6-2. CTE와 SQL 처리과정

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1. WITH 절 or CTE (Common Table Expression)

- 서브쿼리의 일종

- WITH 절(clause)이라고도 하고 CTE 라고도 함

- 하나의 서브쿼리를 또 다른 서브쿼리에서 참조하여 재 사용 가능한 구문

- 오라클 11g 까지는 하나의 서브쿼리에서 다른 서브쿼리 참조 못했음
  - ➔ WITH 절 사용
  - ➔ 오라클 12c 부터는 LATERAL 키워드 사용해 가능

1. WITH 절 or CTE

▪ WITH절 구문

WITH alias1 **AS** (SELECT …

FROM …),

alias2 **AS** (SELECT …

FROM …),

….

alias_last **AS** (SELECT …

FROM …)

SELECT …

FROM alias_last

… ;

▪ **WITH 별칭 AS 다음에 서브쿼리 형태**

▪ **WITH**은 한 번만 명시, 서브쿼리는 여러 개 사용 가능

▪ 최종 반환 결과는 마지막에 있는 메인 쿼리

▪ 서브쿼리 내에서 다른 서브쿼리 참조 가능
➔ 서브쿼리 내의 **FROM** 절에서 다른 서브쿼리 별칭을 기술해 인라인 뷰처럼 사용 가능

▪ 메인 쿼리에서는 **FROM** 절에서 서브쿼리 한 개, 혹은 여러 개의 서브쿼리 조인해 결과 조회 가능

2. WITH 절 or CTE 실습

WITH dept AS (

SELECT department_id,

department_name dept_name

FROM departments

)

SELECT a.employee_id

,a.first_name || ' ' || a.last_name

FROM employees a,

dept b

WHERE a.department_id = b.department_id

ORDER BY 1;

	EMPLOYEE_ID	A.FIRST_NAME||''||A.LAST_NAME
73	172	Elizabeth Bates
74	173	Sundita Kumar
75	174	Ellen Abel
76	175	Alyssa Hutton
77	176	Jonathon Taylor
78	177	Jack Livingston
79	179	Charles Johnson
80	180	Winston Taylor
81	181	Jean Fleaur
82	182	Martha Sullivan
83	183	Girard Geoni

2. WITH 절 or CTE 실습

WITH **dept_loc** AS (

SELECT a.department_id, a.department_name dept_name,

    b.location_id, b.street_address, b.city, b.country_id

 FROM departments a,

    locations b

 WHERE a.location_id = b.location_id

),

cont AS (

SELECT b.department_id, b.dept_name,

    b.street_address, b.city, a.country_name

 FROM countries a,

    dept_loc b

 WHERE a.country_id = b.country_id

)

SELECT a.employee_id, a.first_name || ' ' || a.last_name emp_name,

    b.dept_name, b.street_address, b.country_name

 FROM employees a, **cont b**

 WHERE a.department_id = b.department_id

 ORDER BY 1;

	EMPLOYEE_ID	EMP_NAME	DEPT_NAME	STREET_ADDRESS	COUNTRY_NAME
76	175	Alyssa Hutton	Sales	Magdalen Centre, The ...	United Kingdom
77	176	Jonathon Taylor	Sales	Magdalen Centre, The ...	United Kingdom
78	177	Jack Livingston	Sales	Magdalen Centre, The ...	United Kingdom
79	179	Charles Johnson	Sales	Magdalen Centre, The ...	United Kingdom
80	180	Winston Taylor	Shipping	2011 Interiors Blvd	United States of America
81	181	Jean Fleaur	Shipping	2011 Interiors Blvd	United States of America
82	182	Martha Sullivan	Shipping	2011 Interiors Blvd	United States of America
83	183	Girard Geoni	Shipping	2011 Interiors Blvd	United States of America
84	184	Nandita Sarchand	Shipping	2011 Interiors Blvd	United States of America
85	185	Alexis Bull	Shipping	2011 Interiors Blvd	United States of America
86	186	Julia Dellinger	Shipping	2011 Interiors Blvd	United States of America
87	187	Anthony Cabrio	Shipping	2011 Interiors Blvd	United States of America
88	188	Kelly Chung	Shipping	2011 Interiors Blvd	United States of America

