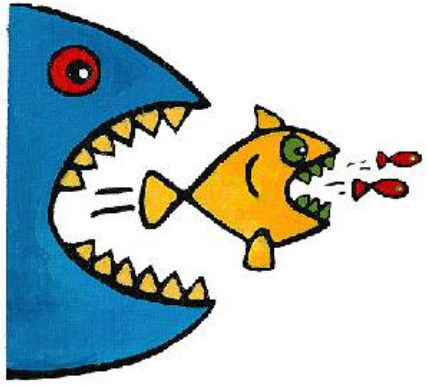
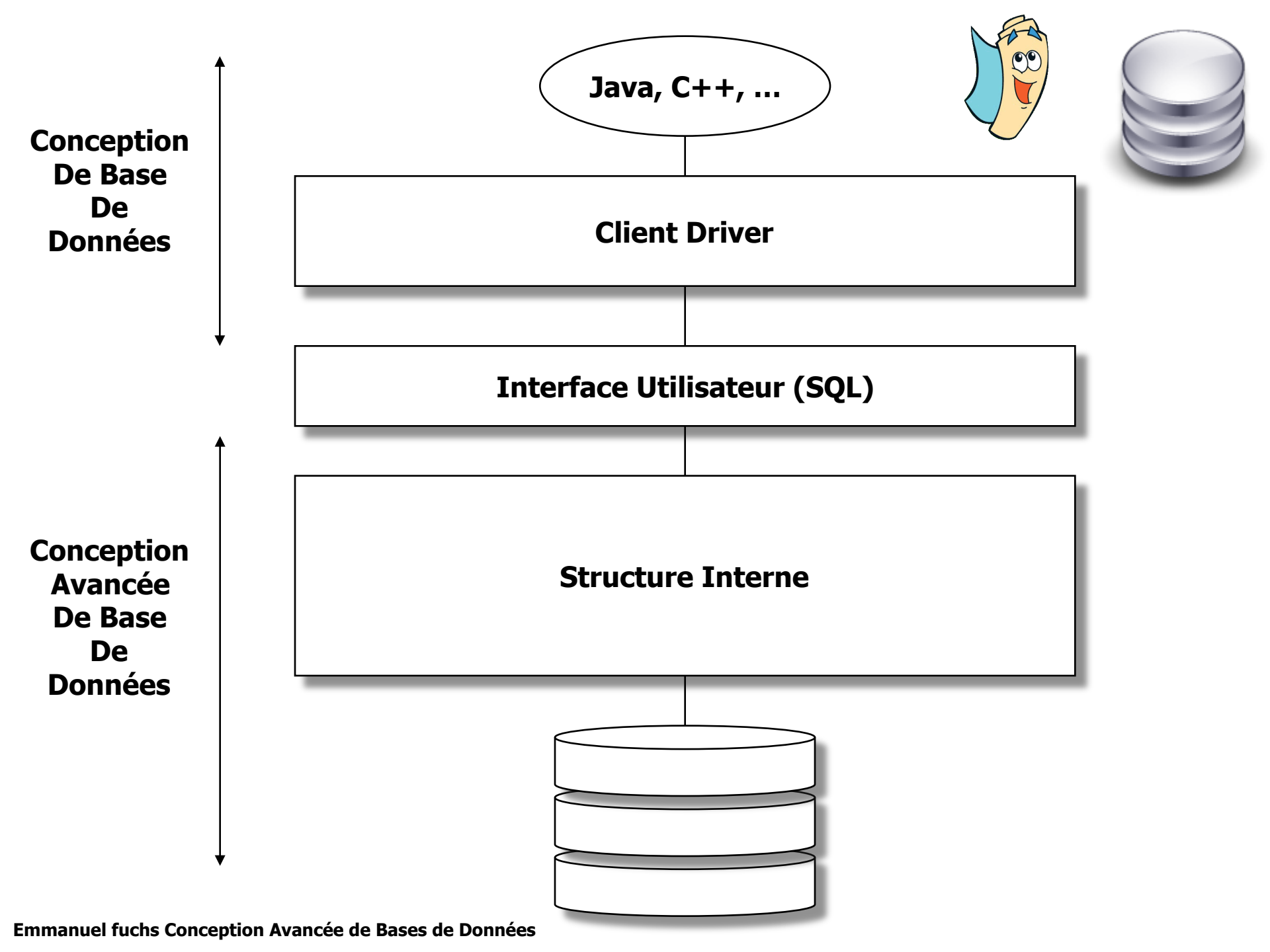


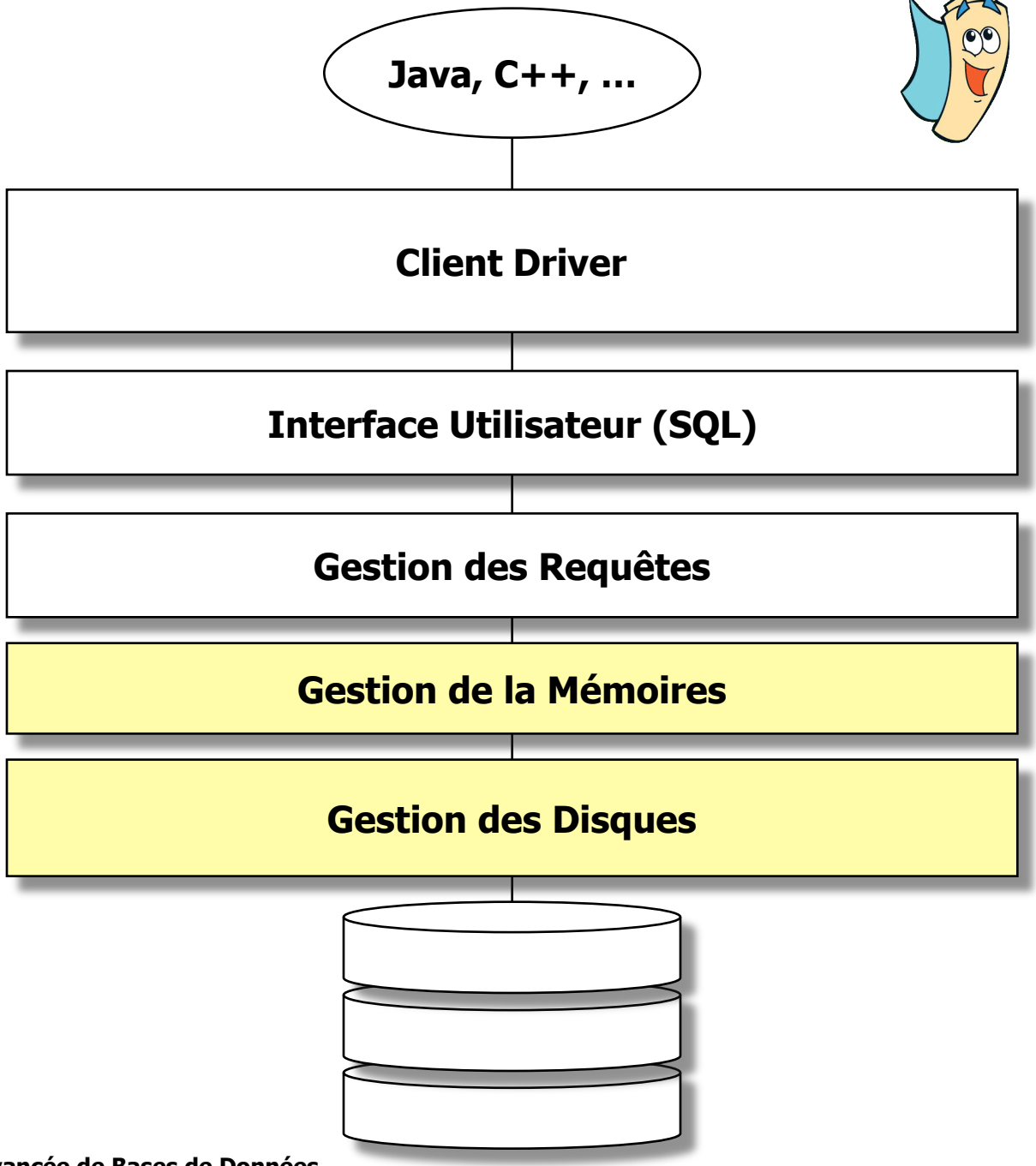
Conception Avancée de Bases de Données

Disk Merge Join

Disk Sort Merge

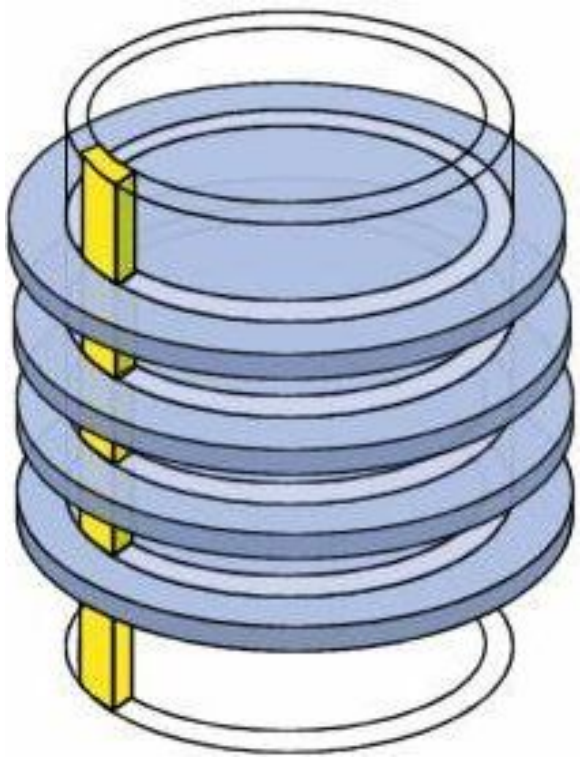
Tri Fusion


Conception De Base De Données
Java, C++, ...
Client Driver
Interface Utilisateur (SQL)
Conception Avancée De Base De Données
Structure Interne


Java, C++, ...
Client Driver
Interface Utilisateur (SQL)
Gestion des Requêtes
Gestion de la Mémoires
Gestion des Disques

Problème.

- Que se passe-t-il si la taille d'une relation est plus grande que la taille de la mémoire ?



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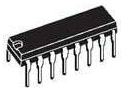


Problème.

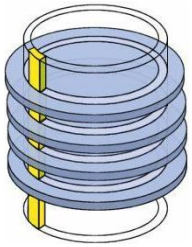
- Que se passe-t-il si la taille d'une relation est plus grande que la taille de la mémoire ?

- ***Il faut découper la relation pour réaliser les opérations par « segments »***

- Un SGBD gère lui-même l'espace disque comme, et à la place, du système d'exploitation.
  - Les relations sont stockées sur disque sous forme de segments non contigus.

