

Module 5:

Windowing and the OVER Clause

Windows on Data

- **OVER Clause**

- Added in SQL Server 2005, along with the ranking functions ROW_NUMBER, RANK, DENSE_RANK, NTILE

- **Can also be used with aggregate functions**

- SUM, COUNT, MIN, MAX, AVG
 - Doesn't require GROUP BY

- **Exposes a window over the result set for each row**

- SQL Server 2012 adds
 - Running aggregations
 - Sliding aggregations
 - Row lookups
 - Percentiles

OVER

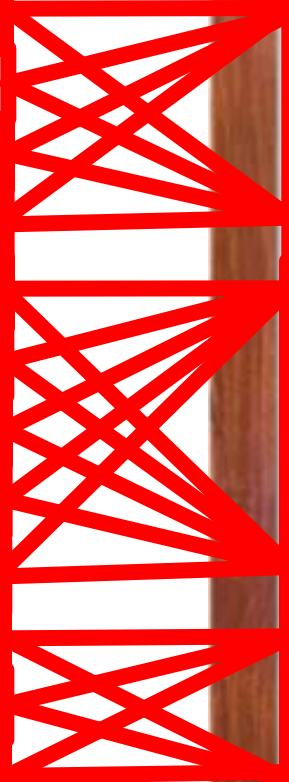
AcctId	TxnDate	Amount
1	3/10/2012	500
1	3/22/2012	250
1	3/24/2012	75
1	3/26/2012	125
2	3/11/2012	500
2	3/15/2012	50
2	3/22/2012	5000
2	3/24/2012	550
2	3/27/2012	95
3	3/15/2012	600
3	3/22/2012	25
3	3/23/2012	125

AcctId	TxnDate	Amount
1	3/10/2012	500
1	3/22/2012	250
1	3/24/2012	75
1	3/26/2012	125
2	3/11/2012	500
2	3/15/2012	50
2	3/22/2012	5000
2	3/24/2012	550
2	3/27/2012	95
3	3/15/2012	600
3	3/22/2012	25
3	3/23/2012	125

OVER with PARTITION BY

AcctId	TxnDate	Amount
1	3/10/2012	500
1	3/22/2012	250
1	3/24/2012	75
1	3/26/2012	125
2	3/11/2012	500
2	3/15/2012	50
2	3/22/2012	5000
2	3/24/2012	550
2	3/27/2012	95
3	3/15/2012	600
3	3/22/2012	25
3	3/23/2012	125

AcctId	TxnDate	Amount
1	3/10/2012	500
1	3/22/2012	250
1	3/24/2012	75
1	3/26/2012	125
2	3/11/2012	500
2	3/15/2012	50
2	3/22/2012	5000
2	3/24/2012	550
2	3/27/2012	95
3	3/15/2012	600
3	3/22/2012	25
3	3/23/2012	125



OVER with PARTITION BY and ORDER BY

AcctId	TxnDate	Amount
1	3/10/2012	500
1	3/22/2012	250
1	3/24/2012	75
1	3/26/2012	125
2	3/11/2012	500
2	3/15/2012	50
2	3/22/2012	5000
2	3/24/2012	550
2	3/27/2012	95
3	3/15/2012	600
3	3/22/2012	25
3	3/23/2012	125

AcctId	TxnDate	Amount
1	3/24/2012	75
1	3/26/2012	125
1	3/22/2012	250
1	3/10/2012	500
2	3/15/2012	50
2	3/27/2012	95
2	3/11/2012	500
2	3/24/2012	550
2	3/22/2012	5000
3	3/22/2012	25
3	3/23/2012	125
3	3/15/2012	600

Window Partitioning and Ordering

- **OVER with PARTITION BY**
 - Optionally groups the result set into multiple windows
- **OVER with ORDER BY**
 - Specifies the row sequence in each window
 - Required for the ranking functions
 - Not previously supported for the aggregate functions
- **Now in SQL Server 2012**
 - OVER with ORDER BY now supported with aggregate functions
 - Eight new analytic windowing functions
 - Four lookup functions
 - Four percentile functions