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2. WITH 절 or CTE 실습

WITH **emp_info** AS (

SELECT a.employee_id,

    a.first_name || ' ' || a.last_name emp_name,

    b.department_id, b.department_name dept_name,

    c.street_address, c.city,

    d.country_name, e.region_name

 FROM employees a,   departments b,

    locations c,   countries d,   regions e

WHERE a.department_id = b.department_id

  AND b.location_id   = c.location_id

  AND c.country_id   = d.country_id

  AND d.region_id   = e.region_id

)

SELECT *

 FROM **emp_info**

 ORDER BY 1;

	EMPLOYEE_ID	EMP_NAME	DEPARTMENT_ID	DEPT_NAME	STREET_ADDRESS	CITY	COUNTRY_NAME	REGION_NAME
73	172	Elizabeth Bates	80	Sales	Magdalen Centre, The Oxford Science Park	Oxford	United Kingdom	Europe
74	173	Sundita Kumar	80	Sales	Magdalen Centre, The Oxford Science Park	Oxford	United Kingdom	Europe
75	174	Ellen Abel	80	Sales	Magdalen Centre, The Oxford Science Park	Oxford	United Kingdom	Europe
76	175	Alyssa Hutton	80	Sales	Magdalen Centre, The Oxford Science Park	Oxford	United Kingdom	Europe
77	176	Jonathon Taylor	80	Sales	Magdalen Centre, The Oxford Science Park	Oxford	United Kingdom	Europe
78	177	Jack Livingston	80	Sales	Magdalen Centre, The Oxford Science Park	Oxford	United Kingdom	Europe
79	179	Charles Johnson	80	Sales	Magdalen Centre, The Oxford Science Park	Oxford	United Kingdom	Europe
80	180	Winston Taylor	50	Shipping	2011 Interiors Blvd	South San Francisco	United States of America	Americas
81	181	Jean Fleaur	50	Shipping	2011 Interiors Blvd	South San Francisco	United States of America	Americas
82	182	Martha Sullivan	50	Shipping	2011 Interiors Blvd	South San Francisco	United States of America	Americas
83	183	Girard Geoni	50	Shipping	2011 Interiors Blvd	South San Francisco	United States of America	Americas
84	184	Nandita Sarchand	50	Shipping	2011 Interiors Blvd	South San Francisco	United States of America	Americas
85	185	Alexis Bull	50	Shipping	2011 Interiors Blvd	South San Francisco	United States of America	Americas

2. WITH 절 or CTE 실습

WITH **coun_sal** AS (

SELECT c.country_id, SUM(a.salary) sal_amt

  FROM employees a,

     departments b,

     locations c

 WHERE a.department_id = b.department_id

  AND b.location_id = c.location_id

GROUP BY c.country_id),

mains AS (

SELECT b.country_name, a.sal_amt

 FROM **coun_sal** a,

    countries b

 WHERE a.country_id = b.country_id   )

SELECT *

 FROM **mains**

 ORDER BY 1;

	COUNTRY_NAME	SAL_AMT
1	Canada	19000
2	Germany	10000
3	United Kingdom	311000
4	United States of America	344416

3. WITH 절 특징
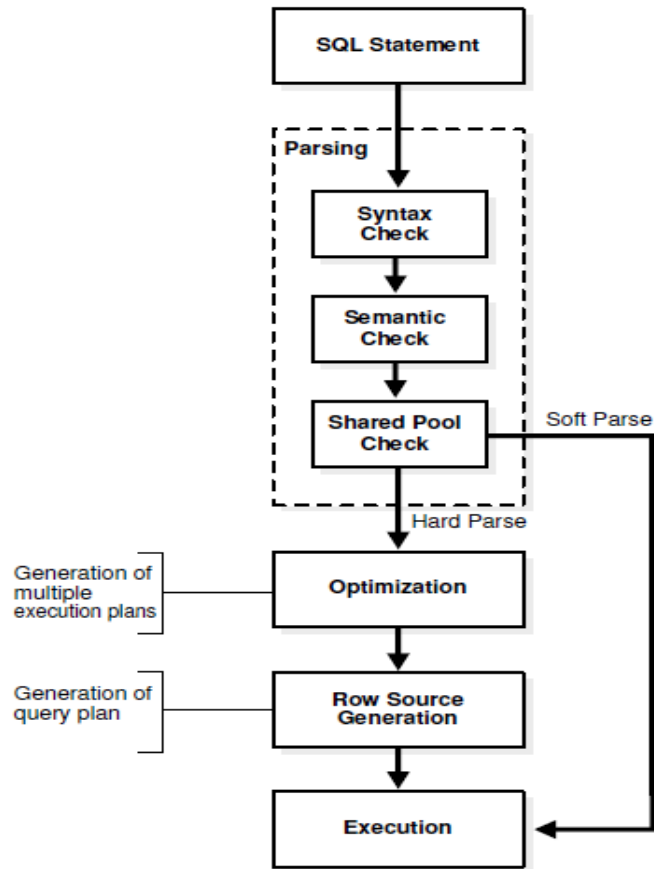
- WITH 절은 내부적으로 TEMP 테이블 스페이스를 사용함
  ➔ TEMP 테이블스페이스에 각 서브쿼리 결과를 담아두고 있음

