



# **Transact SQL – Analytische Funktionen**

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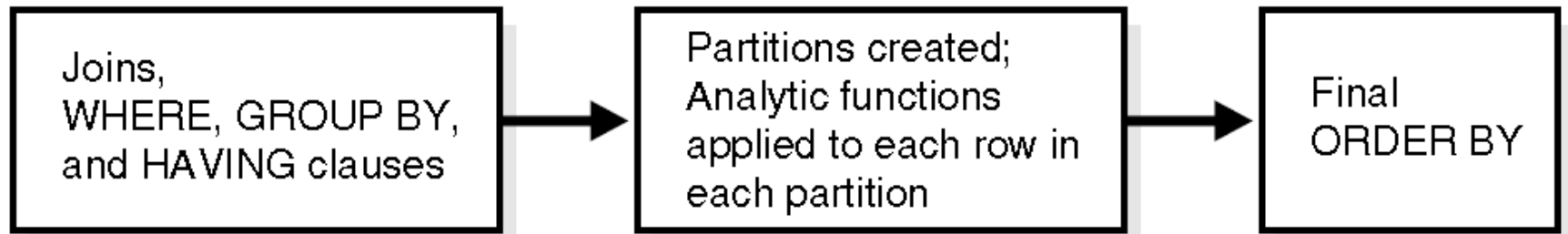
## Partitionierung der Ergebnismenge: Fenster-Funktionen

```
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;
```



## 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;
```

## 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;
```