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BY NC ND
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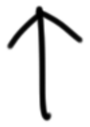
Bitmap Index on City

Row vs Column Ca

Colleagues		
name	**street**	**city**
peter	unistreet	new york
steve	macstreet	cuppertino
mike	longstreet	berlin
tim	unistreet	berlin
hans	msstreet	new york
jens	longstreet	cuppertino
frank	unistreet	new york
olaf	macstreet	berlin
stefan	longstreet	berlin
alekh	unistreet	berlin
felix	macstreet	new york
jorge	longstreet	berlin

city		
new york	**cuppertino**	**berlin**
1	0	0
0	1	0
0	0	1
0	0	1
1	0	0
0	1	0
1	0	0
0	0	1
0	0	1
0	0	1
1	0	0
0	0	1



Bitlists

1 2 3

Bitmap Index on Street

Colleagues		
name	**street**	**city**
peter	unistreet	new york
steve	macstreet	cuppertino
mike	longstreet	berlin
tim	unistreet	berlin
hans	msstreet	new york
jens	longstreet	cuppertino
frank	unistreet	new york
olaf	macstreet	berlin
stefan	longstreet	berlin
alekh	unistreet	berlin
felix	macstreet	new york
jorge	longstreet	berlin

city		
new york	cuppertino	berlin
1	0	0
0	1	0
0	0	1
0	0	1
1	0	0
0	1	0
1	0	0
0	0	1
0	0	1
0	0	1
1	0	0
0	0	1

street			
unistreet	macstreet	longstreet	msstreet
1	0	0	0
0	1	0	0
0	0	1	0
1	0	0	0
0	0	0	1
0	0	1	0
1	0	0	0
0	1	0	0
0	0	1	0
1	0	0	0
0	1	0	0
0	0	1	0

1 2 3 4

N := number of tuples

Bitmap Operations

Simple Filter

city = 'berlin'

(1)

(2)

city = 'berlin'

OR city = 'new york'

city		
new york	cuppertino	berlin
1	0	0
0	1	0
0	0	1
0	0	1
1	0	0
0	1	0
1	0	0
0	0	1
0	0	1
0	0	1
1	0	0
0	0	1

street			
unistreet	macstreet	longstreet	msstreet
1	0	0	0
0	1	0	0
0	0	1	0
1	0	0	0
0	0	0	1
0	0	1	0
1	0	0	0
0	1	0	0
0	0	1	0
1	0	0	0
0	1	0	0
0	0	1	0

Bitmap Operations

city ='berlin'

AND

street ='longstreet'

city		
new york	cuppertino	berlin
1	0	0
0	1	0
0	0	1
0	0	1
1	0	0
0	1	0
1	0	0
0	0	1
0	0	1
0	0	1
1	0	0
0	0	1

street			
unistreet	macstreet	longstreet	msstreet
1	0	0	0
0	1	0	0
0	0	1	0
1	0	0	0
0	0	0	1
0	0	1	0
1	0	0	0
0	1	0	0
0	0	1	0
1	0	0	0
0	1	0	0
0	0	1	0

Space Comparison

$D :=$ cardinality

$D_{city} = 3$

$D_{street} = 4$

$N :=$ # of tuples

$N = |\text{Colleagues}| = 12$

city		
new york	cuppertino	berlin
1	0	0
0	1	0
0	0	1
0	0	1
1	0	0
0	1	0
1	0	0
0	0	1
0	0	1
0	0	1
1	0	0
0	0	1

street			
unistreet	macstreet	longstreet	msstreet
1	0	0	0
0	1	0	0
0	0	1	0
1	0	0	0
0	0	0	1
0	0	1	0
1	0	0	0
0	1	0	0
0	0	1	0
1	0	0	0
0	1	0	0
0	0	1	0

$$\underbrace{D}_{1{,}000} \times \underbrace{N}_{1{,}000{,}000} = 1{,}000{,}000{,}000 \text{ bits} = \underline{120 \text{ MB}}$$

Bitmap Applications

WHERE-clause with AND, OR, ...

OLAP

ONLINE ANALYTICAL PROCESSING

DWH

Bitmap Applications

WHERE-clause with AND, OR, ...

building block for query processing