Transfert Disque Mémoire

Relation

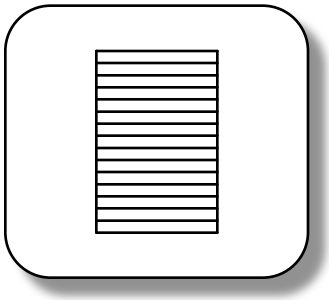


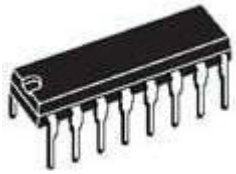
=

Segments
De relation

Lecture

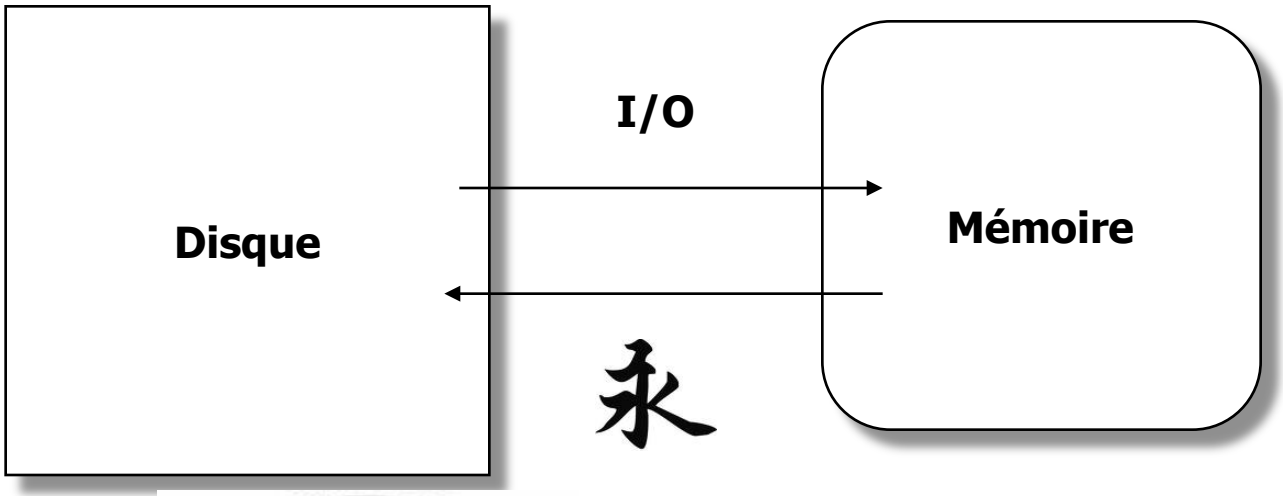
Écriture

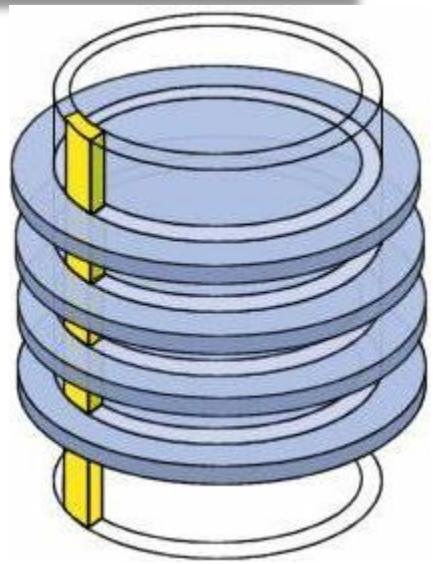




I/O

Entrées/Sorties, Lectures écritures disques, IO



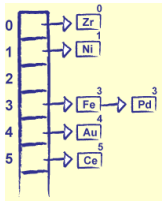


Memory join

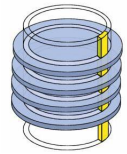
- Nested loop

- Merge join

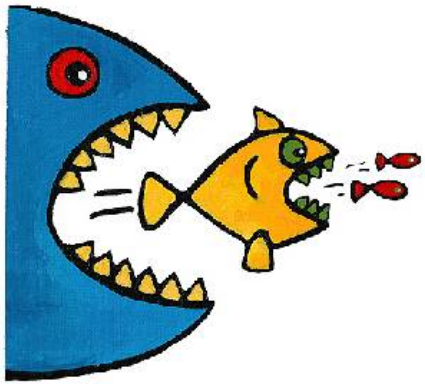
- Hash join



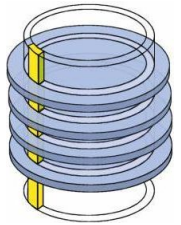
Disk Join algorithms



- Disk Merge join
  - Disk Sort Merge

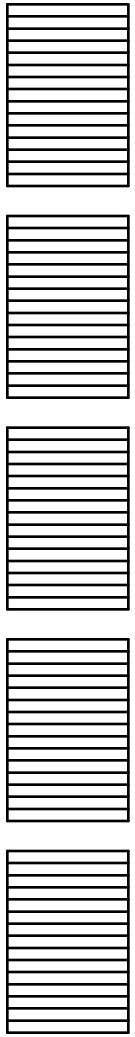


Relations sur disque disques

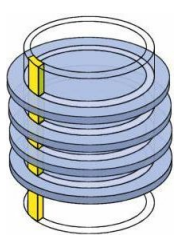


Relation

Segments De relation

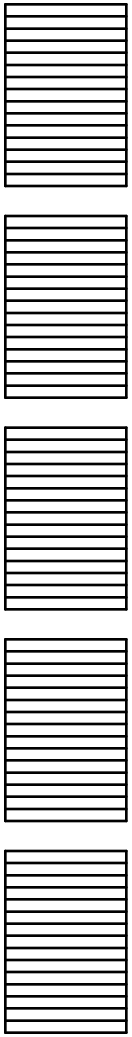


Relations sur disque disques

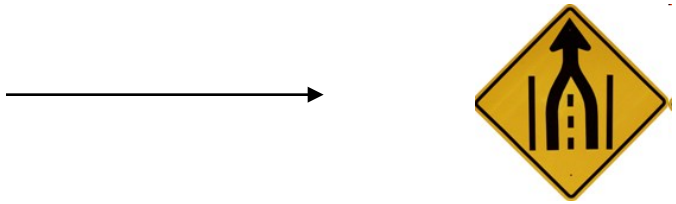


Relation

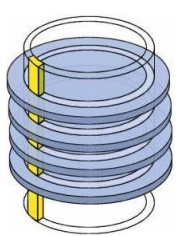
Segments De relation



Les opérations sont réalisées sur les segments

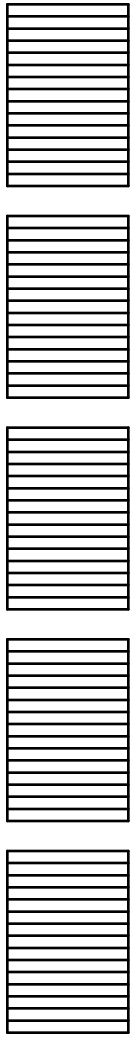


Relations sur disque

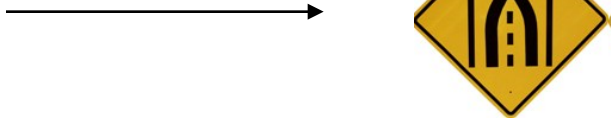


Relation

Segments
De relation



Les opérations sont
réalisées sur les segments



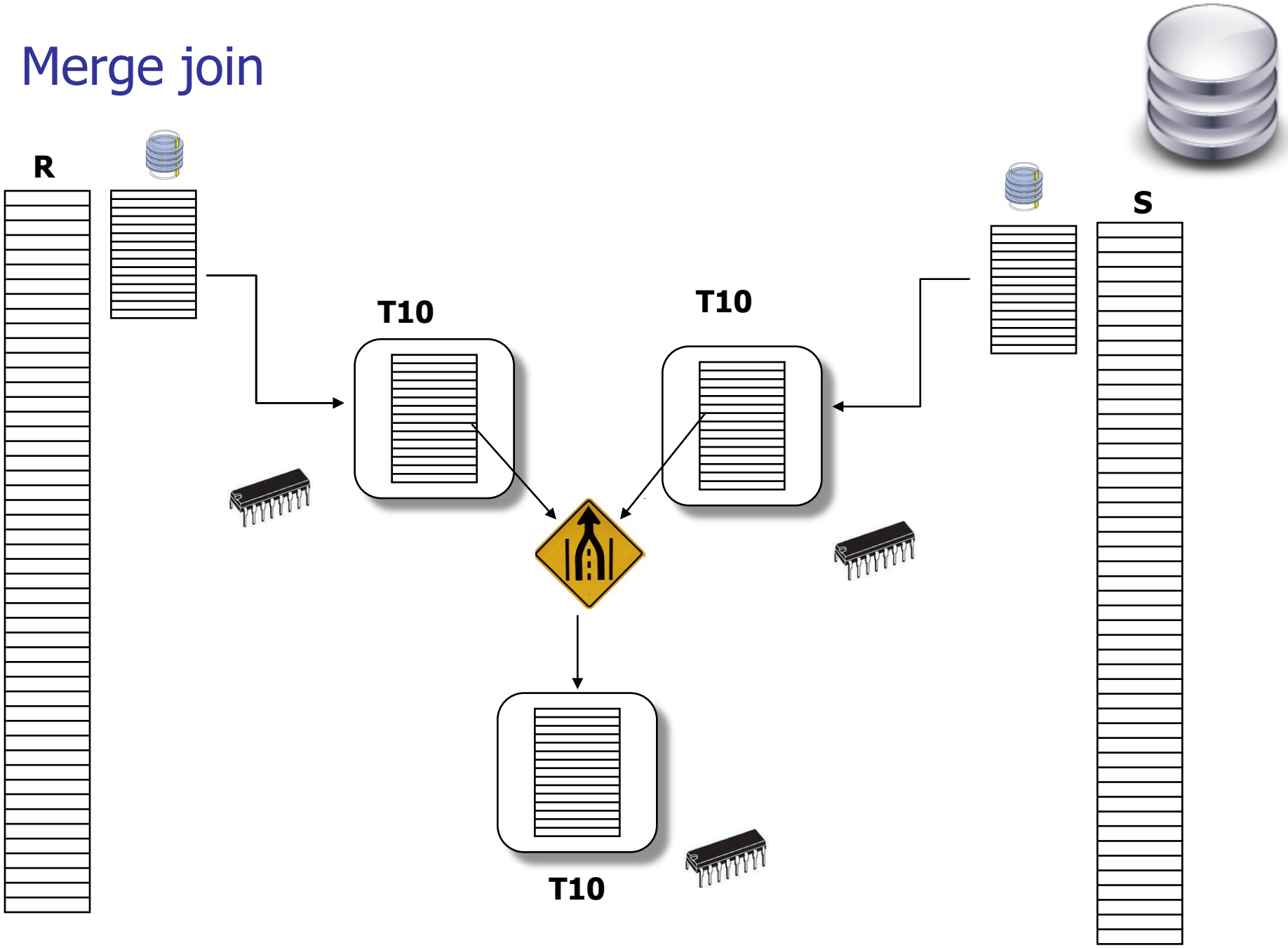
Chaque segment
Est chargé en mémoire
Au cours de l'opération

Two phases

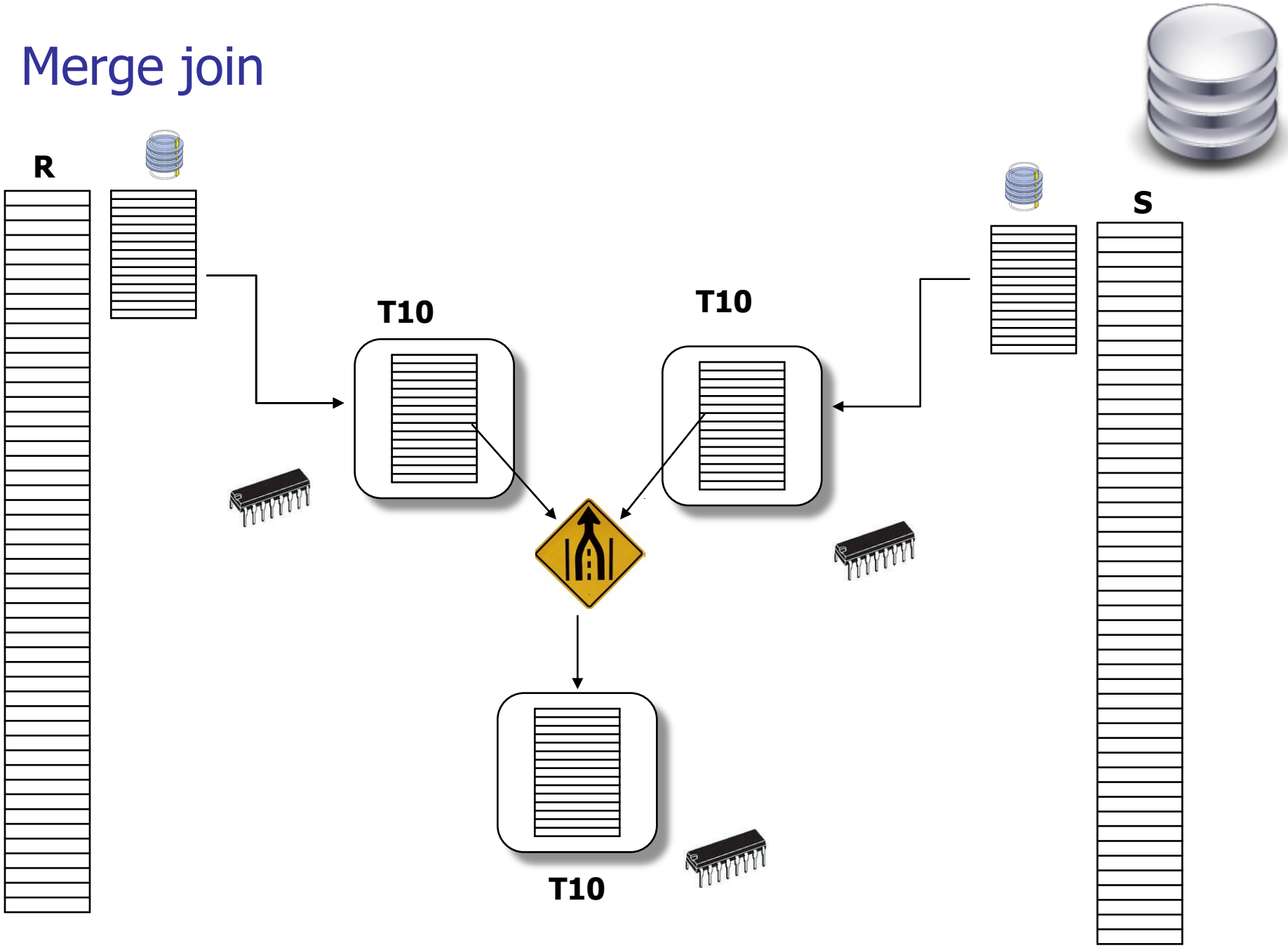
- Disk Sort Merge

- Disk Merge Join

Merge join



Merge join



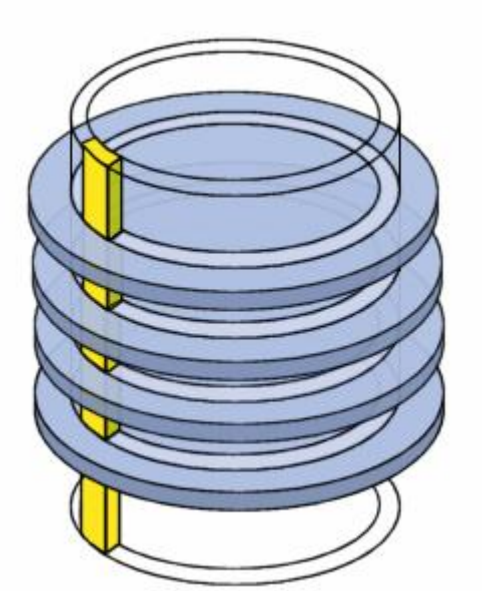
Two Phases

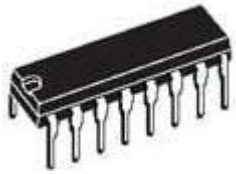
- (1) the sorting phase.
  - Sorting block in memory pages
    - Internal sorting

- (2) the merging phase.
  - Merging blocks in memory pages to disk block
    - Several passes

