

nested loop join 으로 유도하라! 세번째

# ■ 학습 내용

- 1. 연결고리가 되는 컬럼에 인덱스가 있었을때 두개의 테이블 조인시 성능을 높이는 방법 배우기
- 2. 연결고리가 되는 컬럼에 인덱스가 있고 검색조건이 별도로 있었을때 조인의 성능을 높이는 방법 배우기

## ■ 학습 목표

여러개의 테이블을 조인할 때 인덱스를 사용할 수 있으며 조인되는 순서를 올바르게 제시할 수 있습니다.

### 1.조인하려는 테이블 사이의 연결고리에 인덱스가 없었을때

select /\*+ leading(d e) use\_nl(e) \*/ e.ename, d.loc
from emp e, dept d
where e.deptno = d.deptno;

### emp 테이블

full table scan!

#### dept 테이블

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	СОММ	DEPTNO
7839	KING	PRESIDENT		1981-11-17	5000		10
7698	BLAKE	MANAGER	7839	1981-05-01	2850		30
7782	CLARK	MANAGER	7839	1981-05-09	2450		10
7566	JONES	MANAGER	7839	1981-04-01	2975		20
7654	MARTIN	SALESMAN	7698	1981-09-10	1250	1400	30
7499	ALLEN	SALESMAN	7698	1981-02-11	1600	300	30
7844	TURNER	SALESMAN	7698	1981-08-21	1500	0	30
7900	JAMES	CLERK	7698	1981-12-11	950		30
7521	WARD	SALESMAN	7698	1981-02-23	1250	500	30
7902	FORD	ANALYST	7566	1981-12-11	3000		20
7369	SMITH	CLERK	7902	1980-12-09	800		20
7788	SCOTT	ANALYST	7566	1982-12-22	3000		20
7876	ADAMS	CLERK	7788	1983-01-15	1100		20
7934	MILLER	CLERK	7782	1982-01-11	1300		10

DEPTNO	DNAME	LOC
10	ACCOUNTING	NEW YORK
20	RESEARCH	DALLAS
30	SALES	CHICAGO
40	OPERATIONS	BOSTON

buffer 35개

### 2.조인하려는 테이블 사이의 연결고리에 인덱스가 있었을때

select /\*+ leading(d e) use\_nl(e) index(emp emp\_deptno) \*/ e.ename, d.loc from emp e, dept d index range scan! where e.deptno = d.deptno;



emp\_deptno인덱스

dent 테이블

				P " 'E					_			_	· ·		
EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	СОММ	DEPTNO	ROWID		ROWID	DEPTNO		DEPTNO	DNAME	LOC
7839	KING	PRESIDENT		1981-11-17	5000		10	AAAXzDAANAAAC2eAAA	<b>←</b>	XzDAANAAAC2eAAA	10	<b>——</b>	10	ACCOUNTING	NEW YORK
7698	BLAKE	MANAGER	7839	1981-05-01	2850		30	AAAXzDAANAAAC2eAAB		AAAXzDAANAAAC2eAAC	10		20	RESEARCH	DALLAS
7782	CLARK	MANAGER	7839	1981-05-09	2450		10	AAAXzDAANAAAC2eAAC		AAAXzDAANAAAC2eAAN	10		30	SALES	CHICAGO
7566	JONES	MANAGER	7839	1981-04-01	2975		20	AAAXzDAANAAAC2eAAD	<b>←</b>	AAAXzDAANAAAC2eAAD	20	<b>f</b> /l	40	OPERATIONS	BOSTON
7654	MARTIN	SALESMAN	7698	1981-09-10	1250	1400	30	AAAXzDAANAAAC2eAAE		AAAXzDAANAAAC2eAAJ	20	] /			
7499	ALLEN	SALESMAN	7698	1981-02-11	1600	300	30	AAAXzDAANAAAC2eAAF		AAAXzDAANAAAC2eAAK	20	] /			
7844	TURNER	SALESMAN	7698	1981-08-21	1500	0	30	AAAXzDAANAAAC2eAAG		AAAXzDAANAAAC2eAAL	20	]/	but	ffer 1	<b>07H</b>
7900	JAMES	CLERK	7698	1981-12-11	950		30	AAAXzDAANAAAC2eAAH	] <b>/ </b> /	AAXzDAANAAAC2eAAM	20	/			• "
7521	WARD	SALESMAN	7698	1981-02-23	1250	500	30	AAAXzDAANAAAC2eAAI	///	AAAXzDAANAAAC2eAAB	30	]			
7902	FORD	ANALYST	7566	1981-12-11	3000		20	AAAXzDAANAAAC2eAAJ		AAAXzDAANAAAC2eAAE	30				
7369	SMITH	CLERK	7902	1980-12-09	800		20	AAAXzDAANAAAC2eAAK		AAAXzDAANAAAC2eAAF	30				
7788	SCOTT	ANALYST	7566	1982-12-22	3000		20	AAAXzDAANAAAC2eAAL	]7	AAAXzDAANAAAC2eAAG	30				
7876	ADAMS	CLERK	7788	1983-01-15	1100		20	AAAXzDAANAAAC2eAAM		AAAXzDAANAAAC2eAAH	30				
7934	MILLER	CLERK	7782	1982-01-11	1300		10	AAAXzDAANAAAC2eAAN	<b>V</b>	AAAXzDAANAAAC2eAAI	30				

