

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(e 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				

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

### 3. 검색 조건이 있었을때의 조인문장 튜닝

select /\*+ leading(e d) use\_nl(d) index(d 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 YOR
20	ACz+AAA AAAXzCAANAA		20	RESEARCH	DALLAS
	ACz+AAB AAAXzCAANAA		30	SALES	CHICAGO
30	ACz+AAC		40	OPERATIONS	BOSTON
40	AAAXzCAANAA ACz+AAD				

buffer 9개

### 3.검색조건에 인덱스까지 걸어준다면?

select /\*+ leading(e d) use\_nl(d) index(e emp\_ename) index(d 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

**ROWID** 

**ENAME** 

ΔΠΔΜς

emp 테이블

	EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	СОММ
AA	7839	KING	PRESIDENT		1981-11-17	5000	
AΑ	7698	BLAKE	MANAGER	7839	1981-05-01	2850	
^ \							

ADAIVIS	DL1AAM	
ALLEN	AAATifAAHAAA DL1AAF	
BLAKE	AAATifAAHAAA DL1AAB	
CLARK	AAATifAAHAAA DL1AAC	
FORD	AAATifAAHAAA DL1AAJ	
JAMES	AAATifAAHAAA DL1AAH	
JONES	AAATifAAHAAA DL1AAD	
KING	AAATifAAHAAA DL1AAA	
MARTIN	AAATifAAHAAA DL1AAE	
MILLER	AAATifAAHAAA DI 1AAN	
SCOTT	AAATifAAHAAA DL1AAL	
SMITH	AAATifAAHAAA DL1AAK	
TURNER	AAATifAAHAAA DL1AAG	
	A A A T'CA ALLA A A	

AAATifAAHAAA DL1AAM	7839	KING	PRESIDENT		1981-11-17	5000		10
AAATifAAHAAA DL1AAF	7698	BLAKE	MANAGER	7839	1981-05-01	2850		30
AAATifAAHAAA DL1AAB	7782	CLARK	MANAGER	7839	1981-05-09	2450		10
AAATifAAHAAA DL1AAC	7566	JONES	MANAGER	7839	1981-04-01	2975		20
AAATifAAHAAA DL1AAJ	7654	MARTIN	SALESMAN	7698	1981-09-10	1250	1400	30
AAATifAAHAAA DL1AAH	7499	ALLEN	SALESMAN	7698	1981-02-11	1600	300	30
AAATifAAHAAA DL1AAD	7844	TURNER	SALESMAN	7698	1981-08-21	1500	0	30
AAATifAAHAAA DL1AAA	7900	JAMES	CLERK	7698	1981-12-11	950		30
AAATifAAHAAA DL1AAE	7521	WARD	SALESMAN	7698	1981-02-23	1250	500	30
AAATifAAHAAA DI 1AAN	7902	FORD	ANALYST	7566	1981-12-11	3000		20
AAATifAAHAAA DL1AAL	7369	SMITH	CLERK	7902	1980-12-09	800		20
AAATifAAHAAA DL1AAK	7788	SCOTT	ANALYST	7566	1982-12-22	3000		20
AAATifAAHAAA DL1AAG	7876	ADAMS	CLERK	7788	1983-01-15	1100		20
AAATifAAHAAA DL1AAI	7934	MILLER	CLERK	7782	1982-01-11	1300		10

dept\_deptno인덱스 de

**DEPTNO** 

dept	는 테이	이블
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[	DEPTNO	ROWID	
10		AAAXzCAANAA ACz+AAA	
<b>2</b> 0		AAAXzCAANAA ACz+AAB	
	30	AAAXzCAANAA ACz+AAC	
40		AAAXzCAANAA ACz+AAD	
1			

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

	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
	40	OPERATIONS	BOSTON

buffer 97H

### 5.조건이 여러개일 때 검색조건에 인덱스가 있다면?

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

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	AAAXzDAANAAAC2eAAF
7844	TURNER	SALESMAN	7698	1981-08-21	1500	0	30	AAAXzDAANAAAC2eAAG
7900	JAMES	CLERK	7698	1981-12-11	950		30	AAAXzDAAN AAC2eAX i
7521	WARD	SALESMAN	7698	1981-02-23	1250	500	30	AAAXzDA, MAAAL PeAAI
7902	FORD	ANALYST	7566	1981-12-11	3000		20	AAAXzDAANAA C2eA
7369	SMITH	CLERK	7902	1980-12-09	800		20	AAAXzDAANAAAC2& AK
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

	ROWID	DEPTNO		
	AAAXzDAANAAAC2eAAA	10		
	AAAXzDAANAAAC2eAAC	10	l.	L
	AAAXzDAANAAAC2eAAN	10		L
١,	AAAXzDAANAAAC2eAAD	20	ľ	
	AAXzDAANAAAC2eAAJ	20		I
K	AAA (zDAANAAAC2eAAK	20		
	AAXZI AANAAAC2eAAL	20		'
١	AAAX DAA IAAAC2eAAM	20	Ļ	
\	AAAXzDAA (AAAC2eAAB	30		
1	AA XzDAANAAAC2eAAE	30		
	AXzDAANAAAC2eAAF	30		
•	AAAXzDAANAAAC2eAAG	30		
1	AAAXzDAANAAAC2eAAH	30		
	AAAXzDAANAAAC2eAAI	30		

DEPTNO		DNAME	LOC	
10		ACCOUNTING	NEW YORK	ľ
	20	RESEARCH	DALLAS	ľ
	30	SALES	CHICAG	
1	40	OPERATIONS	BOSTON	1

	D	LOC
4	AAAXzDAANAAAC2 eAAA	BOSTON
	AAAXzDA NAAAC2 eAAC	CHCAGO
1	AAAXzDAANAAAC2 eAAN	DALLAS
	AAAXzDAANAAAC2 eAAD	NEW YORK

buffer 47H