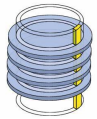
Disque

Mémoire





Non Trié	Non Trié	Non Trié	Non Trié	Non Trié	Non Trié

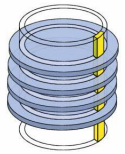


Passe 0

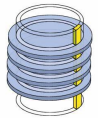
Non Trié

Tri d'un block à la fois
Quick Sort

Trié



Non Trié	Non Trié	Non Trié	Non Trié	Non Trié		

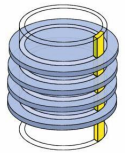


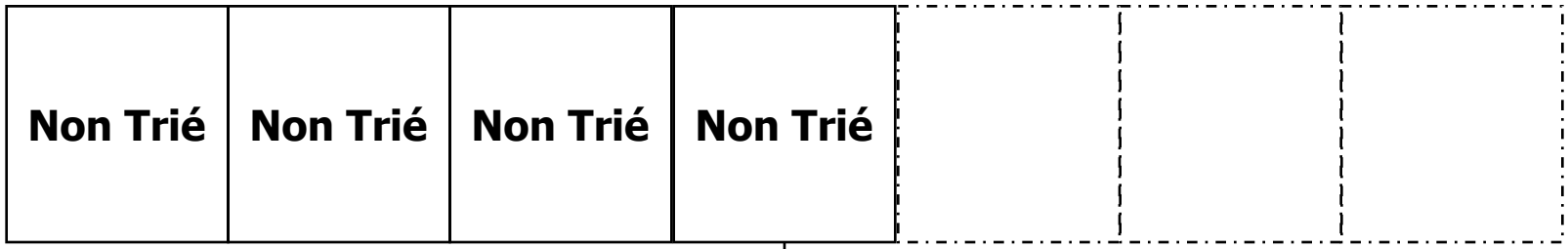
Passe 0

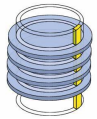
Non Trié

Tri d' un block à la fois
Quick Sort

Trié	Trié

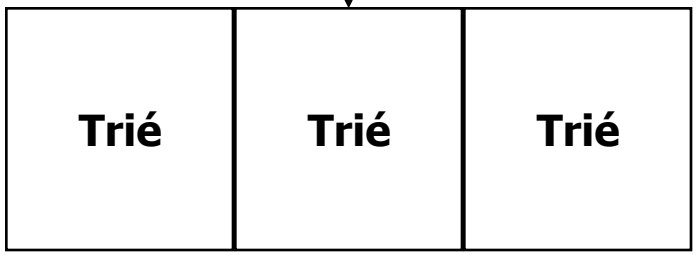


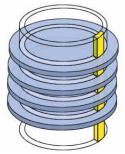


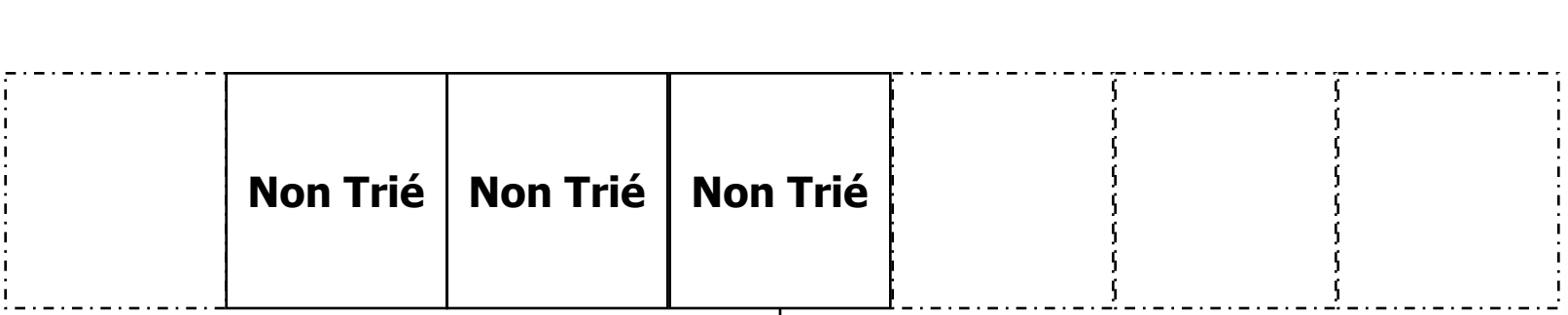


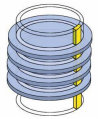
Passe 0

Tri d' un block à la fois
Quick Sort





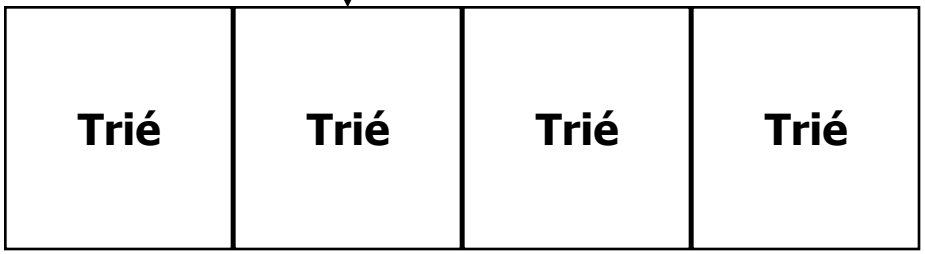


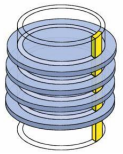


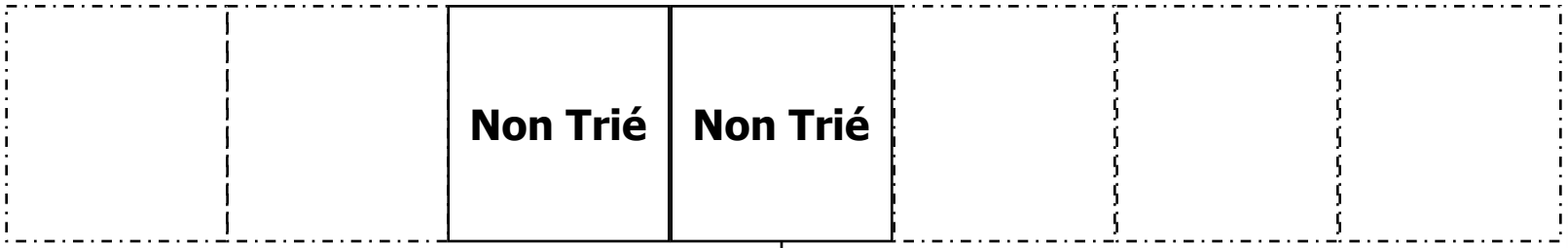
Passe 0

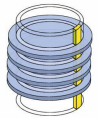
Non Trié

Tri d' un block à la fois
Quick Sort







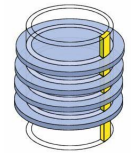


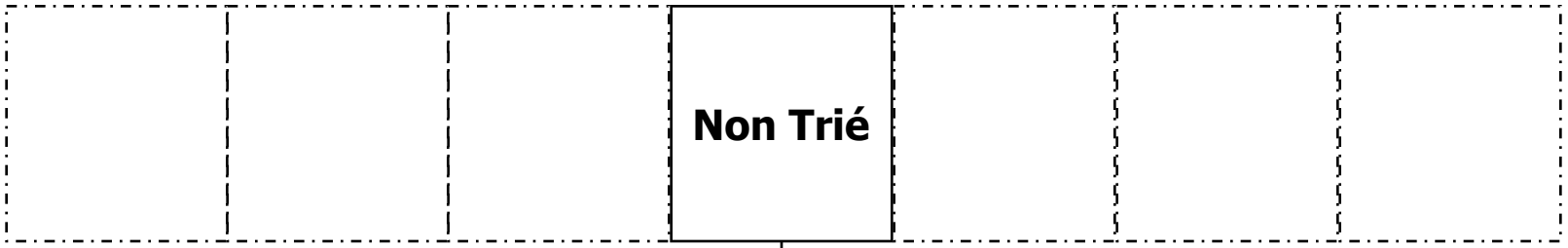
Passe 0

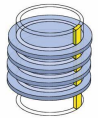
Non Trié

Tri d' un block à la fois
Quick Sort

Trié | Trié | Trié | Trié | Trié

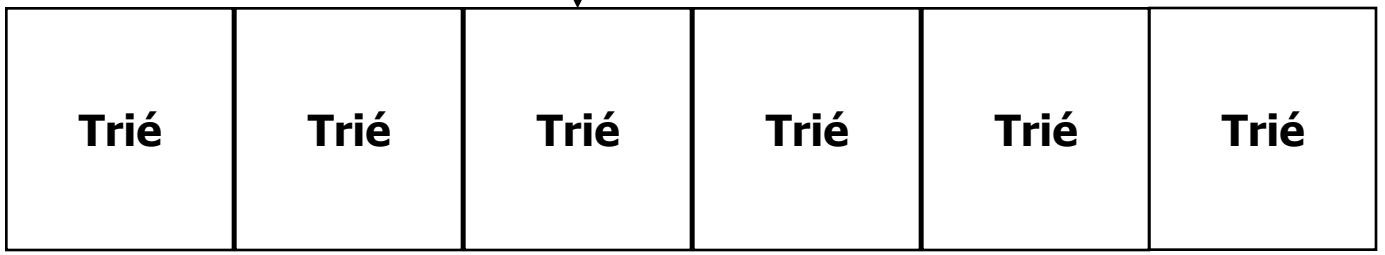


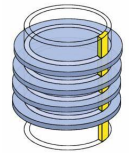


