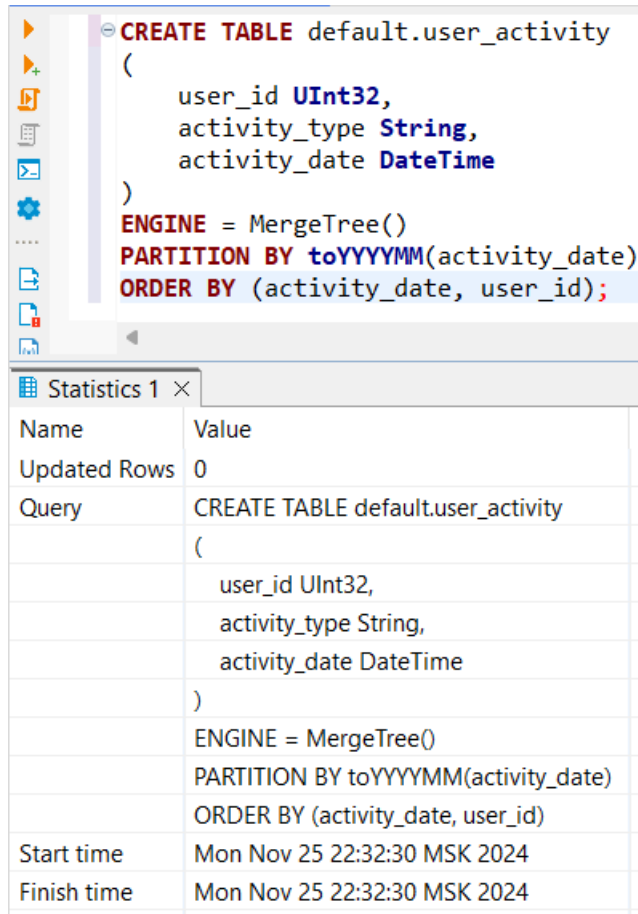


1. Создание таблицы

```
CREATE TABLE default.user_activity
(
    user_id UInt32,
    activity_type String,
    activity_date DateTime
)
ENGINE = MergeTree()
PARTITION BY toYYYYMM(activity_date)
ORDER BY (activity_date, user_id);
```



The screenshot shows a database client interface. The top pane displays the SQL query for creating the table. The bottom pane shows the execution statistics for the query.

Name	Value
Updated Rows	0
Query	CREATE TABLE default.user_activity (user_id UInt32, activity_type String, activity_date DateTime) ENGINE = MergeTree() PARTITION BY toYYYYMM(activity_date) ORDER BY (activity_date, user_id);
Start time	Mon Nov 25 22:32:30 MSK 2024
Finish time	Mon Nov 25 22:32:30 MSK 2024

2. Заполнение таблицы

```
INSERT INTO default.user_activity (user_id, activity_type, activity_date)
VALUES
    (5001, 'login', '2023-05-01 08:30:00'),
    (5001, 'purchase', '2023-05-01 09:15:00'),
    (5001, 'logout', '2023-05-01 10:00:00'),
    (5002, 'login', '2023-05-01 09:00:00'),
    (5002, 'logout', '2023-05-01 11:30:00'),
    (5003, 'login', '2023-05-02 10:00:00'),
    (5003, 'purchase', '2023-05-02 10:30:00'),
    (5004, 'login', '2023-05-02 14:00:00'),
    (5004, 'logout', '2023-05-02 15:45:00'),
    (5005, 'login', '2023-05-03 09:30:00'),
    (5005, 'purchase', '2023-05-03 10:00:00'),
    (5005, 'purchase', '2023-05-03 11:15:00'),
    (5005, 'logout', '2023-05-03 12:00:00');
```

INSERT INTO default.user_activity (user_id, activity_type, activity_date)
VALUES

```
(5001, 'login', '2023-05-01 08:30:00'),
(5001, 'purchase', '2023-05-01 09:15:00'),
(5001, 'logout', '2023-05-01 10:00:00'),
(5002, 'login', '2023-05-01 09:00:00'),
(5002, 'logout', '2023-05-01 11:30:00'),
(5003, 'login', '2023-05-02 10:00:00'),
(5003, 'purchase', '2023-05-02 10:30:00'),
(5004, 'login', '2023-05-02 14:00:00'),
(5004, 'logout', '2023-05-02 15:45:00'),
(5005, 'login', '2023-05-03 09:30:00'),
(5005, 'purchase', '2023-05-03 10:00:00'),
(5005, 'purchase', '2023-05-03 11:15:00'),
(5005, 'logout', '2023-05-03 12:00:00');
```