- TEMP 테이블스페이스는 정렬 용도로 사용

- 과도한 WITH 절 사용 시, TEMP 테이블스페이스 공간을 점유해 성능에 좋지 않음

- 일반적인 경우에는 서브쿼리를 사용하고, 서브쿼리 사용이 수월치 않은 경우 WITH 절 사용

4. SQL 처리과정

· SQL 문장을 작성해 실행하면 오라클 내부에서 어떻게 처리될까?

· SQL 내부 처리 프로세스
  - SQL Syntax Check
  - SQL Semantic Check
  - 가능한 여러 개의 실행계획(Execution Plan) 수립
  - 최적의 실행계획을 선택 해 SQL 실행
  - 실행 결과 반환

4. SQL 처리과정

Figure 3-1   Stages of SQL Processing

- SQL Statement
- Parsing
  - Syntax Check
  - Semantic Check
  - Shared Pool Check → Soft Parse
- Hard Parse
- Generation of multiple execution plans — Optimization
- Generation of query plan — Row Source Generation
- Execution

출처: Oracle Database SQL Tuning Guide (Oracle 18c Manual)

▪ **Syntax Check : SQL 문장 검사 (오타 등)**

예) select * **form** employees;

ORA-00923: FROM keyword not found where expected

▪ **Semantic Check : 의미 검사, 객체 권한 검사**

예) select * from **hong**;

ORA-00942: table or view does not exist

▪ **Shared Pool Check : SQL문장에 ID 부여 등**

▪ **Optimization**

- **SQL 문장을 최적화 해 재작성**

- **여러 개의 실행계획 생성**

▪ **Row Source Generation : 최적의 실행계획 선정**

▪ **Execution : 실행**

4. SQL 처리과정

- 최적의 실행계획이란 ?

