

Distributed Database

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Fragmentation

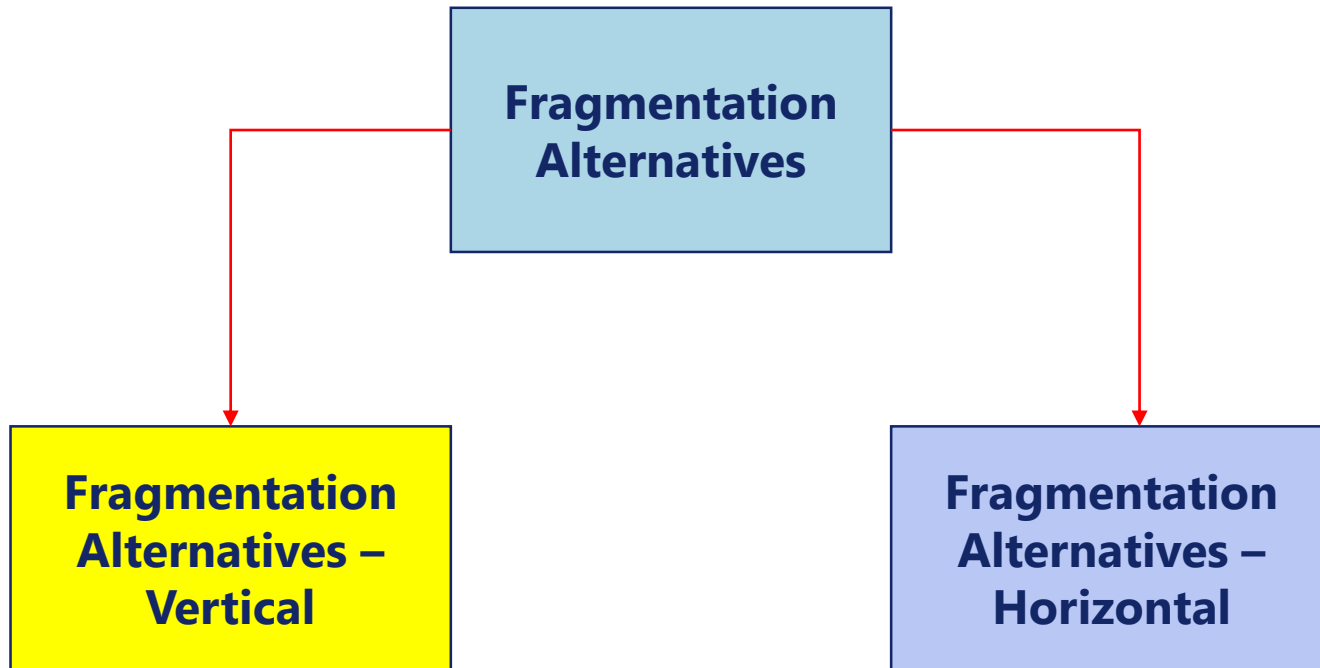


Fragmentation

- ❖ Can't we just distribute relations?
- ❖ What is a reasonable unit of distribution?
 - ❑ relation
 - ✓ views are subsets of relations → locality
 - ✓ extra communication
 - ❑ fragments of relations (sub-relations)
 - ✓ concurrent execution of a number of transactions that access different portions of a relation
 - ✓ views that cannot be defined on a single fragment will require extra processing
 - ✓ semantic data control (especially integrity enforcement) more difficult



Fragmentation Alternative (FA)





Fragmentation Alternatives – Horizontal

PROJ₁ : projects with budgets less than \$200,000

PROJ₂ : projects with budgets greater than or equal to \$200,000

PROJ

PNB	PNAME	BUDGET	LOCATION
P1	Instrumentation	150000	Jakarta
P2	Database Develop	135000	Surabaya
P3	ERP / MRP	250000	Surabaya
P4	Maintenance	310000	Bandung
P5	ERP / MRP	500000	Medan

PROJ1

PNB	PNAME	BUDGET	LOCATION
P1	Instrumentation	150000	Jakarta
P2	Database Develop	135000	Surabaya