Name	Value
Updated Rows	13
Query	INSERT INTO default.user_activity (user_id, activity_type, activity_date)

3. Выполнение мутаций

```
ALTER TABLE default.user_activity
UPDATE activity_type = 'order'
WHERE user_id = 5001 AND activity_type = 'purchase';
```

ALTER TABLE default.user_activity
UPDATE activity_type = 'order'
WHERE user_id = 5001 AND activity_type = 'purchase';

Name	Value
Updated Rows	1
Query	ALTER TABLE default.user_activity UPDATE activity_type = 'order' WHERE user_id = 5001 AND activity_type = 'purchase'
Start time	Mon Nov 25 22:45:17 MSK 2024
Finish time	Mon Nov 25 22:45:17 MSK 2024

4. Проверка результатов

```
select
  *
from
  default.user_activity
order by
  user_id, activity_date
```

select
*
from
default.user_activity
order by
user_id, activity_date

	123 user_id	A-Z activity_type	activity_date
1	5,001	login	2023-05-01 05:30:00
2	5,001	order	2023-05-01 06:15:00
3	5,001	logout	2023-05-01 07:00:00
4	5,002	login	2023-05-01 06:00:00

```

SELECT
    database,
    table,
    mutation_id,
    command,
    create_time,
    is_done,
    latest_failed_part,
    latest_fail_reason
FROM system.mutations
WHERE table = 'user_activity'
ORDER BY create_time DESC;

```

Grid	A-Z database	A-Z table	A-Z mutation_id	A-Z command	create_time	is_done	A-Z latest_failed_part	A-Z latest_fail_reason
1	default	user_activity	mutation_2.txt	UPDATE activity_type =	2024-11-25 19:45:17	1		

5. Манипуляция с партициями

```

SELECT DISTINCT partition
FROM system.parts
WHERE table = 'user_activity' AND active;

```

Grid	A-Z partition
1	202305

```

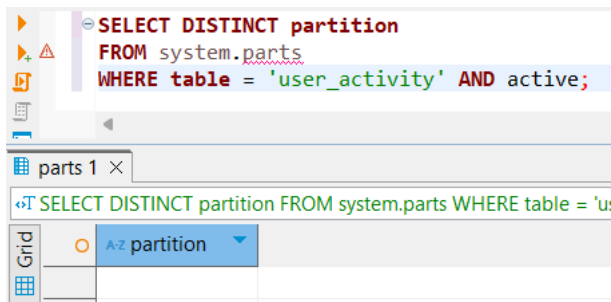
ALTER TABLE default.user_activity DROP PARTITION 202305;

```

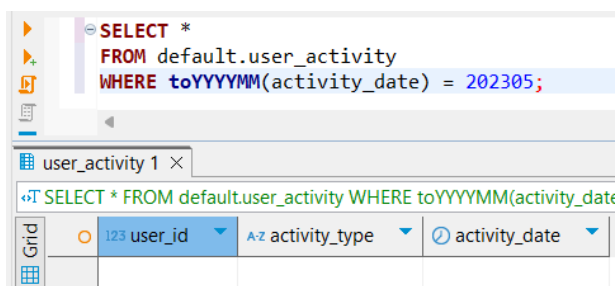
Name	Value
Updated Rows	0
Query	ALTER TABLE default.user_activity DROP PARTITION 202305
Start time	Mon Nov 25 23:05:57 MSK 2024
Finish time	Mon Nov 25 23:05:57 MSK 2024

6. Проверка состояния таблицы

```
SELECT DISTINCT partition
FROM system.parts
WHERE table = 'user_activity' AND active;
```



```
SELECT *
FROM default.user_activity
WHERE toYYYYMM(activity_date) = 202305;
```