- 내비게이션 시스템과 비슷함

- 여러 개의 실행계획을 세우고 그 중 가장 비용(Cost)이 낮은 계획을 선택해 실행
    ➔ 가장 빨리 결과를 내는 실행계획을 선택

4. SQL 처리과정

· 회사 → 러닝스푼즈
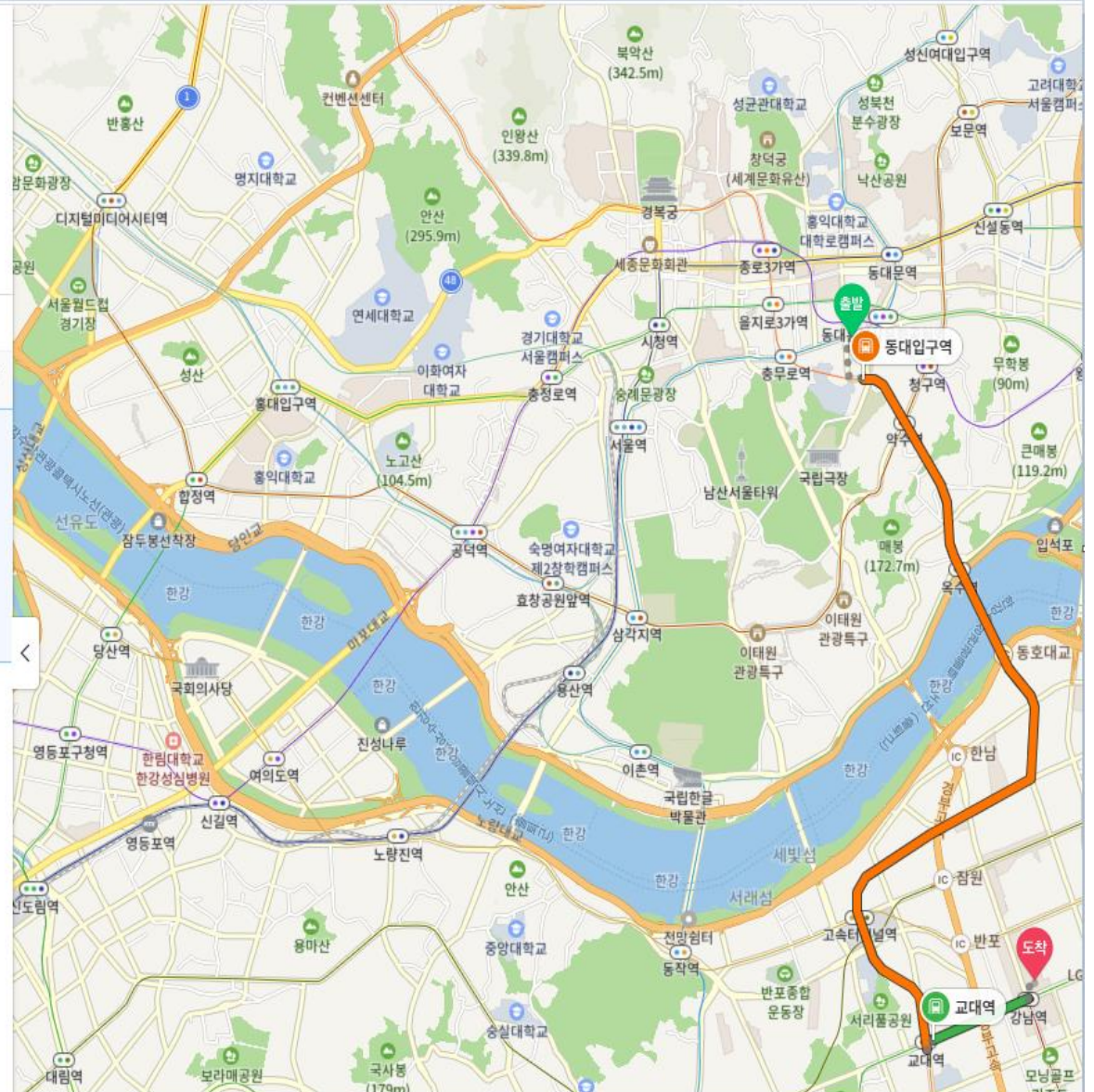
4. SQL 처리과정

- 최적의 실행계획을 위해서는 테이블의 통계정보를 최신으로 갱신

- 통계정보 : 테이블의 로우 수, 블록 수 등 실행계획을 세우기 위한 기초 정보

- 같은 테이블에 100건, 10000건, 백만 건 있을 경우에 따라 통계정보 달라짐
  - 조인 시, 어떤 테이블을 먼저 읽느냐에 따라 성능 차이 발생

- 내비게이션에서 현재 교통상황을 반영하면 경로가 달라지는 것과 유사

4. SQL 처리과정

- 오라클 버전이 올라갈수록 실행계획을 잘 세우고 있음

- 실행계획을 잘 못 세웠을 경우, **SQL** 실행 계획을 조정해 성능을 향상
   ➔ **SQL 튜닝 (힌트 사용)**

- 대부분의 경우, 튜닝 시 조인 방식과 순서를 변경

4. SQL 처리과정

- 실행했던 SQL 이력 조회 (ORAUSER로 접속해 실행)

```
SELECT *
   FROM V$SQL;
```

4. SQL 처리과정

WITH coun_sal AS (*/*+ gather_plan_statistics */*

SELECT c.country_id, SUM(a.salary) sal_amt

  FROM employees a,

    departments b,

    locations c

 WHERE a.department_id = b.department_id

  AND b.location_id = c.location_id

GROUP BY c.country_id),

mains AS (

SELECT b.country_name, a.sal_amt

  FROM coun_sal a,

    countries b

 WHERE a.country_id = b.country_id

)

SELECT *

  FROM mains

 ORDER BY 1;

```
SQL_ID  dr3g074gz5bw7, child number 0
-------------------------------------
WITH coun_sal AS ( /*+ gather_plan_statistics */ SELECT c.country_id,
SUM(a.salary) sal_amt   FROM employees a, /* HONG */        departments
b,        locations c  WHERE a.department_id = b.department_id      AND
b.location_id = c.location_id GROUP BY c.country_id ), mains AS (
SELECT b.country_name, a.sal_amt    FROM coun_sal a,        countries b
WHERE a.country_id = b.country_id ) SELECT *   FROM mains  ORDER BY 1

Plan hash value: 2024698841
```