Demo

- **OVER with Aggregate Functions**

Demo

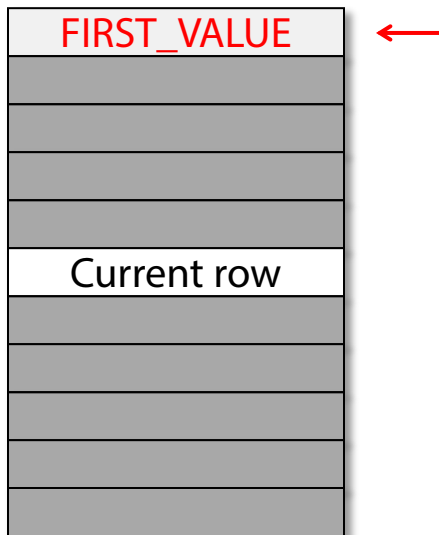
- Running and Sliding Aggregations

New Analytic Functions

Window Lookup Functions

- **FIRST_VALUE**

- Returns a column value from the first row of the window



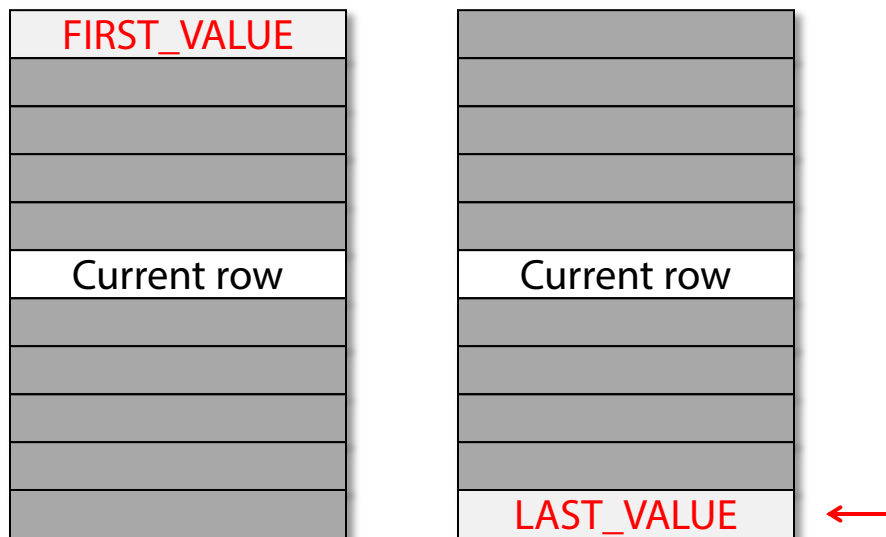
Window Lookup Functions

- **FIRST_VALUE**

- Returns a column value from the first row of the window

- **LAST_VALUE**

- Returns a column value from the last row of the window



Window Lookup Functions

- **FIRST_VALUE**

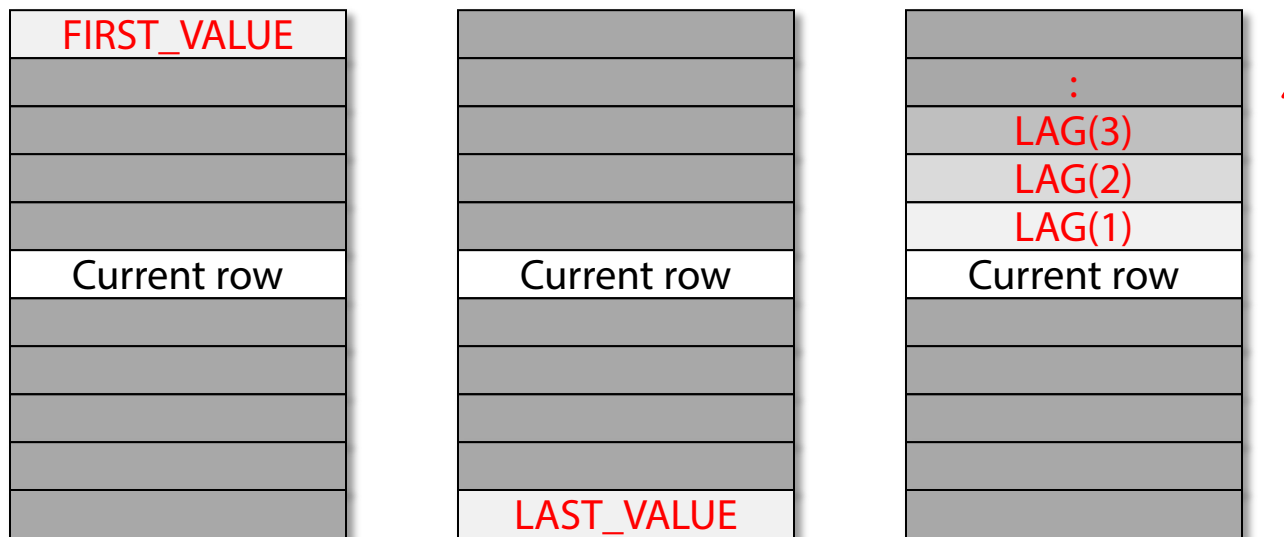
- Returns a column value from the first row of the window