L	<i>D</i> 1.1.10	DIW WILL	
I	10	ACCOUNTING	NEW YORK
	20	RESEARCH	DALLAS
	30	SALES	CHICAGO
	40	OPERATIONS	BOSTON
_		-	

### 3. 검색 조건이 있었을때의 조인문장 튜닝

select /\*+ leading(e d) use\_nl(d) index(dept dept\_deptno) \*/ e.ename, d.loc from emp e, dept d
where e.deptno = d.deptno and e.ename='SCOTT';



#### emp 테이블

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	СОММ	DEPTNO
7839	KING	PRESIDENT		1981-11-17	5000		10
7698	BLAKE	MANAGER	7839	1981-05-01	2850		30
7782	CLARK	MANAGER	7839	1981-05-09	2450		10
7566	JONES	MANAGER	7839	1981-04-01	2975		20
7654	MARTIN	SALESMAN	7698	1981-09-10	1250	1400	30
7499	ALLEN	SALESMAN	7698	1981-02-11	1600	300	30
7844	TURNER	SALESMAN	7698	1981-08-21	1500	0	30
7900	JAMES	CLERK	7698	1981-12-11	950		30
7521	WARD	SALESMAN	7698	1981-02-23	1250	500	30
7902	FORD	ANALYST	7566	1981-12-11	3000		20
7369	SMITH	CLERK	7902	1980-12-09	800		20
7788	SCOTT	ANALYST	7566	1982-12-22	3000		20
7876	ADAMS	CLERK	7788	1983-01-15	1100		20
7934	MILLER	CLERK	7782	1982-01-11	1300		10

#### dept\_deptno인덱스

#### dept 테이블

DEPTNO	ROWID		DEPTNO	DNAME	LOC
10	AAAXzCAANAA		10	ACCOUNTING	NEW YO
20	ACz+AAA AAAXzCAANAA		20	RESEARCH	DALLAS
	ACz+AAB AAAXzCAANAA		30	SALES	CHICAG
30	ACz+AAC		40	OPERATIONS	BOSTON
40	AAAXzCAANAA ACz+AAD				I

buffer 9개

### 3.검색조건에 인덱스까지 걸어준다면?

select /\*+ leading(e d) use\_nl(d) index(emp emp\_ename) index(dept dept\_deptno) \*/ e.ename, d.loc

from emp e, dept d where e.deptno = d.deptno and e.ename='SCOTT';