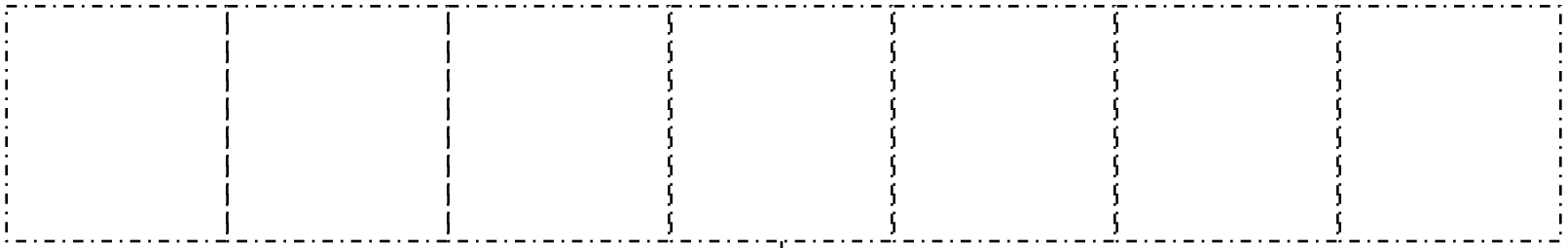


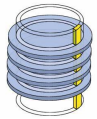
Passe 0

Tri d' un block à la fois
Quick Sort







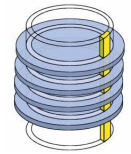


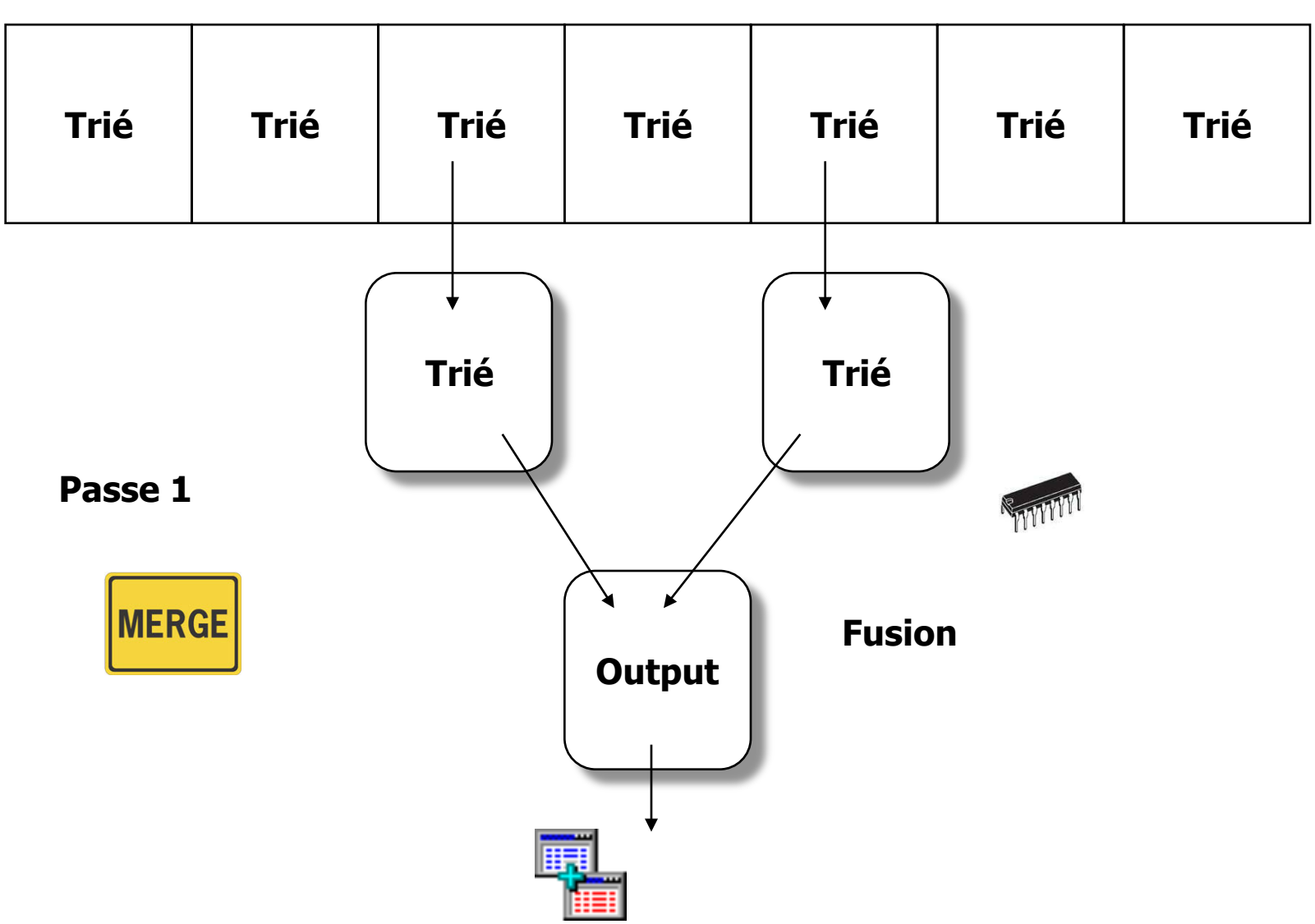
Passe 0

Non Trié

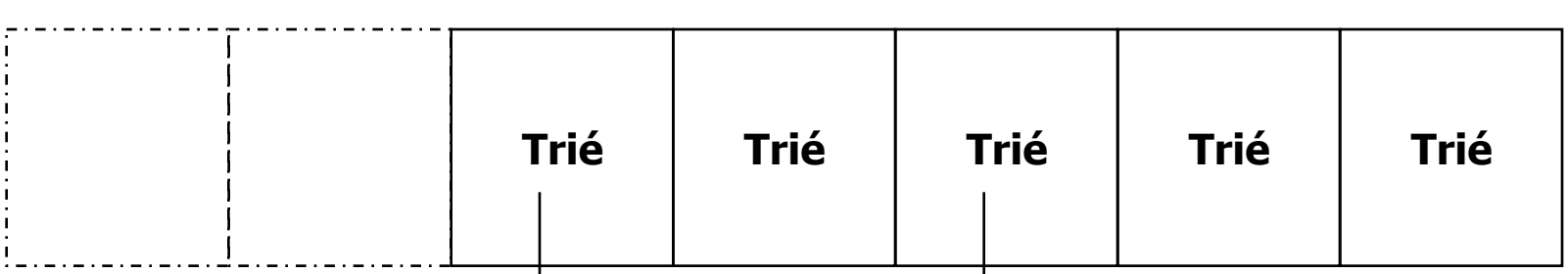
Tri d' un block à la fois
Quick Sort

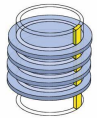
Trié	Trié	Trié	Trié	Trié	Trié	Trié




Trié
Trié
Trié
Trié
Trié
Trié
Trié
Trié
Trié
Passe 1
MERGE
Output
Fusion

3 pages





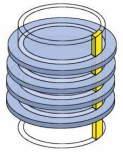
Trié

Trié

Passe 1

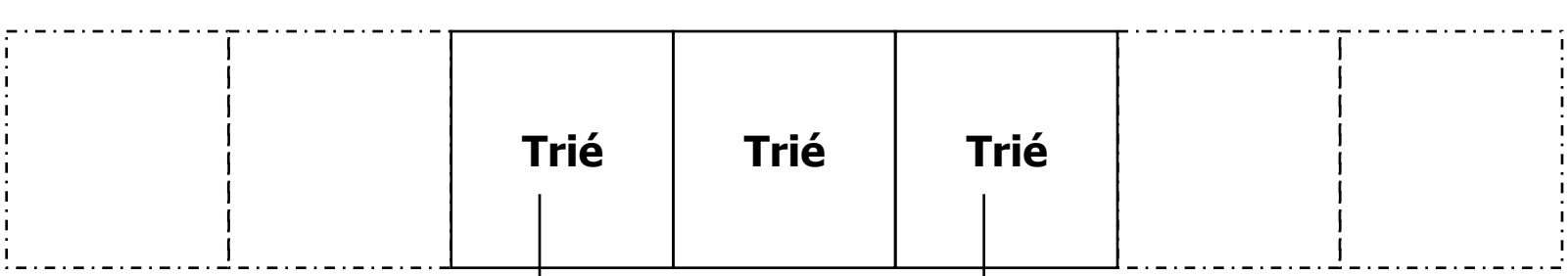
Output

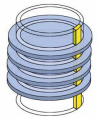
Fusion

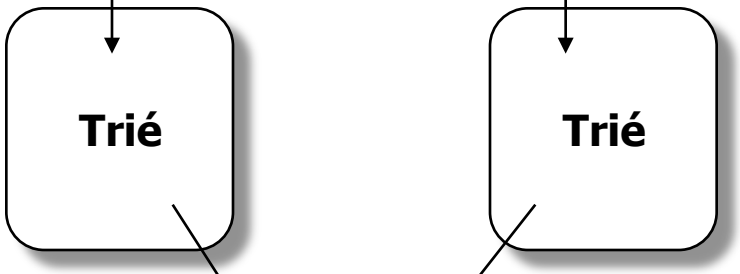


Trié

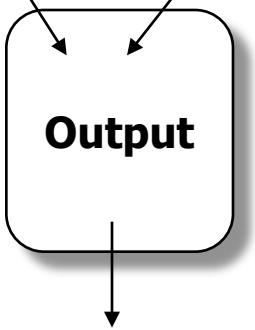
3 buffers



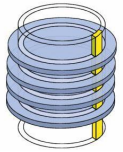


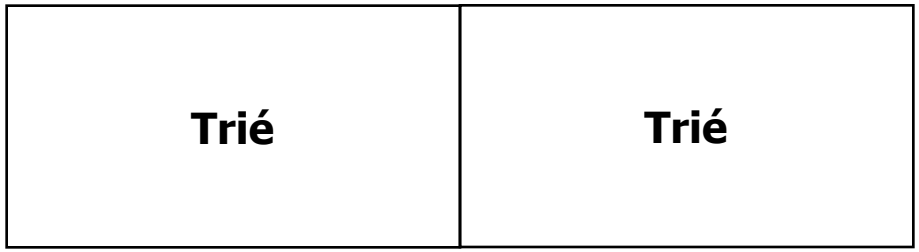


Passe 1

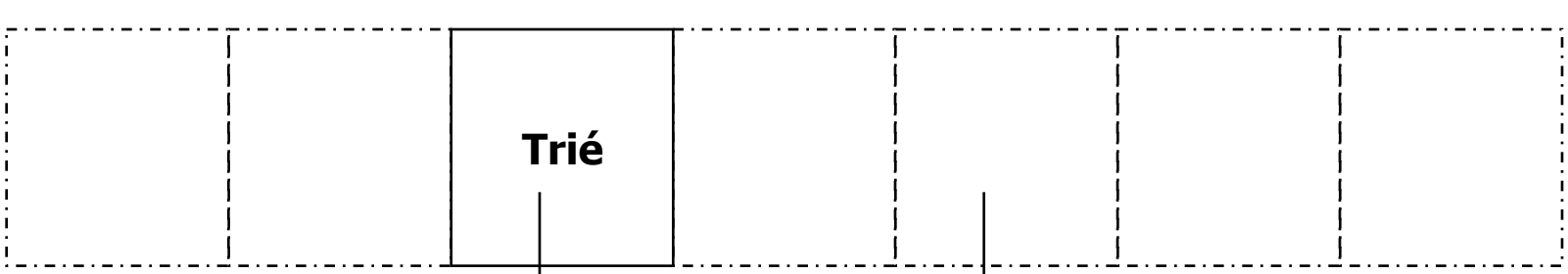


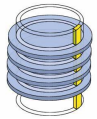
Fusion



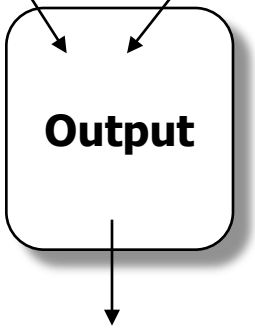


3 buffers

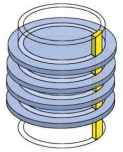


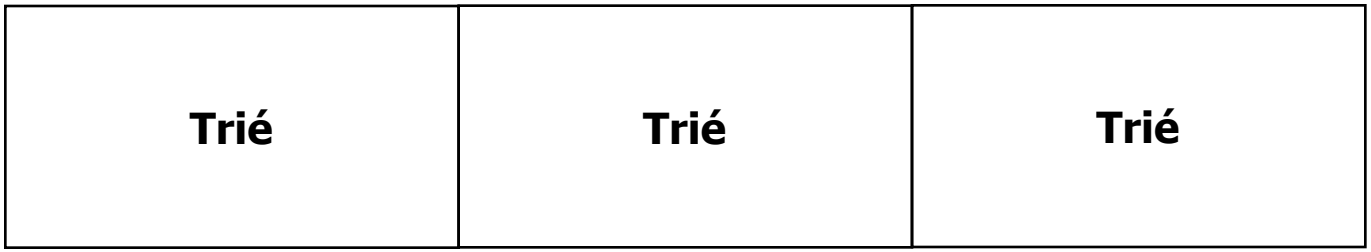


Passe 1



Fusion





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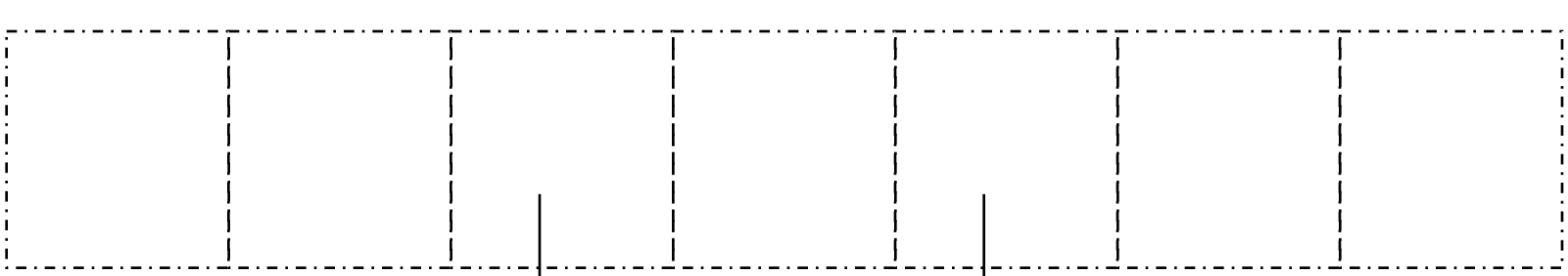
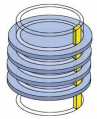




