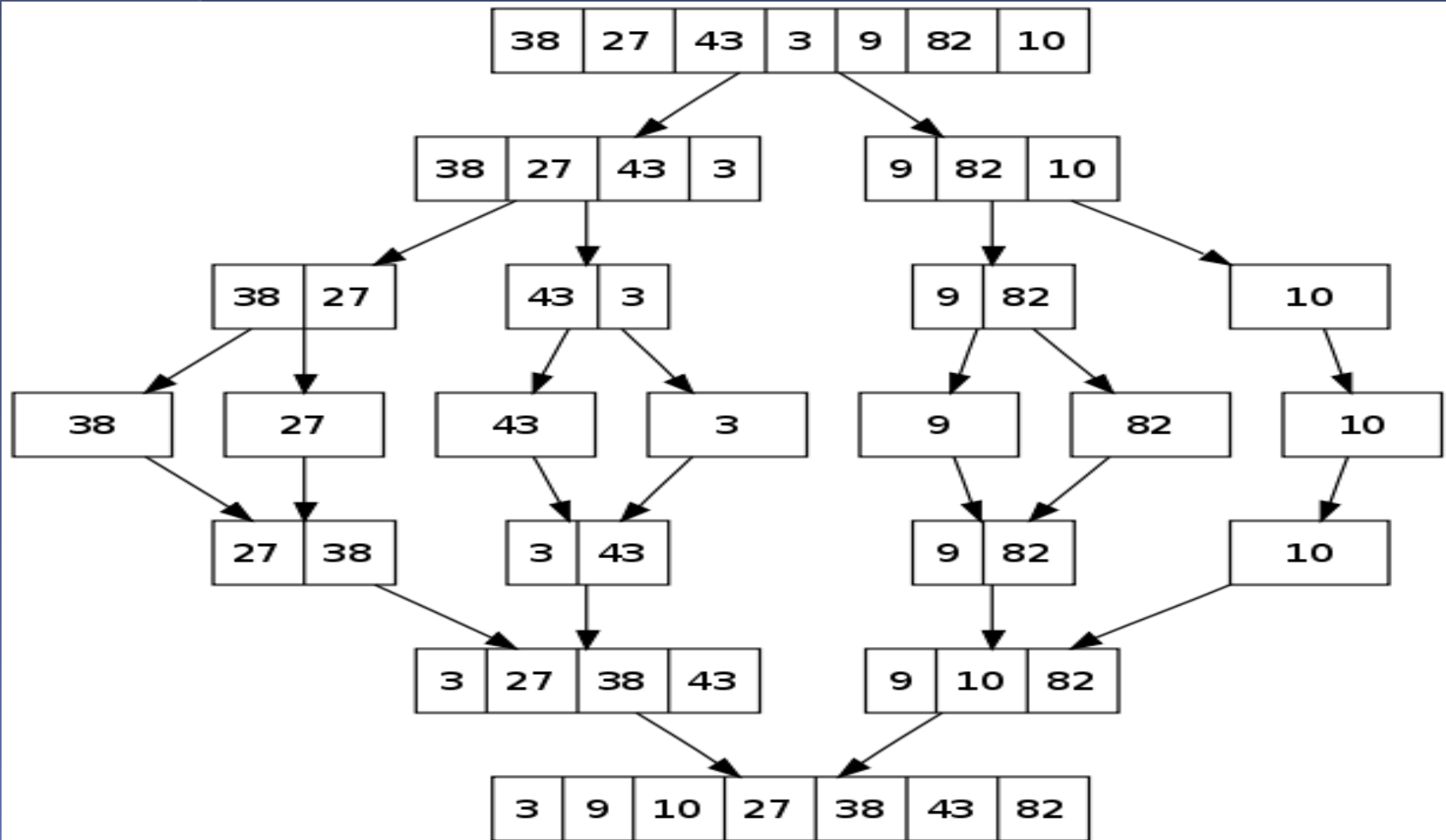
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Merge Sort Example



Merge

Merge Sort Example





Thank you