index 생성

index 생성

emp\_ename인덱스

**ENAME ADAMS** 

BLAKE

**JONES** 

MARTIN

|--|

ROWID	EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	СОММ	DEPTNO
AATifAAHAAA DL1AAM	7839	KING	PRESIDENT		1981-11-17	5000		10
AATifAAHAAA DL1AAF	7698	BLAKE	MANAGER	7839	1981-05-01	2850		30
AATifAAHAAA DL1AAB	7782	CLARK	MANAGER	7839	1981-05-09	2450		10
AATifAAHAAA DL1AAC	7566	JONES	MANAGER	7839	1981-04-01	2975		20
AATifAAHAAA DL1AAJ	7654	MARTIN	SALESMAN	7698	1981-09-10	1250	1400	30
AATifAAHAAA DL1AAH	7499	ALLEN	SALESMAN	7698	1981-02-11	1600	300	30
AATifAAHAAA DL1AAD	7844	TURNER	SALESMAN	7698	1981-08-21	1500	0	30
AATifAAHAAA DL1AAA	7900	JAMES	CLERK	7698	1981-12-11	950		30
AATifAAHAAA DL1AAE	7521	WARD	SALESMAN	7698	1981-02-23	1250	500	30
AATifAAHAAA DI 1AAN	7902	FORD	ANALYST	7566	1981-12-11	3000		20
AATifAAHAAA DL1AAL	7369	SMITH	CLERK	7902	1980-12-09	800		20
AATifAAHAAA DL1AAK	7788	SCOTT	ANALYST	7566	1982-12-22	3000		20
AATifAAHAAA DL1AAG	7876	ADAMS	CLERK	7788	1983-01-15	1100		20
AATifAAHAAA	7934	MILLER	CLERK	7782	1982-01-11	1300		10

dept\_deptno인덱스

#### dept 테이블

	DEPTNO	ROWID			
	10	AAAXzCAANAA ACz+AAA			
	<b>4</b> 20	AAAXzCAANAA AC7+AAB			
	30	AAAXzCAANAA ACz+AAC			
	40	AAAXzCAANAA ACz+AAD			
7					

DEPTNO	DNAME	LOC
10	ACCOUNTING	NEW YORK
20	RESEARCH	DALLAS
30	SALES	CHICAGO
40	OPERATIONS	BOSTON

buffer 4개

### 4.조건이 여러개일 때의 조인문장 튜닝

select /\*+ gather\_plan\_statistics leading(d e) use\_nl(e) \*/ e.ename, e.sal, d.loc
from emp e, dept d
where e.deptno = d.deptno and e.job='SALESMAN' and d.loc='CHICAGO';



emp 테이블

			CIII					
EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	СОММ	DEPTNO	ROWID
7839	KING	PRESIDENT		1981-11-17	5000		10	AAAXzDAANAAAC2eAAA
7698	BLAKE	MANAGER	7839	1981-05-01	2850		30	AAAXzDAANAAAC2eAAB
7782	CLARK	MANAGER	7839	1981-05-09	2450		10	AAAXzDAANAAAC2eAAC
7566	JONES	MANAGER	7839	1981-04-01	2975		20	AAAXzDAANAAAC2eAAD
7654	MARTIN	SALESMAN	7698	1981-09-10	1250	1400	30	AAAXzDAANAAAC2eAAE
7499	ALLEN	SALESMAN	7698	1981-02-11	1600	300	30	AAAXzDAANAAAC2eAA
7844	TURNER	SALESMAN	7698	1981-08-21	1500	0	30	AAAXzDAANAAAC2e G
7900	JAMES	CLERK	7698	1981-12-11	950		30	AAAXzDAANAAAC2eAAH
7521	WARD	SALESMAN	7698	1981-02-23	1250	500	30	AAAXzDAANAAAC2eAAI
7902	FORD	ANALYST	7566	1981-12-11	3000		20	AAAXzDAANAAAC2eA
7369	SMITH	CLERK	7902	1980-12-09	800		20	AAAXzDAANAAAC2eAAK
7788	SCOTT	ANALYST	7566	1982-12-22	3000		20	AAAXzDAANAAAC2eAAL
7876	ADAMS	CLERK	7788	1983-01-15	1100		20	AAAXzDAANAAAC2eAAM
7934	MILLER	CLERK	7782	1982-01-11	1300		10	AAAXzDAANAAAC2eAAN

#### emp\_deptno인덱스

ROWID	DEPTNO	
AAAXzDAANAAAC2eAAA	10	
AAAXzDAANAAAC2eAAC	10	
AAAXzDAANAAAC2eAAN	10	
AAAXzDAANAAAC2eAAD	20	
AAAXzDAANAAAC2eAAJ	20	
AAAXzDAANAAAC2eAAK	20	
AAAXzDAANAAAC2eAAL	20	١,
AAAXzDAANAAAC2eAAM	20	
AAAXzDAANAAAC2eAAB	30	
AAAXzDAANAAAC2eAAE	30	
AAAXzDAANAAAC2eAAF	30	
AAAXzDAANAAAC2eAAG	30	
AAAXzDAANAAAC2eAAH	30	
AAAXzDAANAAAC2eAAI	30	