Trié

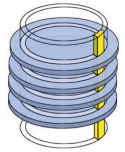
Trié

Passe 1

MERGE

Output

Fusion



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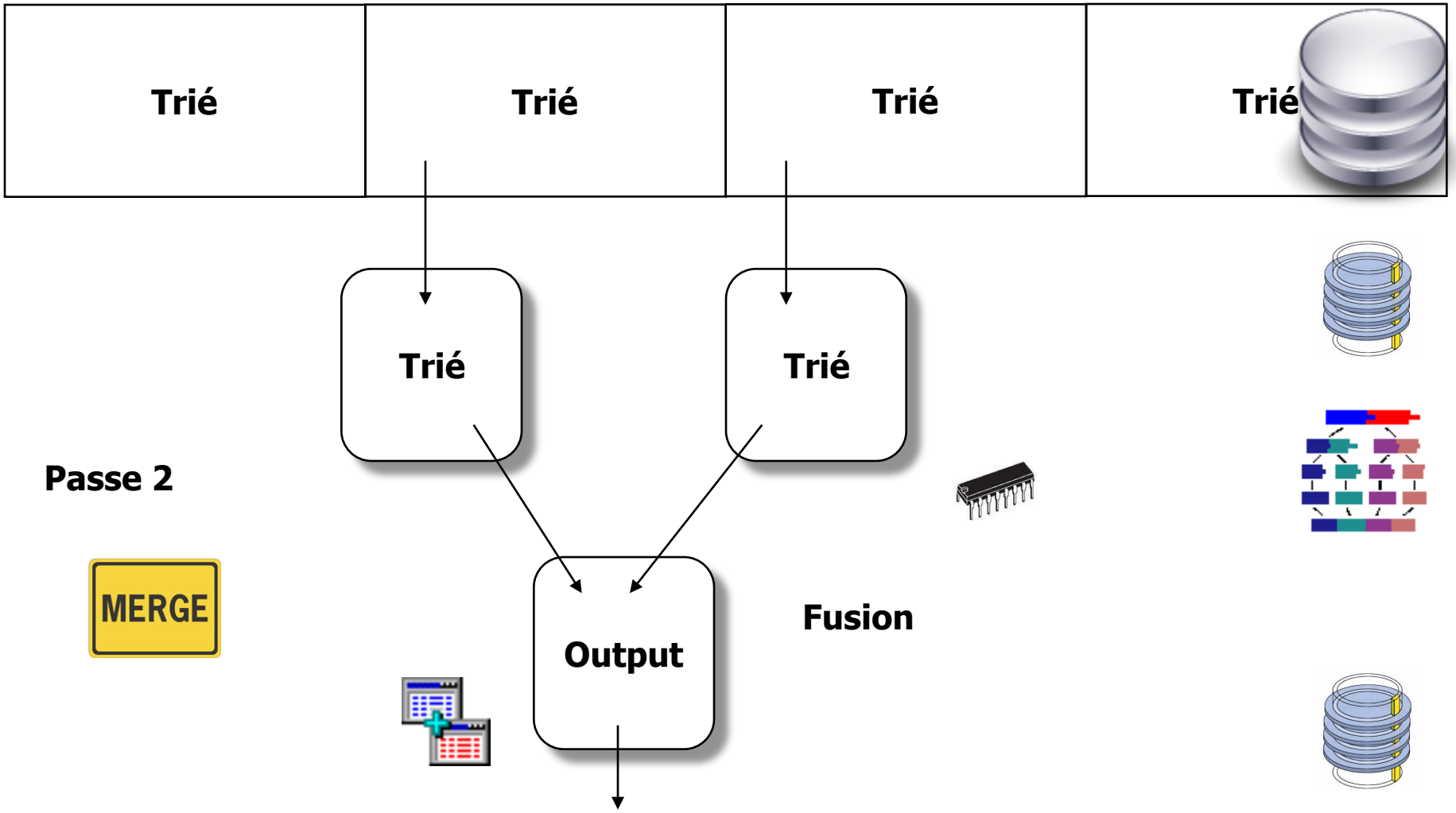
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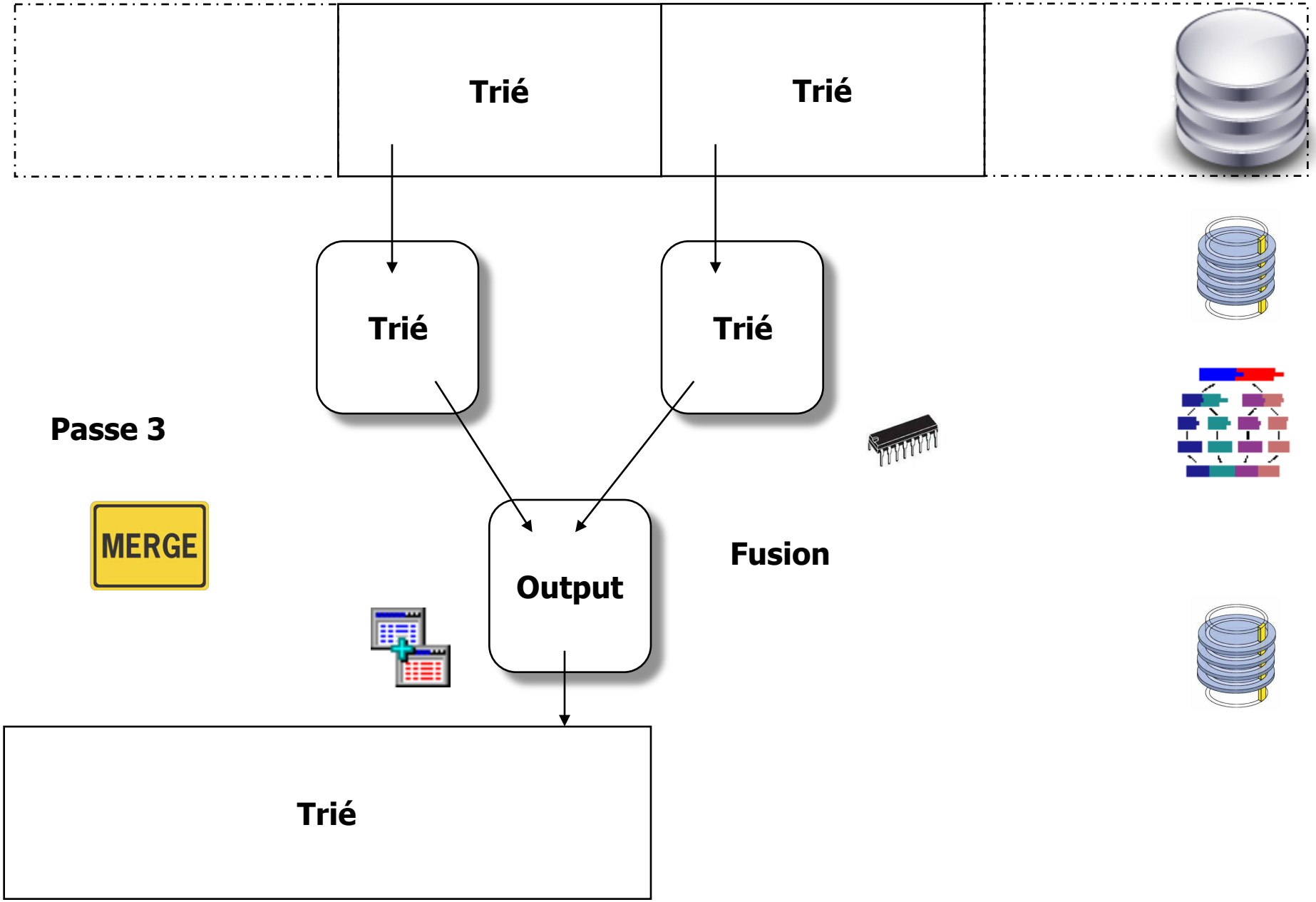
Passe 2
MERGE
Output
Fusion
3 buffers


Trié
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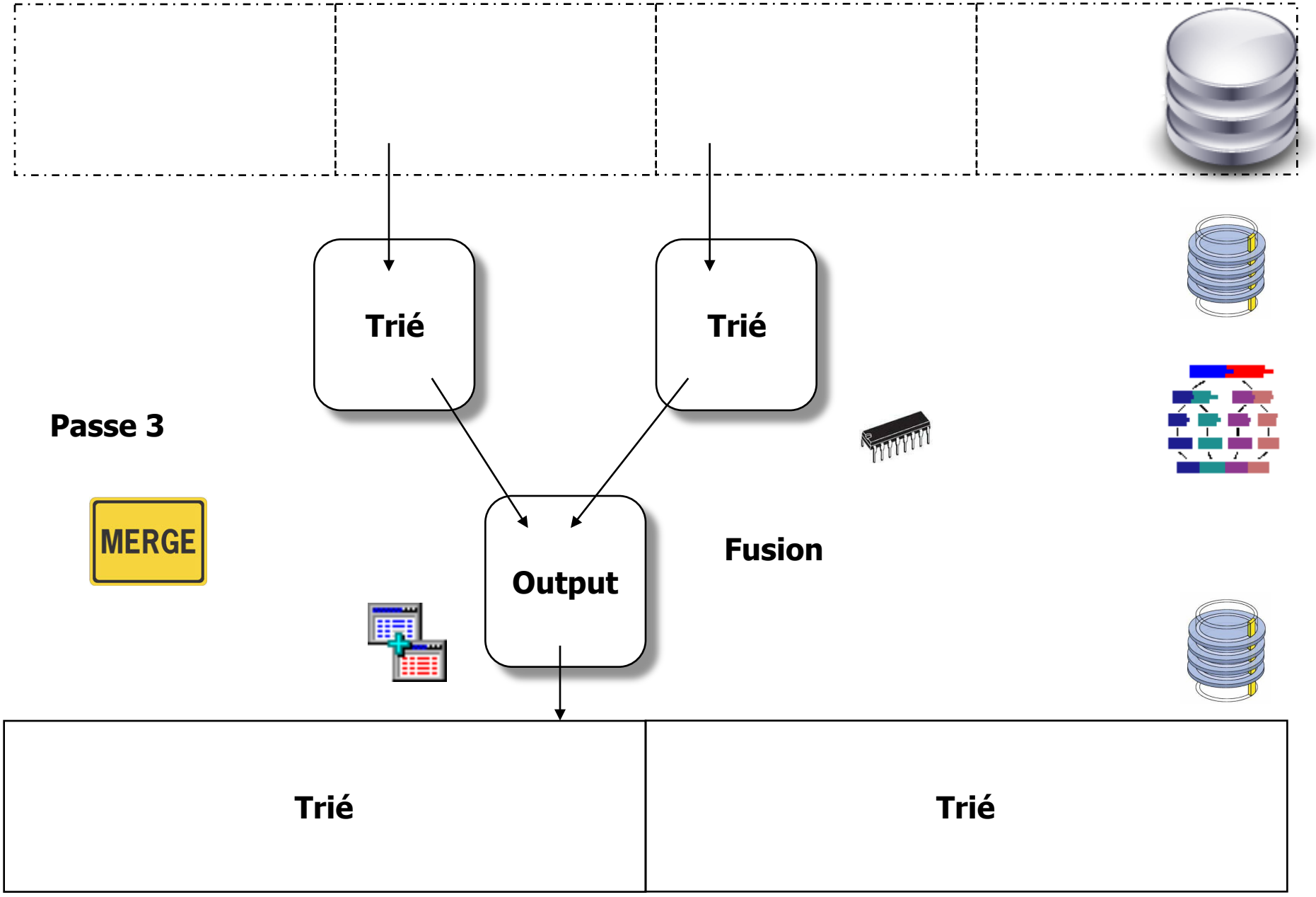
Passe 3
MERGE
Output
Fusion
Trié
3 buffers


Trié
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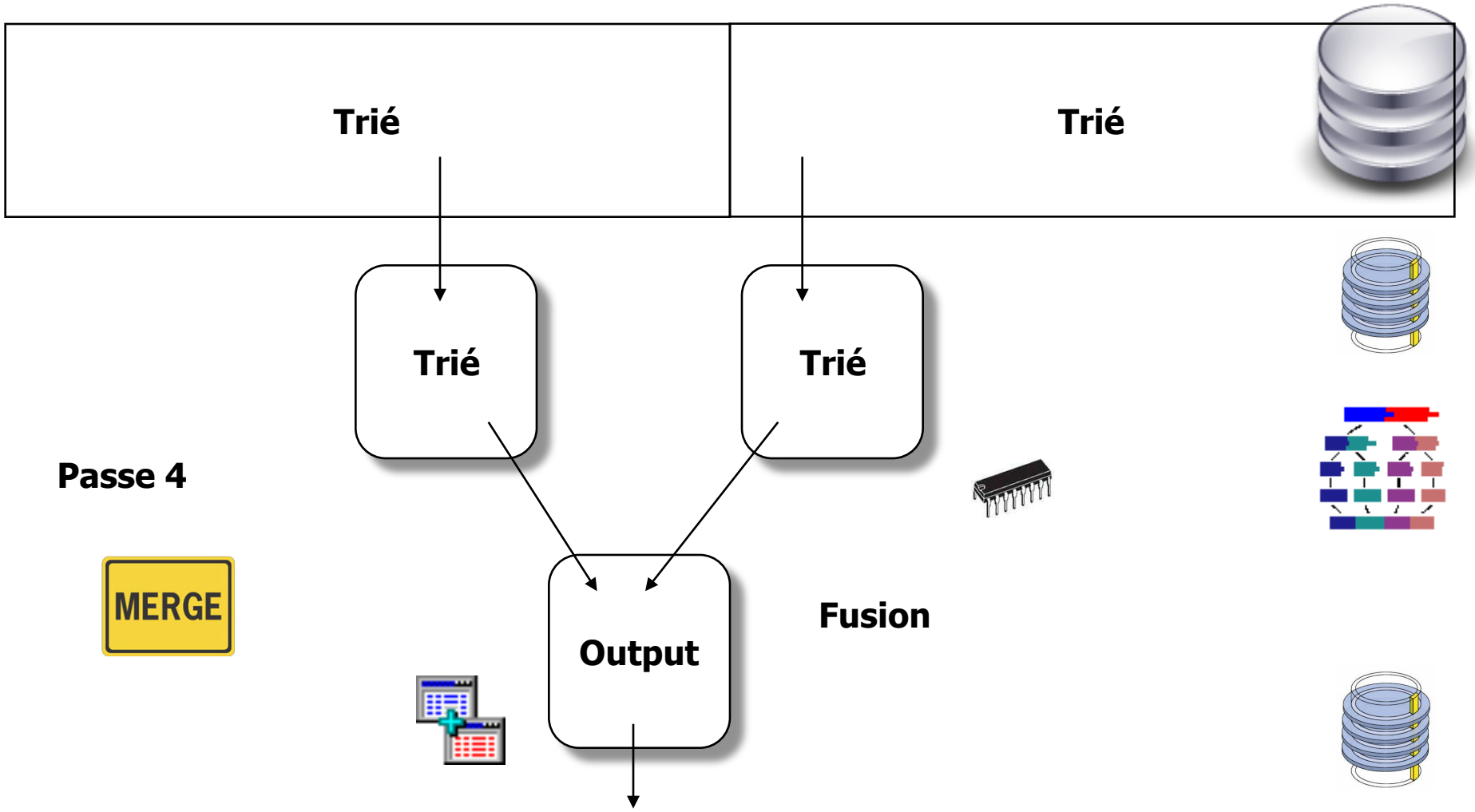
Passe 3
MERGE
Output
Fusion
Trié
Trié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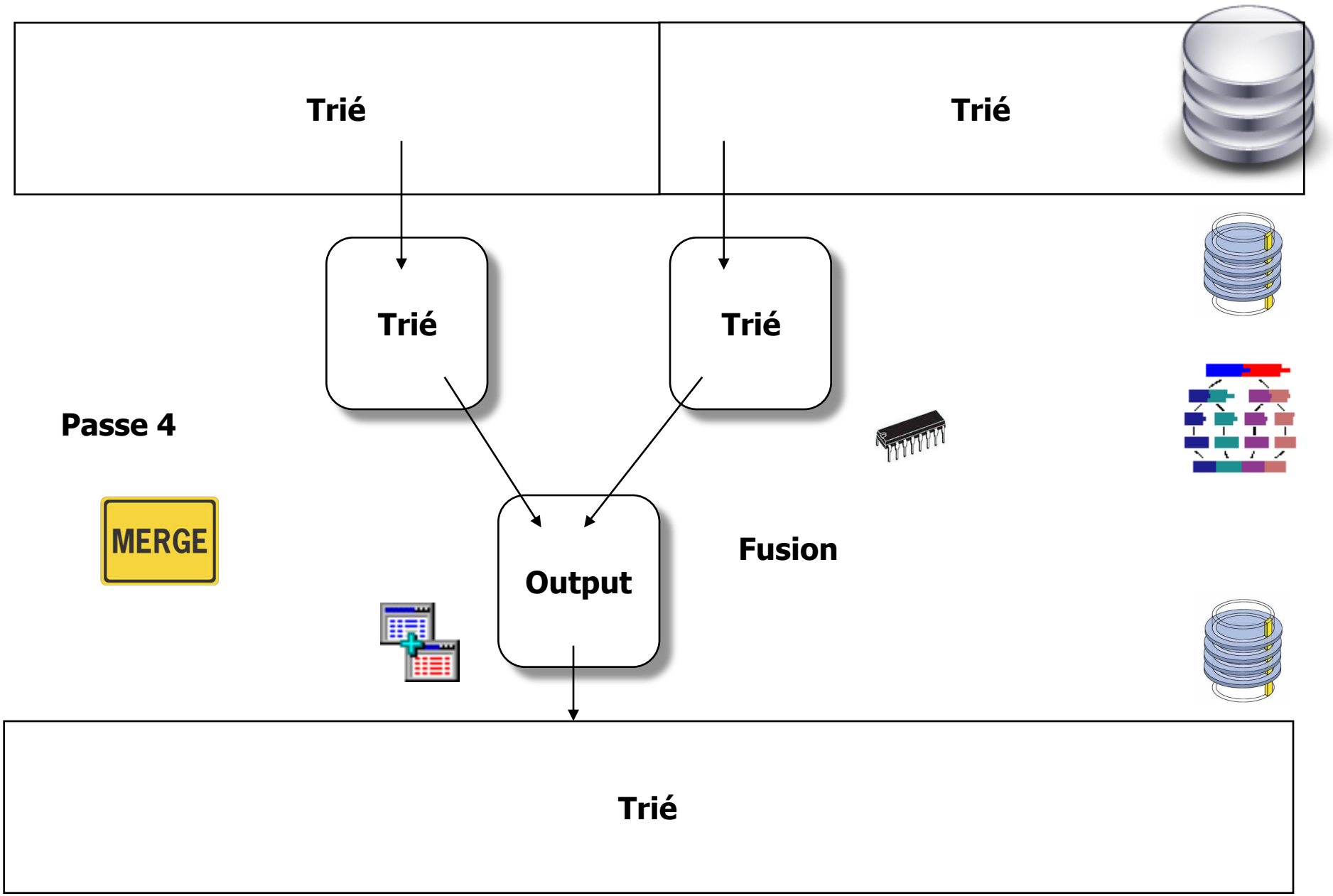
Passe 4
MERGE
Output
Fusion
3 buffers