Id	Operation	Name	E-Rows	E-Bytes	Cost (%CPU)	E-Time	OMem	1Mem	Used-Mem
0	SELECT STATEMENT				8 (100)				
1	SORT GROUP BY		106	3392	8 (13)	00:00:01	2048	2048	2048 (0)
* 2	HASH JOIN		106	3392	7 (0)	00:00:01	1236K	1236K	1619K (0)
* 3	HASH JOIN		29	725	4 (0)	00:00:01	1476K	1476K	1592K (0)
4	NESTED LOOPS		23	414	2 (0)	00:00:01			
5	VIEW	index$_join$_003	23	138	2 (0)	00:00:01			
* 6	HASH JOIN						1610K	1610K	1606K (0)
7	INDEX FAST FULL SCAN	LOC_COUNTRY_IX	23	138	1 (0)	00:00:01			
8	INDEX FAST FULL SCAN	LOC_ID_PK	23	138	1 (0)	00:00:01			
* 9	INDEX UNIQUE SCAN	COUNTRY_C_ID_PK	1	12	0 (0)				
10	VIEW	index$_join$_002	29	203	2 (0)	00:00:01			
* 11	HASH JOIN						1610K	1610K	1506K (0)
12	INDEX FAST FULL SCAN	DEPT_ID_PK	29	203	1 (0)	00:00:01			
13	INDEX FAST FULL SCAN	DEPT_LOCATION_IX	29	203	1 (0)	00:00:01			
14	TABLE ACCESS FULL	EMPLOYEES	107	749	3 (0)	00:00:01			

```
Query Block Name / Object Alias (identified by operation id):
-------------------------------------------------------------

   1 - SEL$DA08B5C9
   5 - SEL$0EDF14EB / C@SEL$1
   6 - SEL$0EDF14EB
   7 - SEL$0EDF14EB / indexjoin$_alias$_001@SEL$0EDF14EB
   8 - SEL$0EDF14EB / indexjoin$_alias$_002@SEL$0EDF14EB
   9 - SEL$DA08B5C9 / B@SEL$2
  10 - SEL$FE1F385F / B@SEL$1
  11 - SEL$FE1F385F
  12 - SEL$FE1F385F / indexjoin$_alias$_001@SEL$FE1F385F
  13 - SEL$FE1F385F / indexjoin$_alias$_002@SEL$FE1F385F
  14 - SEL$DA08B5C9 / A@SEL$1
```

4. SQL 처리과정

WITH coun_sal AS (*/*+ gather_plan_statistics */*

SELECT c.country_id, SUM(a.salary) sal_amt

  FROM employees a,

    departments b,

    locations c

 WHERE a.department_id = b.department_id

  AND b.location_id = c.location_id

GROUP BY c.country_id),

mains AS (

SELECT b.country_name, a.sal_amt

  FROM coun_sal a,

    countries b

 WHERE a.country_id = b.country_id

)