PROJ2

PNB	PNAME	BUDGET	LOCATION
P3	ERP / MRP	250000	Surabaya
P4	Maintenance	310000	Bandung
P5	ERP / MRP	500000	Medan



Fragmentation Alternatives – Vertical

PROJ₁: information about project budgets

PROJ₂: information about project names and locations

PROJ

PNB	PNAME	BUDGET	LOCATION
P1	Instrumentation	150000	Jakarta
P2	Database Develop	135000	Surabaya
P3	ERP / MRP	250000	Surabaya
P4	Maintenance	310000	Bandung
P5	ERP / MRP	500000	Medan

PROJ1

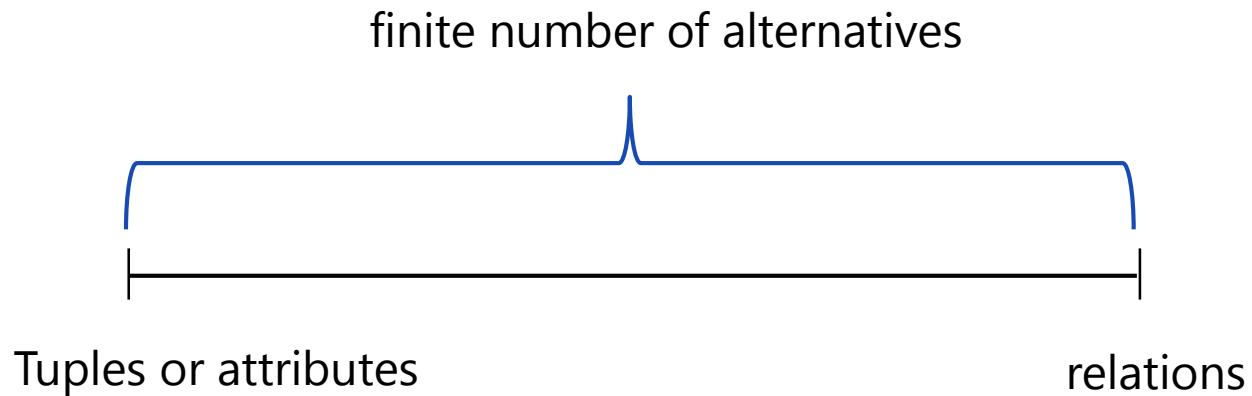
PNB	BUDGET
P1	150000
P2	135000
P3	250000
P4	310000
P5	500000

PROJ2

PNB	PNAME	LOCATION
P1	Instrumentation	Jakarta
P2	Database Develop	Surabaya
P3	ERP / MRP	Surabaya
P4	Maintenance	Bandung
P5	ERP / MRP	Medan



Degree of Fragmentation



Finding the suitable level of partitioning within this range



Allocation Alternatives

- ❖ Non-replicated
 - ❑ partitioned : each fragment resides at only one site
- ❖ Replicated
 - ❑ fully replicated : each fragment at each site
 - ❑ partially replicated : each fragment at some of the sites
- ❖ Rule of thumb:

If $\frac{\text{read-only queries}}{\text{update queries}} \ll 1$, replication is advantageous,
otherwise replication may cause problems



Comparison of Replication Alternatives

	FULL-REPLICATION	PARTIAL-REPLICATION	PARTITIONING
QUERY PROCESSING	Easy	← Same Difficulty →	
DIRECTORY MANAGEMENT	Easy or Non-existent	← Same Difficulty →	
CONCURRENCY CONTROL	Moderate	Difficult	Easy
RELIABILITY	Very High	High	Low
REALITY	Possible Application	Realistic	Possible Application



Information Requirements

❖ **4 (four) categories:**

- Database information
- Application information
- Communication network information
- Computer system information



Latihan soal

Jelaskan konsep fragmentation berdasarkan information requirements dan buat contoh sederhana pada masing approach di bawah ini

1. Primary Horizontal Fragmentation (PHF)
2. Derived Horizontal Fragmentation (DHF)

Thank You !

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