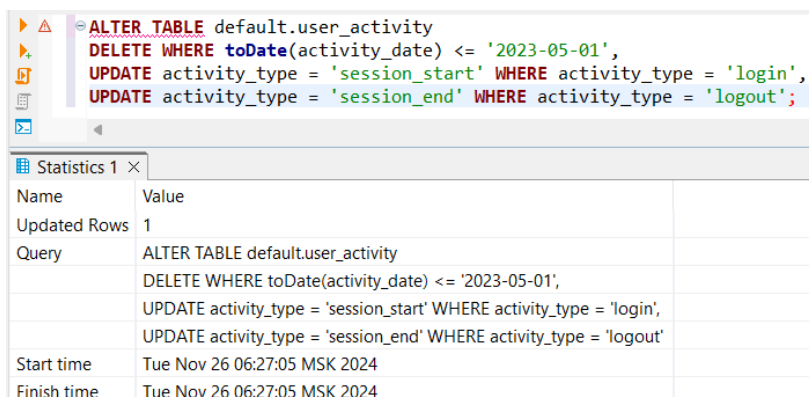


7. Исследуйте, как работают другие типы мутаций

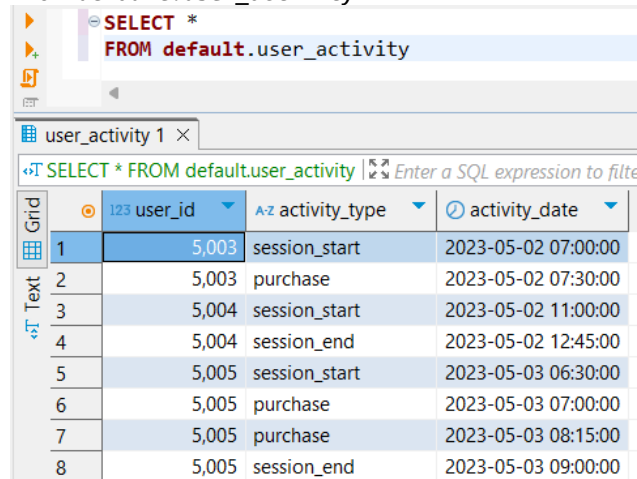
```
INSERT INTO default.user_activity (user_id, activity_type, activity_date)
VALUES
```

```
(5001, 'login', '2023-05-01 08:30:00'),
(5001, 'purchase', '2023-05-01 09:15:00'),
(5001, 'logout', '2023-05-01 10:00:00'),
(5002, 'login', '2023-05-01 09:00:00'),
(5002, 'logout', '2023-05-01 11:30:00'),
(5003, 'login', '2023-05-02 10:00:00'),
(5003, 'purchase', '2023-05-02 10:30:00'),
(5004, 'login', '2023-05-02 14:00:00'),
(5004, 'logout', '2023-05-02 15:45:00'),
(5005, 'login', '2023-05-03 09:30:00'),
(5005, 'purchase', '2023-05-03 10:00:00'),
(5005, 'purchase', '2023-05-03 11:15:00'),
(5005, 'logout', '2023-05-03 12:00:00');
```

```
ALTER TABLE default.user_activity
DELETE WHERE toDate(activity_date) <= '2023-05-01',
UPDATE activity_type = 'session_start' WHERE activity_type = 'login',
UPDATE activity_type = 'session_end' WHERE activity_type = 'logout';
```



```
SELECT *
FROM default.user_activity
```

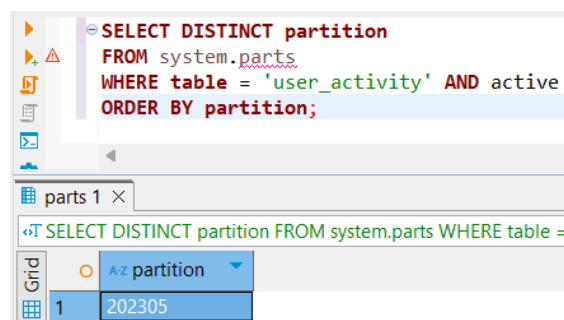


	123 user_id	A-Z activity_type	activity_date
1	5,003	session_start	2023-05-02 07:00:00
2	5,003	purchase	2023-05-02 07:30:00
3	5,004	session_start	2023-05-02 11:00:00
4	5,004	session_end	2023-05-02 12:45:00
5	5,005	session_start	2023-05-03 06:30:00
6	5,005	purchase	2023-05-03 07:00:00
7	5,005	purchase	2023-05-03 08:15:00
8	5,005	session_end	2023-05-03 09:00:00