SELECT *

  FROM mains

  ORDER BY 1;

```
SQL_ID  dr3g074gz5bw7, child number 0
-------------------------------------
WITH coun_sal AS ( /*+ gather_plan_statistics */ SELECT c.country_id,
SUM(a.salary) sal_amt   FROM employees a, /* HONG */        departments
b,          locations c  WHERE a.department_id = b.department_id       AND
b.location_id = c.location_id GROUP BY c.country_id ), mains AS (
SELECT b.country_name, a.sal_amt    FROM coun_sal a,        countries b
WHERE a.country_id = b.country_id ) SELECT *   FROM mains   ORDER BY 1

Plan hash value: 2024698841


-------------------------------------------------------------------------------------------------------------------------------
| Id  | Operation                    | Name              | E-Rows |E-Bytes| Cost (%CPU)| E-Time   | OMem | 1Mem | Used-Mem |
-------------------------------------------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT             |                   |        |       |    8 (100)|          |      |      |          |
|   1 |  SORT GROUP BY               |                   |    106 |  3392 |    8  (13)| 00:00:01 | 2048 | 2048 | 2048  (0)|
|*  2 |   HASH JOIN                  |                   |    106 |  3392 |    7   (0)| 00:00:01 | 1236K| 1236K| 1619K  (0)|
|*  3 |    HASH JOIN                 |                   |     29 |   725 |    4   (0)| 00:00:01 | 1476K| 1476K| 1592K  (0)|
|   4 |     NESTED LOOPS             |                   |     23 |   414 |    2   (0)| 00:00:01 |      |      |          |
|   5 |      VIEW                    | index$_join$_003  |     23 |   138 |    2   (0)| 00:00:01 |      |      |          |
|*  6 |       HASH JOIN              |                   |        |       |           |          | 1610K| 1610K| 1606K  (0)|
|   7 |        INDEX FAST FULL SCAN  | LOC_COUNTRY_IX    |     23 |   138 |    1   (0)| 00:00:01 |      |      |          |
|   8 |        INDEX FAST FULL SCAN  | LOC_ID_PK         |     23 |   138 |    1   (0)| 00:00:01 |      |      |          |
|*  9 |      INDEX UNIQUE SCAN       | COUNTRY_C_ID_PK   |      1 |    12 |    0   (0)|          |      |      |          |
|  10 |     VIEW                     | index$_join$_002  |     29 |   203 |    2   (0)| 00:00:01 |      |      |          |
|* 11 |      HASH JOIN               |                   |        |       |           |          | 1610K| 1610K| 1506K  (0)|
|  12 |       INDEX FAST FULL SCAN   | DEPT_ID_PK        |     29 |   203 |    1   (0)| 00:00:01 |      |      |          |
|  13 |       INDEX FAST FULL SCAN   | DEPT_LOCATION_IX  |     29 |   203 |    1   (0)| 00:00:01 |      |      |          |
|  14 |    TABLE ACCESS FULL         | EMPLOYEES         |    107 |   749 |    3   (0)| 00:00:01 |      |      |          |
-------------------------------------------------------------------------------------------------------------------------------

Query Block Name / Object Alias (identified by operation id):
-------------------------------------------------------------

   1 - SEL$DA08B5C9
   5 - SEL$0EDF14EB / C@SEL$1
   6 - SEL$0EDF14EB
   7 - SEL$0EDF14EB / indexjoin$_alias$_001@SEL$0EDF14EB
   8 - SEL$0EDF14EB / indexjoin$_alias$_002@SEL$0EDF14EB
   9 - SEL$DA08B5C9 / B@SEL$2
  10 - SEL$FE1F385F / B@SEL$1
  11 - SEL$FE1F385F
  12 - SEL$FE1F385F / indexjoin$_alias$_001@SEL$FE1F385F
  13 - SEL$FE1F385F / indexjoin$_alias$_002@SEL$FE1F385F
  14 - SEL$DA08B5C9 / A@SEL$1
```

4. SQL 처리과정

```sql
SELECT /*+ gather_plan_statistics */
       d.country_name, SUM(a.salary) sal_amt
  FROM employees a,
       departments b,
       locations c,
       countries d
 WHERE a.department_id = b.department_id
   AND b.location_id = c.location_id
   AND c.country_id = d.country_id
 GROUP BY d.country_name
 ORDER BY 1;
```

Optimizer goal: All rows

Tabs: Tree | HTML | Text | XML

Description	Object owner	Object name	Cost	Cardinality	Bytes
SELECT STATEMENT, GOAL = ALL_ROWS			8	25	800
SORT GROUP BY			8	25	800
HASH JOIN			7	106	3,392
HASH JOIN			4	29	725
NESTED LOOPS			2	23	414
VIEW	HR	index$_join$_003	2	23	138
HASH JOIN					
INDEX FAST FULL SCAN	HR	LOC_COUNTRY_IX	1	23	138
INDEX FAST FULL SCAN	HR	LOC_ID_PK	1	23	138
INDEX UNIQUE SCAN	HR	COUNTRY_C_ID_PK	0	1	12
VIEW	HR	index$_join$_002	2	29	203
HASH JOIN					
INDEX FAST FULL SCAN	HR	DEPT_ID_PK	1	29	203
INDEX FAST FULL SCAN	HR	DEPT_LOCATION_IX	1	29	203
TABLE ACCESS FULL	HR	EMPLOYEES	3	107	749

4. SQL 처리과정

```
SELECT /*+ gather_plan_statistics */
    d.country_name, SUM(a.salary) sal_amt
 FROM employees a,
    departments b,
    locations c,
    countries d
 WHERE a.department_id = b.department_id
   AND b.location_id = c.location_id
   AND c.country_id = d.country_id
GROUP BY d.country_name
ORDER BY 1;
```

```
SELECT *
FROM V$SQL
WHERE sql_text LIKE '%gather%' ;
```