Trié
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Passe 4
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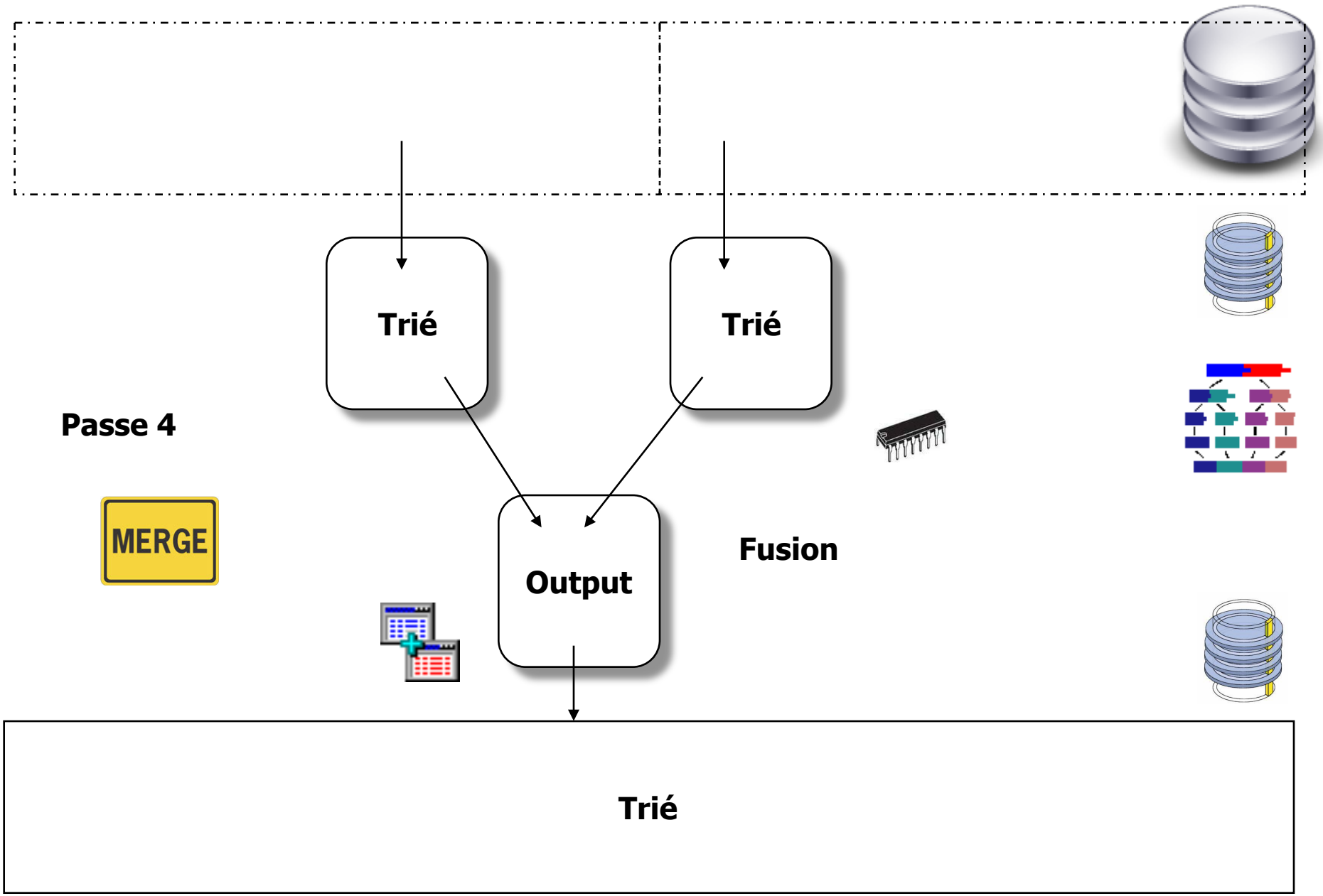
Trié


Trié
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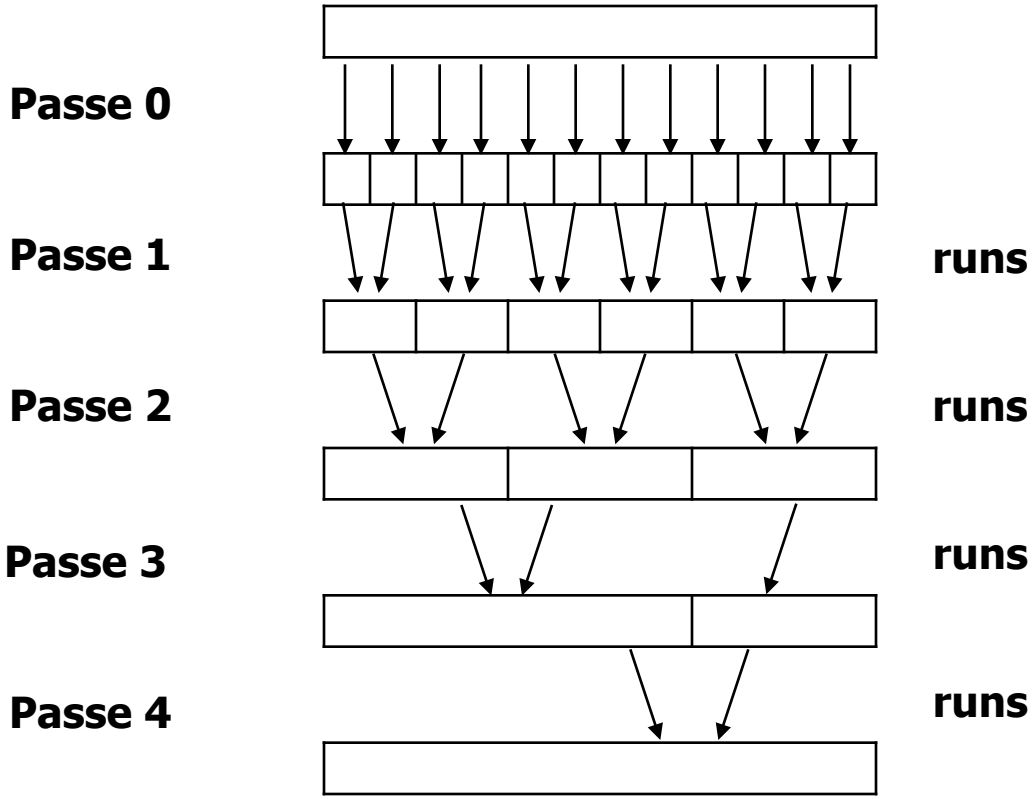
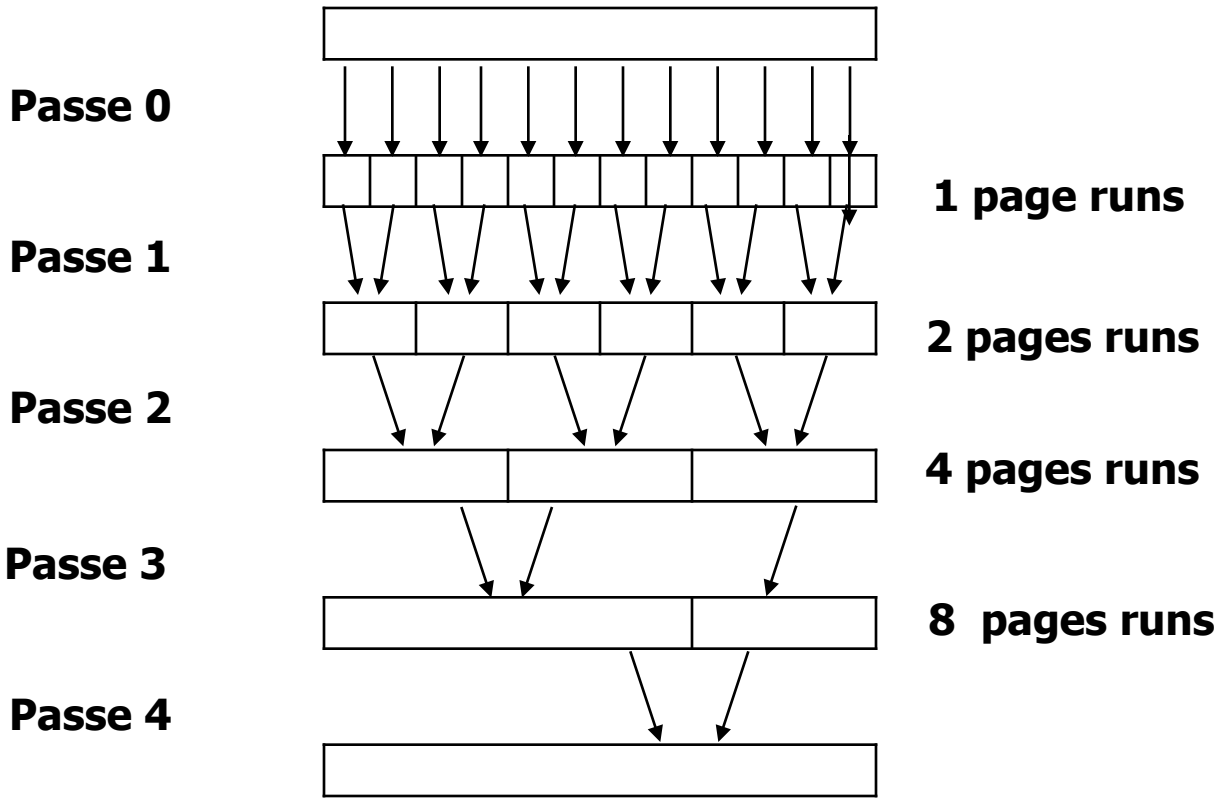
Passe 4
MERGE
Output
Fusion
Trié

