

# Bit Map Index

Kathleen Durant PhD

CS3200

Northeastern University

# Bit Map Index

- When an index field has few values, the index can be represented as a bit map
- For each value for the index field, assign a bit to that value
- Set the bit if the record has that value
- Similar concept to data type found in MySQL to enum

# Bitmap Index Example

STAFF

ID	Fname	Lname	Salary	Position	Branch
SG14	John	White	18000	Manager	B005
SG37	Flo	Beech	12000	Assistant	B003
SL21	Carson	Ford	30000	Supervisor	B003
SL41	Mary	Howel	9000	Assistant	B007
SL21	Susan	Brand	30000	Assistant	B003
SL41	Julie	Lee	9000	Manager	B007

(Position)

Supervisor	Assistant	Manager
0	0	1
0	1	0
1	0	0
0	1	0
0	1	0
0	0	1

Data File

Bitmap Index

Only 3 different  
position values

Supervisor

Assistant

Manager

# Can have multiple bit map indexes

(Branch)

B003	B005	B007
0	1	0
1	0	0
1	0	0
0	0	1
1	0	0
0	0	1

(Position)

Supervisor	Assistant	Manager
0	0	1
0	1	0
1	0	0
0	1	0
0	1	0
0	0	1

ID	Fname	Lname	Salary	Position	Branch
SG14	John	White	18000	Manager	B005
SG37	Flo	Beech	12000	Assistant	B003
SL21	Carson	Ford	30000	Supervisor	B003
SL41	Mary	Howel	9000	Assistant	B007
SL21	Susan	Brand	30000	Assistant	B003
SL41	Julie	Lee	9000	Manager	B007

# Can use bitwise operations to answer queries

(Branch)

B003	B005	B007
0	1	0
1	0	0
1	0	0
0	0	1
1	0	0
0	0	1

(Position)

Supervisor	Assistant	Manager
0	0	1
0	1	0
1	0	0
0	1	0
0	1	0
0	0	1

ID	Fname	Lname	Salary	Position	Branch
SG14	John	White	18000	Manager	B005
SG37	Flo	Beech	12000	Assistant	B003
SL21	Carson	Ford	30000	Supervisor	B003
SL41	Mary	Howel	9000	Assistant	B007
SL21	Susan	Brand	30000	Assistant	B003
SL41	Julie	Lee	9000	Manager	B007

```
SELECT *  
FROM staff  
WHERE position = 'Manager'  
AND Branch = 'B007';
```

# Bitmap index

- Bitmap index is a good alternative for secondary indexes when there are few values for the index key
- Allows simple bit map operations to minimize the I/O's for a query