- **LAST_VALUE**

- Returns a column value from the last row of the window

- **LAG**

- Returns a column value from a previous row of the window



Window Lookup Functions

- **FIRST_VALUE**

- Returns a column value from the first row of the window

- **LAST_VALUE**

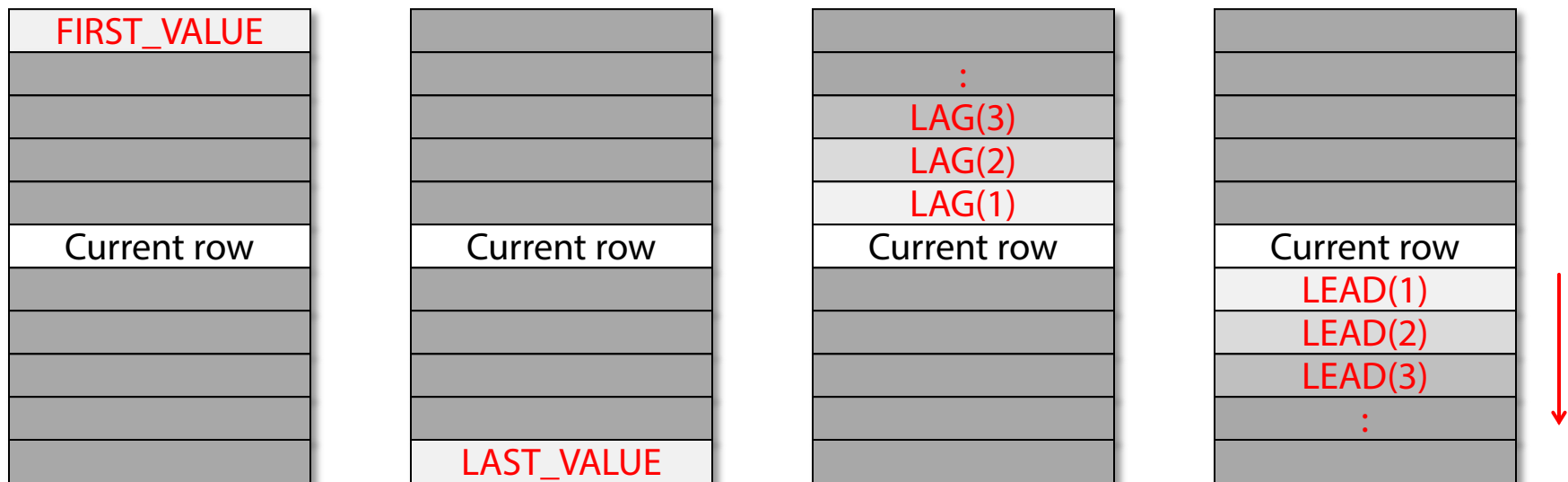
- Returns a column value from the last row of the window

- **LAG**

- Returns a column value from a previous row of the window

- **LEAD**

- Returns a column value from a subsequent row of the window



Demo

- Window Lookup Functions

Window Percentile Functions

- **PERCENT_RANK**

- Calculate percentile as $(\text{RANK} - 1) / (N - 1)$

PERCENT_RANK		RANK	
→	0	0 / 24	1
→	.041666	1 / 24	2
→	.083333	2 / 24	3
	:		:
	.916666	22 / 24	23
	.958333	23 / 24	24
→	1	24 / 24	25
$(\text{RANK} - 1) / (N - 1)$			
		N	
		25	

Window Percentile Functions

- **PERCENT_RANK**

- Calculate percentile as $(\text{RANK} - 1) / (N - 1)$

- **CUME_DIST**

- Calculate percentile as RANK / N

PERCENT_RANK

0	0 / 24
.041666	1 / 24
.083333	2 / 24
:	
.916666	22 / 24
.958333	23 / 24
1	24 / 24