8. Попробуйте создать новую партицию и вставить в нее данные

Проверка существующих партиций:

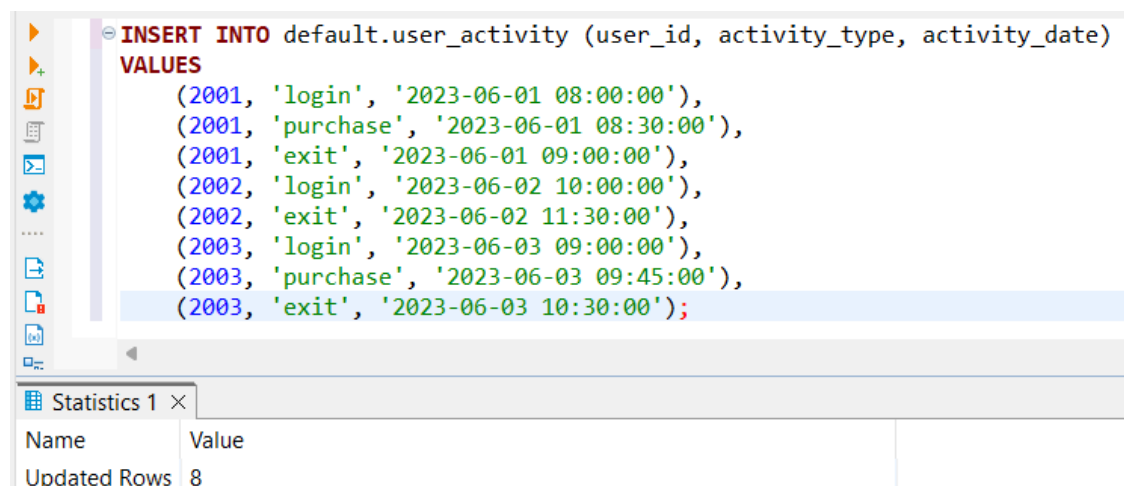
```
SELECT DISTINCT partition
FROM system.parts
WHERE table = 'user_activity' AND active
ORDER BY partition;
```



A-Z partition
1 202305

Вставка новых данных с автоматическим созданием новой партиции за июнь 2023 года:

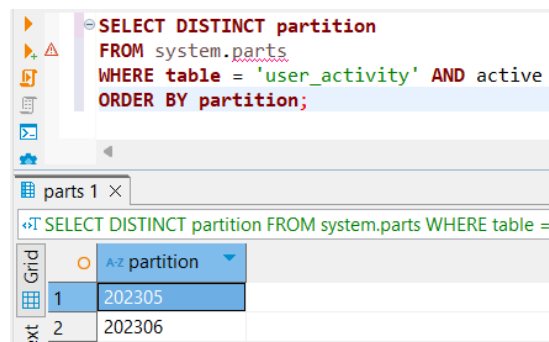
```
INSERT INTO default.user_activity (user_id, activity_type, activity_date)
VALUES
(2001, 'login', '2023-06-01 08:00:00'),
(2001, 'purchase', '2023-06-01 08:30:00'),
(2001, 'exit', '2023-06-01 09:00:00'),
(2002, 'login', '2023-06-02 10:00:00'),
(2002, 'exit', '2023-06-02 11:30:00'),
(2003, 'login', '2023-06-03 09:00:00'),
(2003, 'purchase', '2023-06-03 09:45:00'),
(2003, 'exit', '2023-06-03 10:30:00');
```



Name	Value
Updated Rows	8

Проверка создания новой партии

```
SELECT DISTINCT partition
FROM system.parts
WHERE table = 'user_activity' AND active
ORDER BY partition;
```