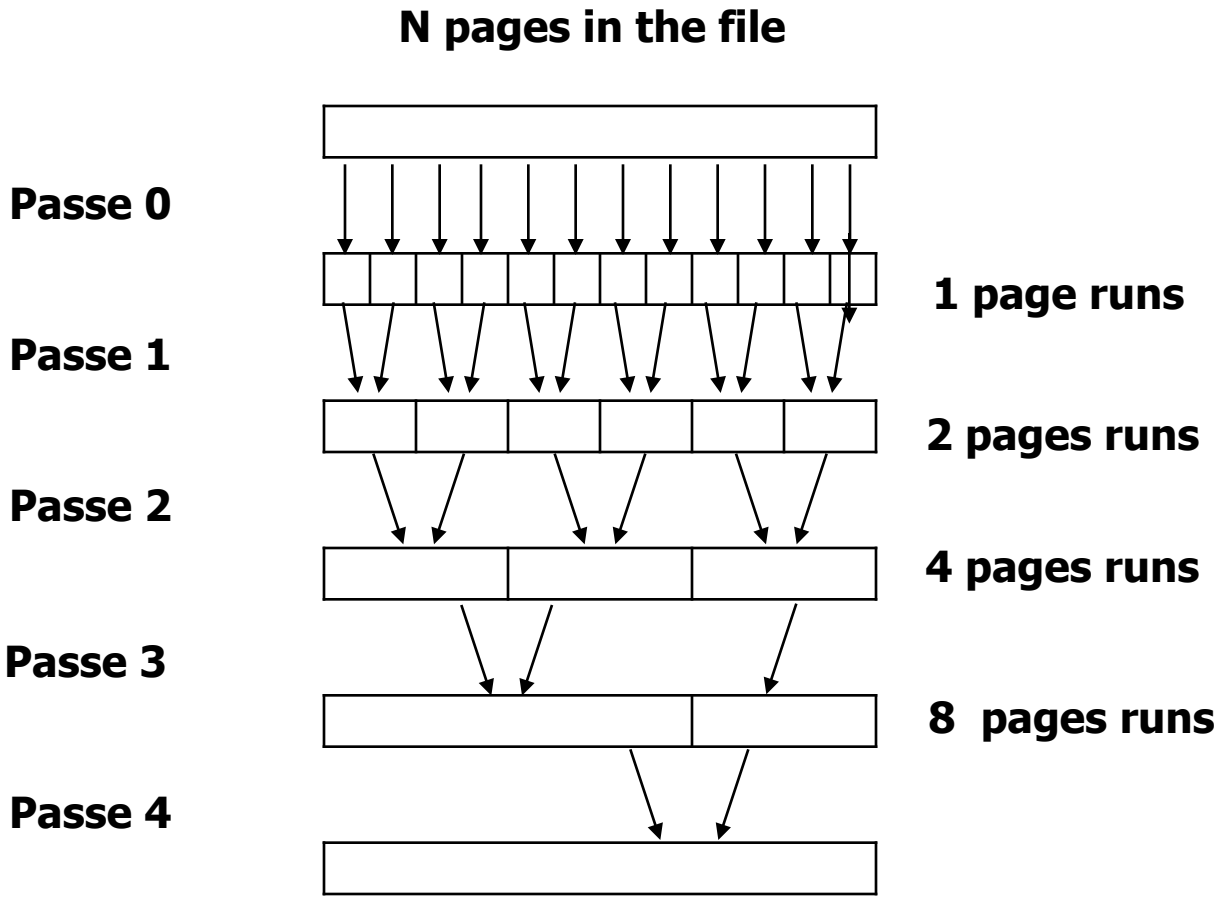
2 way Sort Merge



2 way Sort Merge

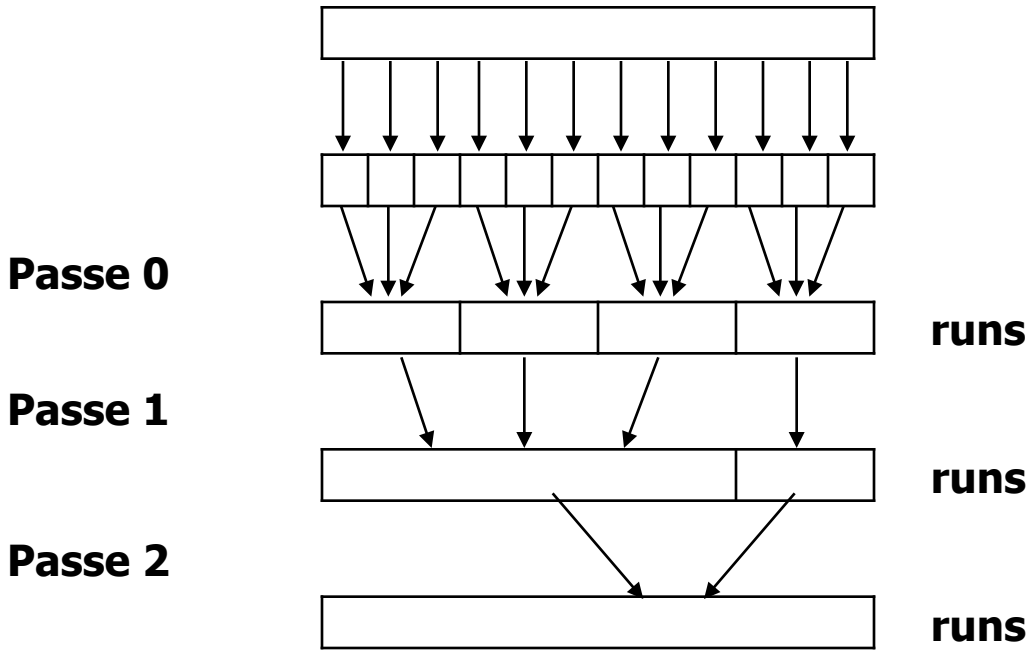


2 way Sort Merge

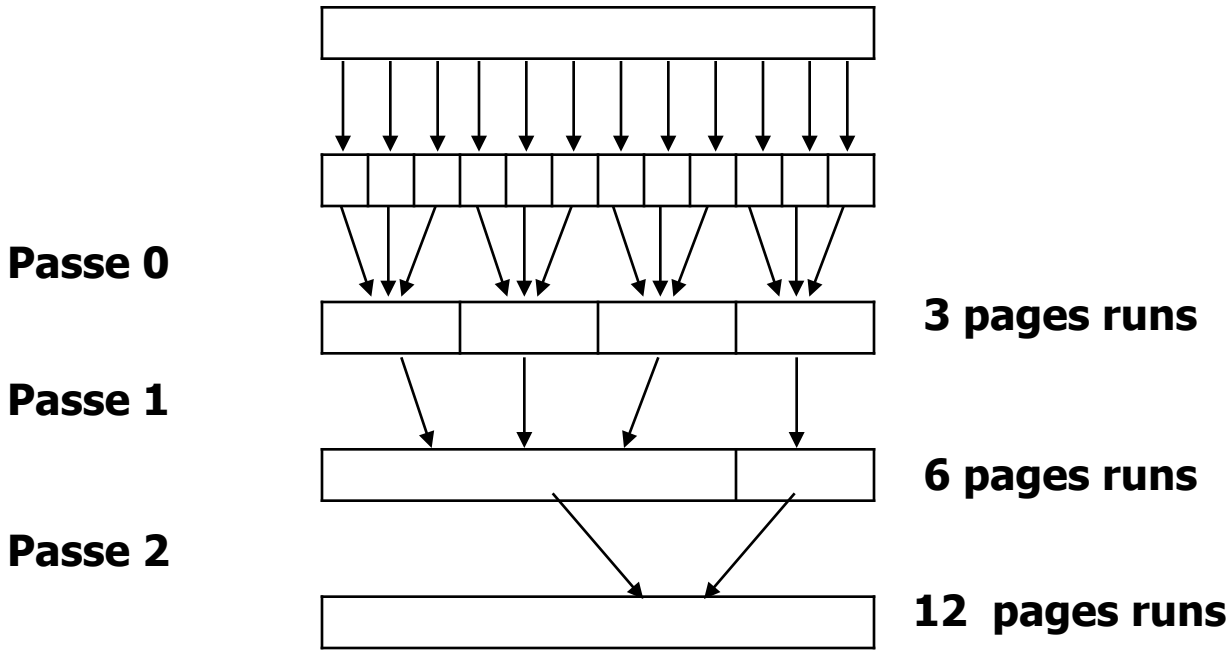


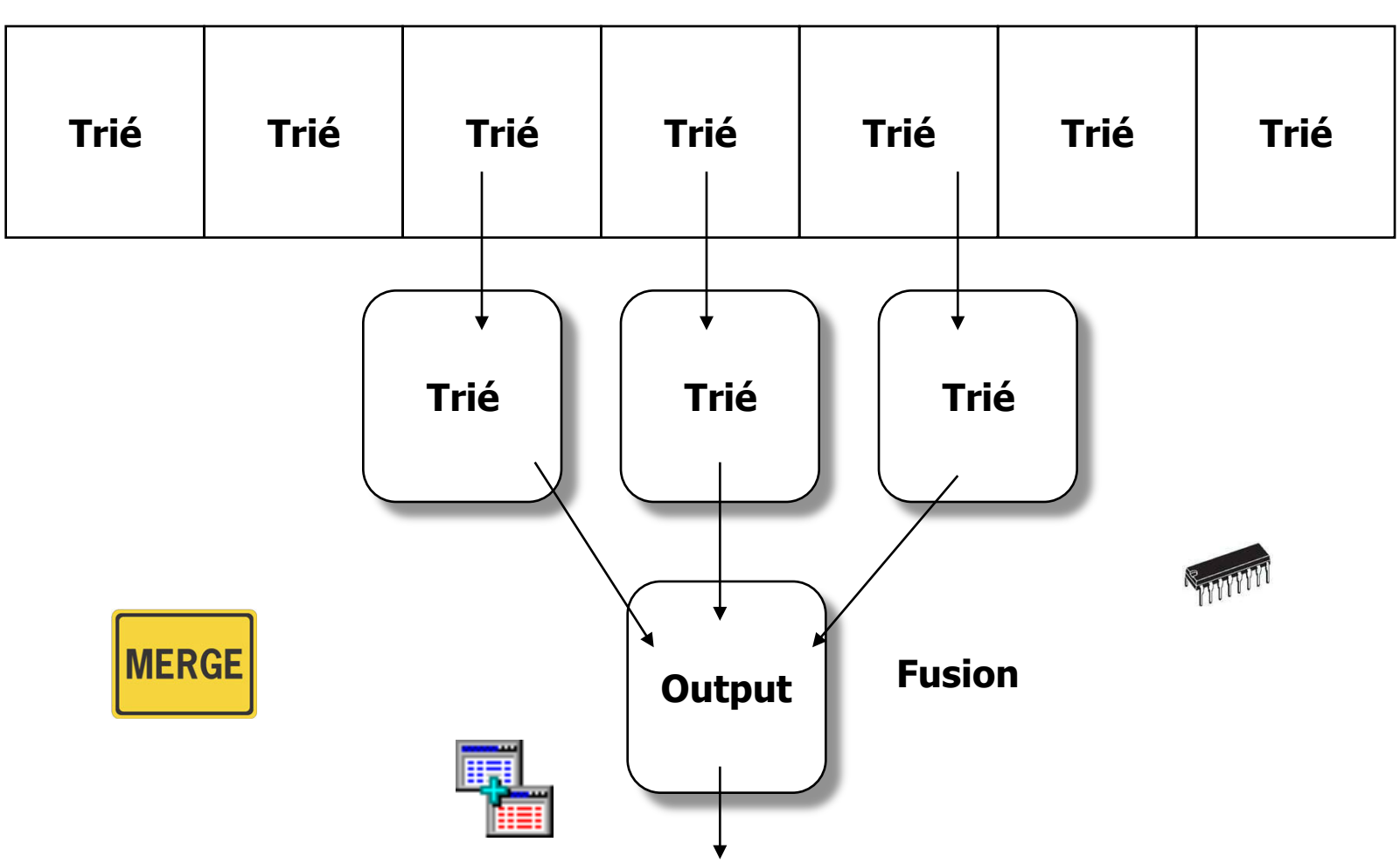
Number of passes : $2\ N\ (\lceil \log_2 N \rceil + 1)$

3 way Sort Merge



3 way Sort Merge

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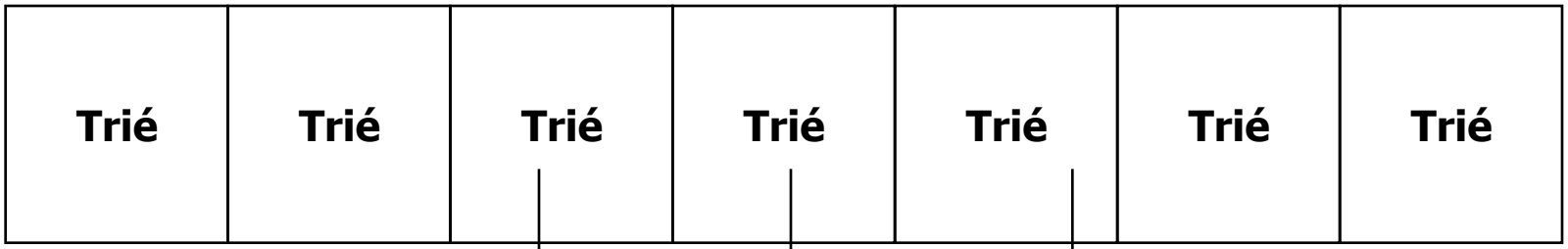
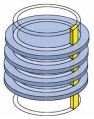
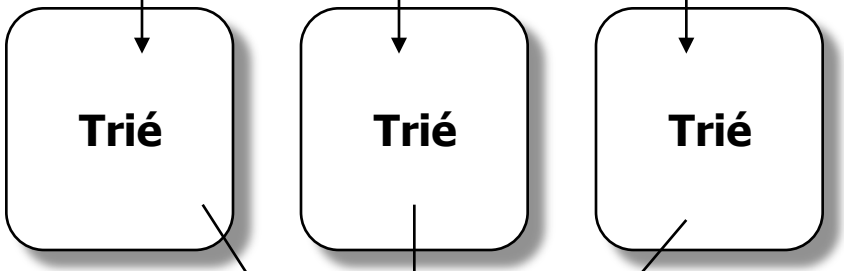
MERGE
Output
Fusion