		SQL_TEXT		SQL_FULLTEXT		SQL_ID	
▶	1	SELECT /*+ gather_plan_statistics */ d.country_name,	⋯	<CLOB>	⋯	gx8yap8azwk86	
	2	WITH coun_sal AS (/*+ gather_plan_statistics */ SELECT c.	⋯	<CLOB>	⋯	1qhf1d8jyx8r0	
	3	SELECT * FROM V$SQL WHERE sql_text LIKE '%gather%'	⋯	<CLOB>	⋯	85pnhrcjk7tpf	

4. SQL 처리과정

select *

from table(dbms_xplan.display_cursor ('gx8yap8azwk86', null, 'ADVANCED ALLSTATS LAST'));

	PLAN_TABLE_OUTPUT	
1	SQL_ID gx8yap8azwk86, child number 0	...
2	----------------------------------	...
3	SELECT /*+ gather_plan_statistics */ d.country_name,	...
4	SUM(a.salary) sal_amt FROM employees a, departments b,	...
5	locations c, countries d WHERE a.department_id =	...
6	b.department_id AND b.location_id = c.location_id AND	...
7	c.country_id = d.country_id GROUP BY d.country_name ORDER BY 1	...
8		...
9	Plan hash value: 2024698841	...
10		...
11	--	...
12	| Id | Operation | Name | Starts | E-Rows |E-Bytes| Cost (%CPU)| E-T	...
13	--	...

4. SQL 처리과정

select *

from table(dbms_xplan.display_cursor ('gx8yap8azwk86', null, 'ADVANCED ALLSTATS LAST'));

```
SQL_ID  gx8yap8azwk86, child number 0
-------------------------------------
SELECT /*+ gather_plan_statistics */        d.country_name,
SUM(a.salary) sal_amt   FROM employees a,        departments b,
locations c,        countries d  WHERE a.department_id =
b.department_id    AND b.location_id = c.location_id      AND
c.country_id = d.country_id GROUP BY d.country_name ORDER BY 1

Plan hash value: 2024698841
```

Id	Operation	Name	Starts	E-Rows	E-Bytes	Cost (%CPU)	E-Time	A-Rows	A-Time	Buffers	OMem	1Mem	Used-Mem
0	SELECT STATEMENT		1			8 (100)		4	00:00:00.01	67			
1	SORT GROUP BY		1	25	800	8 (13)	00:00:01	4	00:00:00.01	67	2048	2048	2048 (0)
* 2	HASH JOIN		1	106	3392	7 (0)	00:00:01	106	00:00:00.01	67	1298K	1298K	1597K (0)
* 3	HASH JOIN		1	29	725	4 (0)	00:00:01	29	00:00:00.01	20	1610K	1610K	1635K (0)
4	NESTED LOOPS		1	23	414	2 (0)	00:00:01	23	00:00:00.01	12			
5	VIEW	index$_join$_003	1	23	138	2 (0)	00:00:01	23	00:00:00.01	8			
* 6	HASH JOIN		1					23	00:00:00.01	8	1610K	1610K	1616K (0)
7	INDEX FAST FULL SCAN	LOC_COUNTRY_IX	1	23	138	1 (0)	00:00:01	23	00:00:00.01	4			
8	INDEX FAST FULL SCAN	LOC_ID_PK	1	23	138	1 (0)	00:00:01	23	00:00:00.01	4			
* 9	INDEX UNIQUE SCAN	COUNTRY_C_ID_PK	23	1	12	0 (0)		23	00:00:00.01	4			
10	VIEW	index$_join$_002	1	29	203	2 (0)	00:00:01	29	00:00:00.01	8			
* 11	HASH JOIN		1					29	00:00:00.01	8	1610K	1610K	1491K (0)
12	INDEX FAST FULL SCAN	DEPT_ID_PK	1	29	203	1 (0)	00:00:01	29	00:00:00.01	4			
13	INDEX FAST FULL SCAN	DEPT_LOCATION_IX	1	29	203	1 (0)	00:00:01	29	00:00:00.01	4			
14	TABLE ACCESS FULL	EMPLOYEES	1	107	749	3 (0)	00:00:01	107	00:00:00.01	6			