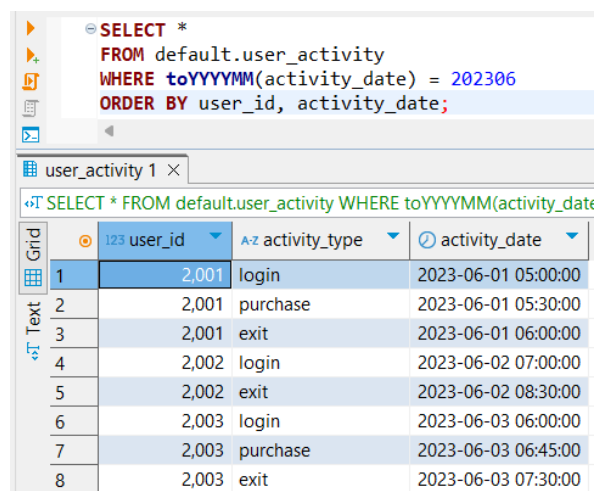


The screenshot shows a SQL IDE interface. The top pane contains the query: `SELECT DISTINCT partition FROM system.parts WHERE table = 'user_activity' AND active ORDER BY partition;`. The bottom pane shows the results in a table with two columns: 'partition' and an unlabeled column. The results are:

partition	
202305	
202306	

Проверка данных в новой партии

```
SELECT *
FROM default.user_activity
WHERE toYYYYMM(activity_date) = 202306
ORDER BY user_id, activity_date;
```

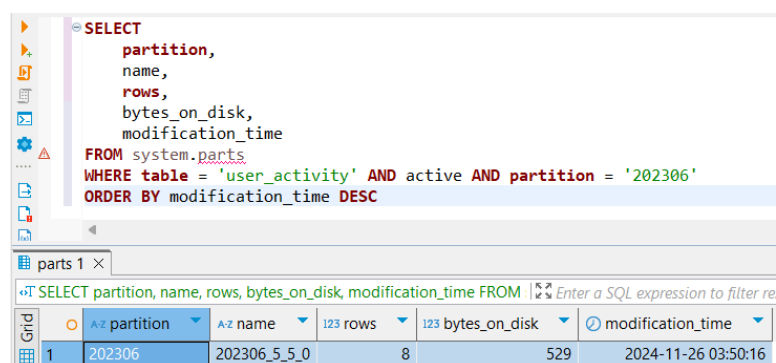


The screenshot shows a SQL IDE interface. The top pane contains the query: `SELECT * FROM default.user_activity WHERE toYYYYMM(activity_date) = 202306 ORDER BY user_id, activity_date;`. The bottom pane shows the results in a table with four columns: 'user_id', 'activity_type', and 'activity_date'. The results are:

user_id	activity_type	activity_date
2,001	login	2023-06-01 05:00:00
2,001	purchase	2023-06-01 05:30:00
2,001	exit	2023-06-01 06:00:00
2,002	login	2023-06-02 07:00:00
2,002	exit	2023-06-02 08:30:00
2,003	login	2023-06-03 06:00:00
2,003	purchase	2023-06-03 06:45:00
2,003	exit	2023-06-03 07:30:00

Получение детальной информации о партии

```
SELECT
    partition,
    name,
    rows,
    bytes_on_disk,
    modification_time
FROM system.parts
WHERE table = 'user_activity' AND active AND partition = '202306'
ORDER BY modification_time DESC
```

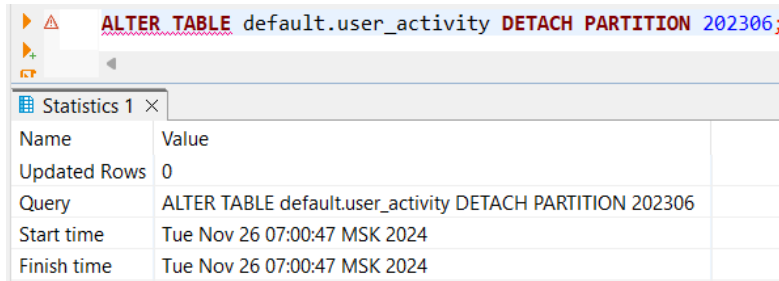


The screenshot shows a SQL IDE interface. The top pane contains the query: `SELECT partition, name, rows, bytes_on_disk, modification_time FROM system.parts WHERE table = 'user_activity' AND active AND partition = '202306' ORDER BY modification_time DESC`. The bottom pane shows the results in a table with five columns: 'partition', 'name', 'rows', 'bytes_on_disk', and 'modification_time'. The results are:

partition	name	rows	bytes_on_disk	modification_time
202306	202306_5_0	8	529	2024-11-26 03:50:16