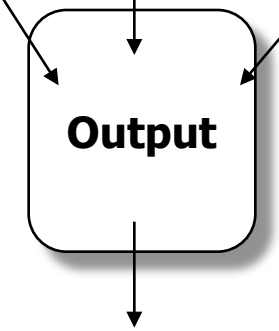
4 buffers



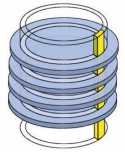


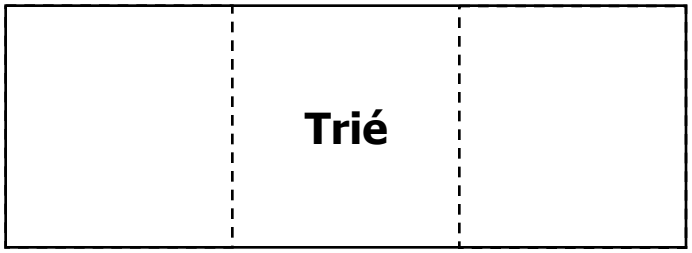


Passe 1

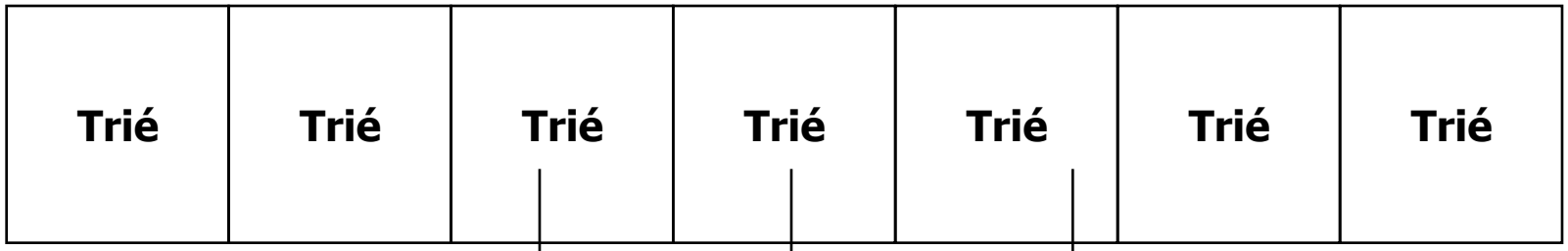


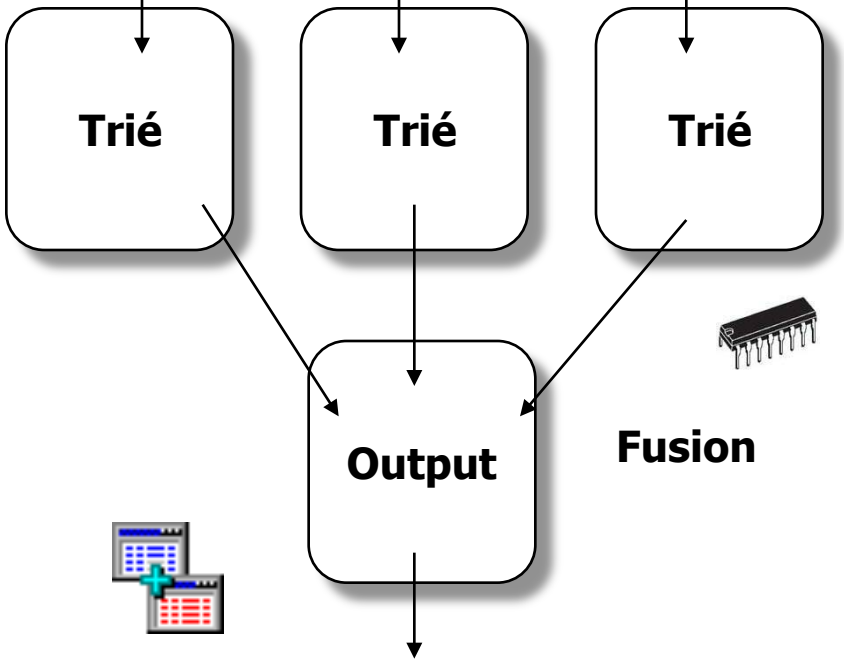
Fusion





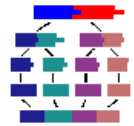
3 WAY MERGE



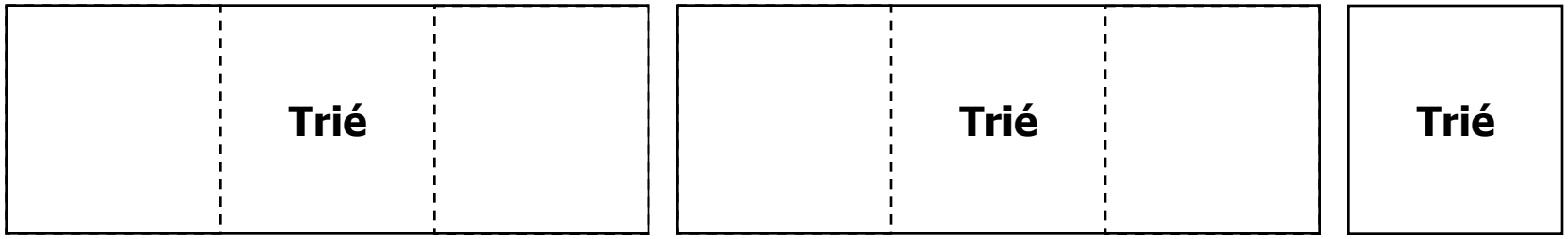


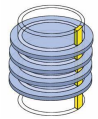
Passe 1

Fusion



3 WAY MERGE



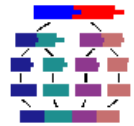


Trié

Trié

Trié

Passe 1



Output

Fusion

3 WAY MERGE

Trié

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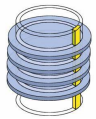

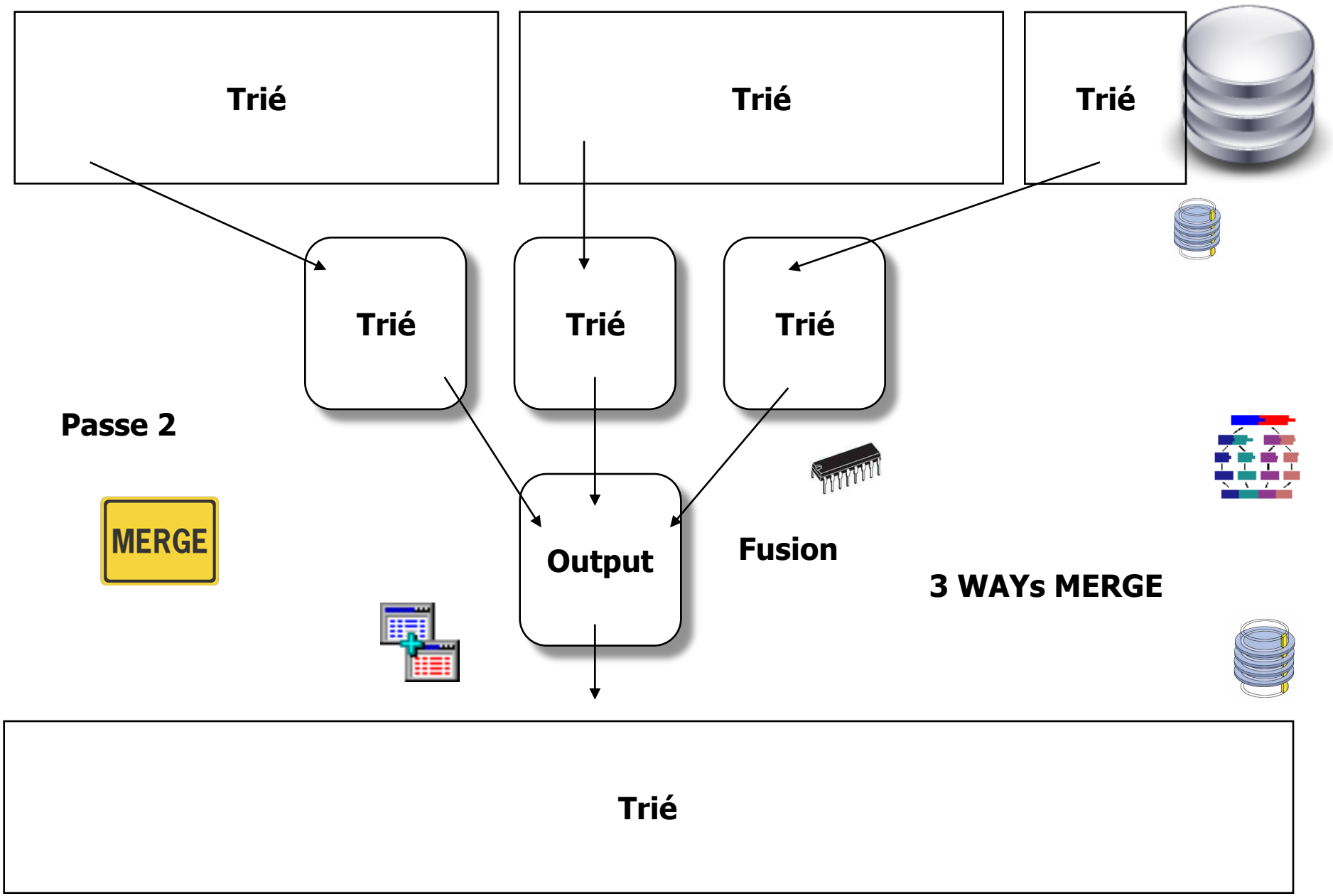
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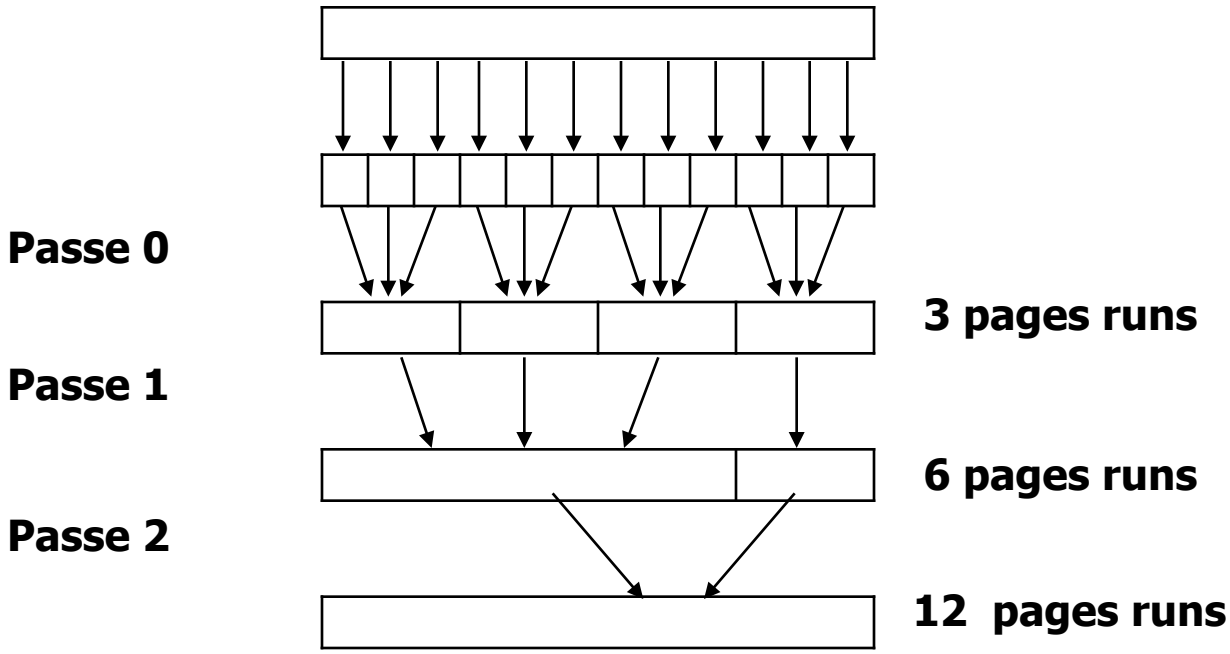
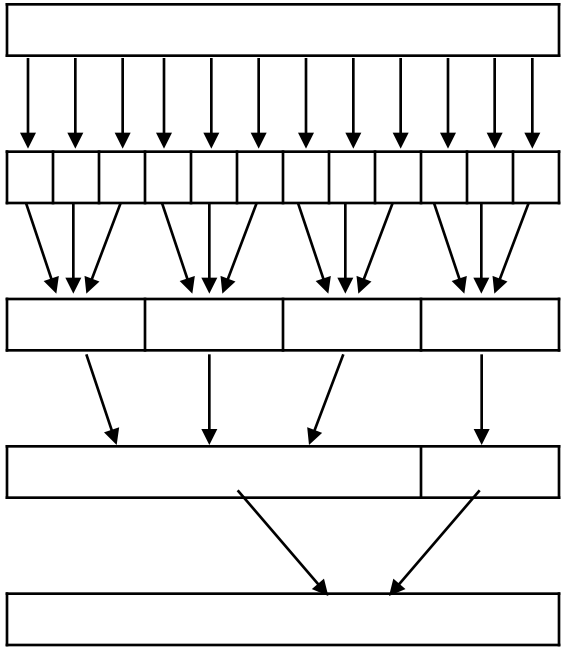
Passe 2
MERGE
Output
Fusion
3 WAYs MERGE
Trié

3 way Sort Merge



3 way Sort Merge

Br=12



Passe 0

Passe 1

Passe 2

3 pages runs : 3 * 4

6 pages runs : 6 * 1 + 4

12 pages runs : 12 * 1

3 buffers