$(\text{RANK} - 1) / (N - 1)$

RANK

1
2
3
:
23
24
25

N

25

CUME_DIST

→ .04	1 / 25
→ .08	2 / 25
→ .12	.3 / 25
:	
.92	23 / 25
.96	24 / 25
→ 1	25 / 25

RANK / N

Window Percentile Functions

- **PERCENTILE_DISC**

- Returns a discrete value at (or near) the specified percentile

PERCENT_RANK

0	0 / 24
.041666	1 / 24
.083333	2 / 24
:	
.916666	22 / 24
.958333	23 / 24
1	24 / 24

$(\text{RANK} - 1) / (N - 1)$

RANK

1
2
3
:
23
24
25

N

25

CUME_DIST

.04	1 / 25
.08	2 / 25
.12	3 / 25
:	
.92	23 / 25
.96	24 / 25
1	25 / 25

RANK / N

PERCENTILE_DISC(.08)

2

Window Percentile Functions

- **PERCENTILE_DISC**

- Returns a discrete value at (or near) the specified percentile

PERCENT_RANK

0	0 / 24
.041666	1 / 24
.083333	2 / 24
:	
.916666	22 / 24
.958333	23 / 24
1	24 / 24

$(\text{RANK} - 1) / (N - 1)$

RANK

1
2
3
:
23
24
25

N

25

CUME_DIST

.04	1 / 25
.08	2 / 25
.12	3 / 25
:	
.92	23 / 25
.96	24 / 25
1	25 / 25

RANK / N

PERCENTILE_DISC(.08)

2

PERCENTILE_DISC(.1)

3

Window Percentile Functions

- **PERCENTILE_DISC**

- Returns a discrete value at (or near) the specified percentile

- **PERCENTILE_CONT**

- Returns a value based on the midpoint between the specified percentile and next discrete percentile

PERCENT_RANK

0	0 / 24
.041666	1 / 24
.083333	2 / 24
:	
.916666	22 / 24
.958333	23 / 24
1	24 / 24

$(\text{RANK} - 1) / (N - 1)$

RANK

1
2
3
:
23
24
25

N

25

CUME_DIST

.04	1 / 25
.08	2 / 25
.12	3 / 25
:	
.92	23 / 25
.96	24 / 25
1	25 / 25

RANK / N

PERCENTILE_DISC(.08)

2

PERCENTILE_DISC(.1)

3

PERCENTILE_CONT(.08)

2.5

Window Percentile Functions

- **PERCENTILE_DISC**

- Returns a discrete value at (or near) the specified percentile

- **PERCENTILE_CONT**

- Returns a value based on the midpoint between the specified percentile and next discrete percentile

PERCENT_RANK

0	0 / 24
.041666	1 / 24
.083333	2 / 24
:	
.916666	22 / 24
.958333	23 / 24
1	24 / 24

$(\text{RANK} - 1) / (N - 1)$

RANK

1
2
3
:
23
24
25

N

25

CUME_DIST

.04	1 / 25
.08	2 / 25
.12	3 / 25
:	
.92	23 / 25
.96	24 / 25
1	25 / 25

RANK / N

PERCENTILE_DISC(.08)

2

PERCENTILE_DISC(.1)

3

PERCENTILE_CONT(.08)

2.5

PERCENTILE_CONT(.1)

2.75

Window Percentile Functions

- **PERCENTILE_DISC**

- Returns a discrete value at (or near) the specified percentile

- **PERCENTILE_CONT**

- Returns a value based on the midpoint between the specified percentile and next discrete percentile

PERCENT_RANK

0	0 / 24
.041666	1 / 24
.083333	2 / 24
:	
.916666	22 / 24
.958333	23 / 24
1	24 / 24

$(\text{RANK} - 1) / (N - 1)$

RANK

1
2
3
:
23
24
25

N

25

CUME_DIST

.04	1 / 25
.08	2 / 25
.12	3 / 25
:	
.92	23 / 25
.96	24 / 25
1	25 / 25

RANK / N

PERCENTILE_DISC(.08)

2

PERCENTILE_DISC(.1)

3

PERCENTILE_CONT(.08)

2.5

PERCENTILE_CONT(.1)

2.75

Demo

- **Window Percentile Functions**