SQL – Analytische Funktionen

Stephan Karrer

Partitionierung der Ergebnismenge: Fenster-Funktionen

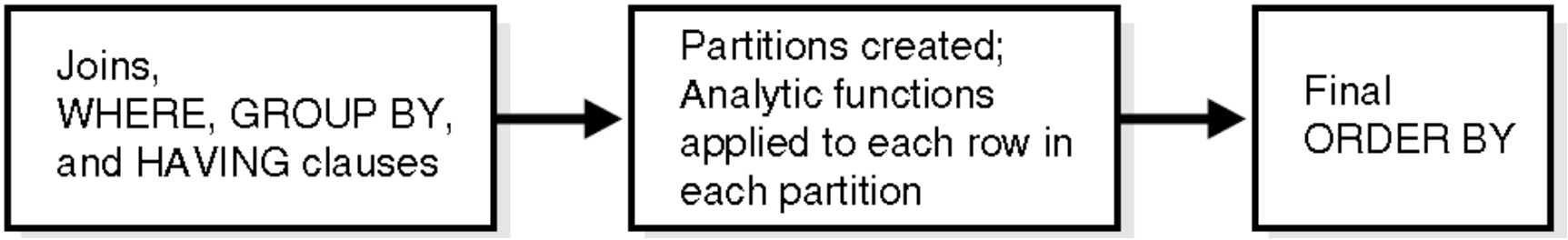
```
SELECT last_name, salary,
       sum(salary) OVER () Gesamt_Sum
    FROM employees;



SELECT last_name, salary, department_id,
       max(salary) OVER (PARTITION BY department_id) Abt_Max
    FROM employees
    ORDER BY department_id;
```

- Das erlaubt uns die Kombination skalarer Werte mit Aggregaten, was bei dem herkömmlichen Gruppierungsvorgehen nicht direkt möglich ist

Einschränkungen



- Da die Partitionierung der Ergebnismenge erst am Ende erfolgt ist die Verwendung der sogenannten „Analytischen Klausel“ nur in der SELECT-Liste erlaubt bzw. kann danach sortiert werden.
- Sollen die Ergebnisse weiterverarbeitet werden, so muss das durch Einbettung in Unterabfrage erfolgen.
- Der Begriff „Partitionierung“ hat hier nichts mit partitionierten Tabellen zu tun (Der ANSI-Standard benutzt den Begriff Fenster bzw. Fensterfunktionen).

Mehrfachgruppierung und -partitionierung

```
SELECT last_name, salary, department_id, job_id, manager_id,
 MAX(salary) OVER (PARTITION BY department_id, job_id) "Dep_Max",
 AVG(salary) OVER (PARTITION BY manager_id) "Man_AVG"
    FROM employees
    ORDER BY department_id, manager_id;
```

- Es ist durchaus Mehrfachgruppierung möglich (wie bei GROUP BY)
- Mehrere, unabhängige Partitionierungen können vorgenommen werden

Partitionierung der Ergebnismenge nach berechneten Werten

```
SELECT last_name, LEN(last_name) AS "Length",
       count(*) OVER (PARTITION BY LEN(last_name)) as "Count"
  FROM employees
  ORDER BY "Length";
```

- Analog zu GROUP BY kann auch hier die Partitionierung anhand berechneter Werte erfolgen

Sortieren

```
SELECT last_name, salary, department_id,
       MAX(salary) OVER (PARTITION BY department_id
                         ORDER BY last_name) Abt_Max
    FROM employees
    ORDER BY department_id;
```

- Sortierung kann innerhalb der Partition erfolgen
- Dann verhält sich die analytische Funktion (Aggregatsfunktion) dynamisch !!
- Globale Sortierung sollte das berücksichtigen

Partitionierung der Ergebnismenge mit dynamischen Fenster

```
SELECT last_name,  salary,
       MAX(salary)
       OVER (ORDER BY salary
                ROWS BETWEEN 2 PRECEDING AND 2 FOLLOWING) n1
  FROM employees;

SELECT last_name,  department_id, salary,
       MAX(salary)
       OVER (PARTITION BY department_id ORDER BY salary
              ROWS BETWEEN 2 PRECEDING AND 2 FOLLOWING) n1
  FROM employees;
```

Möglichkeiten dynamischer Fenster

```
SELECT last_name,  salary,
 SUM(salary) OVER
    (ORDER BY salary ROWS UNBOUNDED PRECEDING) "Unb_Pre",
 SUM(salary) OVER
    (ORDER BY salary ROWS BETWEEN CURRENT ROW
                             AND UNBOUNDED FOLLOWING) "Unb_Fol",
 SUM(salary) OVER
    (ORDER BY salary ROWS BETWEEN 2 PRECEDING
                             AND 2 FOLLOWING) "5_Window",
 SUM(salary) OVER
    (ORDER BY salary RANGE BETWEEN UNBOUNDED PRECEDING
                             AND CURRENT ROW) "Rang_Window"
FROM employees;
```

Rangfolge-Funktionen

```
SELECT last_name, salary, department_id,
       row_number() OVER (ORDER BY salary DESC)
           AS "RowNumber",
       rank() OVER (ORDER BY salary DESC) AS "Rank",
       dense_rank() OVER (ORDER BY salary DESC)
           AS "DenseRank",
       ntile(5) OVER (ORDER BY salary DESC) AS "Bucket"
    FROM employees
    ORDER BY "Rank";
```

Anwendung auf Partionierung

```
SELECT last_name, salary, department_id,
       row_number() OVER (PARTITION BY  department_id
             ORDER BY salary DESC) "RowNumber",
       rank() OVER (PARTITION BY  department_id
             ORDER BY salary DESC) "Rank",
       DENSE_RANK() OVER (PARTITION BY  department_id
             ORDER BY salary DESC) "DenseRank"
    FROM employees
    ORDER BY department_id;
```

Anwendung spezieller analytischer Funktionen

```
SELECT last_name, salary, department_id,
       first_value(salary) OVER (PARTITION BY  department_id
                                 ORDER BY salary DESC) "First",
       last_value(salary) OVER (PARTITION BY  department_id
                                 ORDER BY salary DESC) "Last",
       lead(salary, 1, 0) OVER (PARTITION BY  department_id
                                 ORDER BY salary DESC) "Lead",
       lag(salary, 1,999) OVER (PARTITION BY  department_id
                                 ORDER BY salary DESC) "Lag"
    FROM employees
    ORDER BY department_id;
```