5. Top n Query

- 특정 컬럼 값을 기준으로 상위 n개, 혹은 하위 n개 로우를 조회하는 쿼리

- MSSQL, MySQL 등은 기본 문법에서 제공

- 오라클 11g 까지는 제공하지 않았음
  ➔ 서브쿼리, ROWNUM 을 사용해 구현

- 오라클 12c 부터 기본 문법으로 제공

5. Top 5 Query – ROWNUM 사용

```
SELECT *
FROM (
 SELECT a.employee_id,
         a.first_name || ' ' || a.last_name emp_name,
         a.salary
   FROM employees a
  ORDER BY a.salary DESC
   ) b
WHERE ROWNUM <= 5;
```

	EMPLOYEE_ID	EMP_NAME	SALARY
1	100	Steven King	24000
2	101	Neena Kochhar	17000
3	102	Lex De Haan	17000
4	145	John Russell	14000
5	146	Karen Partners	13500

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5. Top 5 Query – ROW_NUMBER() 사용

SELECT *

FROM (SELECT a.employee_id,

          a.first_name || ' ' || a.last_name emp_name,

          a.salary,

          ROW_NUMBER() OVER (ORDER BY a.salary DESC) ROW_SEQ

      FROM employees a

) b

WHERE **ROW_SEQ <= 5;**

	EMPLOY...	EMP_NAME	SALARY	ROW_SEQ
1	100	Steven King	24000	1
2	101	Neena Kochhar	17000	2
3	102	Lex De Haan	17000	3
4	145	John Russell	14000	4
5	146	Karen Partners	13500	5

5. Top 5 Query – FETCH FIRST ROWS 구문 (12c 부터)

SELECT a.employee_id,

     a.first_name || ' ' || a.last_name emp_name,

     a.salary

 FROM employees a

ORDER BY a.salary **DESC**

FETCH FIRST 5 ROWS ONLY;

	EMPLOY...	EMP_NAME	SALARY
1	100	Steven King	24000
2	101	Neena Kochhar	17000
3	102	Lex De Haan	17000
4	145	John Russell	14000
5	146	Karen Partners	13500

5. Top 5 Query – FETCH FIRST ROWS 구문 (12c 부터)

SELECT a.employee_id,

      a.first_name || ' ' || a.last_name emp_name,

      a.salary

 FROM employees a

FETCH FIRST 5 ROWS ONLY;

	EMPLOYEE_ID	EMP_NAME	SALARY
1	100	Steven King	24000
2	101	Neena Kochhar	17000
3	102	Lex De Haan	17000
4	103	Alexander Hunold	9000
5	104	Bruce Ernst	6000

5. Top 5 Query – FETCH FIRST ROWS 구문 (12c 부터)

SELECT a.employee_id,

      a.first_name || ' ' || a.last_name emp_name,

      a.salary

 FROM employees a

ORDER BY a.salary DESC

FETCH FIRST 5 PERCENT ROWS ONLY;

	EMPLOY...	EMP_NAME	SALARY
1	100	Steven King	24000
2	101	Neena Kochhar	17000
3	102	Lex De Haan	17000
4	145	John Russell	14000
5	146	Karen Partners	13500
6	201	Michael Hartstein	13000

5. Top 5 Query – FETCH FIRST ROWS 구문 (12c 부터)

SELECT a.employee_id,

      a.first_name || ' ' || a.last_name emp_name,

      a.salary

 FROM employees a

ORDER BY a.salary

FETCH FIRST 5 PERCENT ROWS ONLY;

	EMPLOYEE_ID	EMP_NAME	SALARY
1	132	TJ Olson	2100
2	128	Steven Markle	2200
3	136	Hazel Philtanker	2200
4	127	James Landry	2400
5	135	Ki Gee	2400
6	119	Karen Colmenares	2500

5. Top 5 Query – FETCH FIRST ROWS 구문 (12c 부터)

SELECT a.employee_id,

        a.first_name || ' ' || a.last_name emp_name,

        a.salary

 FROM employees a

ORDER BY a.salary

FETCH FIRST 5 PERCENT ROWS WITH TIES;

	EMPLOYEE_ID	EMP_NAME	SALARY
1	132	TJ Olson	2100
2	128	Steven Markle	2200
3	136	Hazel Philtanker	2200
4	127	James Landry	2400
5	135	Ki Gee	2400
6	119	Karen Colmenares	2500
7	131	James Marlow	2500
8	140	Joshua Patel	2500
9	144	Peter Vargas	2500
10	182	Martha Sullivan	2500
11	191	Randall Perkins	2500