#### dept 테이블

	DEPTNO	DNAME	LOC
	10	ACCOUNTING	NEW YORK
	20	RESEARCH	DALLAS
	30	SALES	CHICAGO
Ī	40	OPERATIONS	BOSTON

buffer 97H

### 5.조건이 여러개일 때 검색조건에 인덱스가 있다면?

select /\*+ gather\_plan\_statistics leading(d e) use\_nl(e)

index(dept dept\_loc) index(emp emp\_deptno) \*/ e.ename, e.sal, d.loc

from emp e, dept d

where e.deptno = d.deptno and e.job='SALESMAN' and d.loc='CHICAGO';

index 생성 emp 테이블

emp\_deptno인덱스

index 생성 dept 테이블

dept\_loc 인덱스

<u> </u>									
	ROWID	DEPTNO	СОММ	SAL	HIREDATE	MGR	JOB	ENAME	EMPNO
	AAAXzDAANAAAC2eAAA	10		5000	1981-11-17		PRESIDENT	KING	7839
	AAAXzDAANAAAC2eAAB	30		2850	1981-05-01	7839	MANAGER	BLAKE	7698
\	AAAXzDAANAAAC2eAAC	10		2450	1981-05-09	7839	MANAGER	CLARK	7782
	AAAXzDAANAAAC2eAAD	20		2975	1981-04-01	7839	MANAGER	JONES	7566
	AAAXzDAANAAAC2eAAE	30	1400	1250	1981-09-10	7698	SALESMAN	MARTIN	7654
N	AAAXzDAANAAAC2eAAF	30	300	1600	1981-02-11	7698	SALESMAN	ALLEN	7499
\  \	AAAXzDAANAAAC2eAAG	30	0	1500	1981-08-21	7698	SALESMAN	TURNER	7844
	AAAXzDAAN AAC2eAA Y	30		950	1981-12-11	7698	CLERK	JAMES	7900
\\	AAAXzDA, NAAAI ReAAI	30	500	1250	1981-02-23	7698	SALESMAN	WARD	7521
1	AAAXzDAANAA C2eA	20		3000	1981-12-11	7566	ANALYST	FORD	7902
	AAAXzDAANAAAC2e AK	20		800	1980-12-09	7902	CLERK	SMITH	7369
( )	AAAXzDAANAAAC2eAAL	20		3000	1982-12-22	7566	ANALYST	SCOTT	7788
1	AAAXzDAANAAAC2eAAM	20		1100	1983-01-15	7788	CLERK	ADAMS	7876
	AAAXzDAANAAAC2eAAN	10		1300	1982-01-11	7782	CLERK	MILLER	7934

	ROWID	DEPTNO		
	AAAXzDAANAAAC2eAAA	10		
	AAAXzDAANAAAC2eAAC	10	l.	L
	AAAXzDAANAAAC2eAAN	10		L
.\	AAAXzDAANAAAC2eAAD	20		L <sub>l</sub>
	AAXzDAANAAAC2eAAJ	20		I
V	AAA (zDAANAAAC2eAAK	20		
	AAXZI AANAAAC2eAAL	20	I	
\	AAAX DAA IAAAC2eAAM	20		
	AAAXzDAA (AAAC2eAAB	30		
1	AA XzDAANAAAC2eAAE	30		
	AXzDAANAAAC2eAAF	30		
	AAAXzDAANAAAC2eAAG	30		
	AAAXzDAANAAAC2eAAH	30		
	AAAXzDAANAAAC2eAAI	30		

DEPTNO	DNAME	LOC			
10	ACCOUNTING	NEW YORK			
20	RESEARCH	DALLAS	İ		
30	SALES	CHICAG			
40	OPERATIONS	BOSTON	_		

	ROWI D	LOC
(	AAAXzDAANAAAC2 eAAA	BOSTON
	AAAXzDA NAAAC2 eAAC	CHCAGO
	AAAXzDAANAAAC2 eAAN	DALLAS
	AAAXzDAANAAAC2 eAAD	NEW YORK

buffer 47H