Отсоединение партии

```
ALTER TABLE default.user_activity DETACH PARTITION 202306;
```

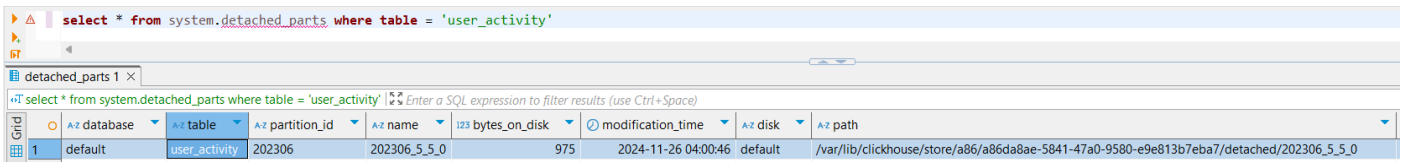


Statistics 1 ×

Name	Value
Updated Rows	0
Query	ALTER TABLE default.user_activity DETACH PARTITION 202306
Start time	Tue Nov 26 07:00:47 MSK 2024
Finish time	Tue Nov 26 07:00:47 MSK 2024

Получение списка отсоединенных партий

```
select * from system.detached_parts where table = 'user_activity'
```



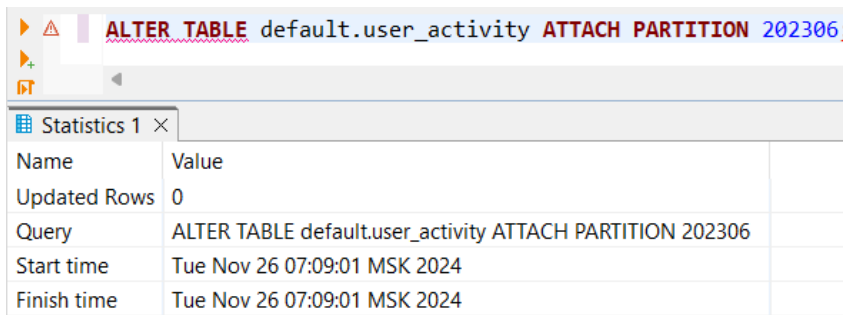
detached_parts 1 ×

select * from system.detached_parts where table = 'user_activity'

	database	table	partition_id	name	bytes_on_disk	modification_time	disk	path
1	default	user_activity	202306	202306_5_5_0	975	2024-11-26 04:00:46	default	/var/lib/clickhouse/store/a86/a86da8ae-5841-47a0-9580-e9e813b7eba7/detached/202306_5_5_0

Присоединение партии обратно

```
ALTER TABLE default.user_activity ATTACH PARTITION 202306;
```

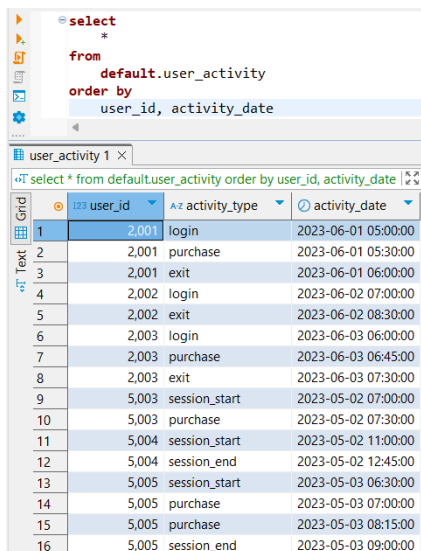


Statistics 1 ×

Name	Value
Updated Rows	0
Query	ALTER TABLE default.user_activity ATTACH PARTITION 202306
Start time	Tue Nov 26 07:09:01 MSK 2024
Finish time	Tue Nov 26 07:09:01 MSK 2024

Проверка данных

```
select
*
from
    default.user_activity
order by
    user_id, activity_date
```



user_activity 1 ×

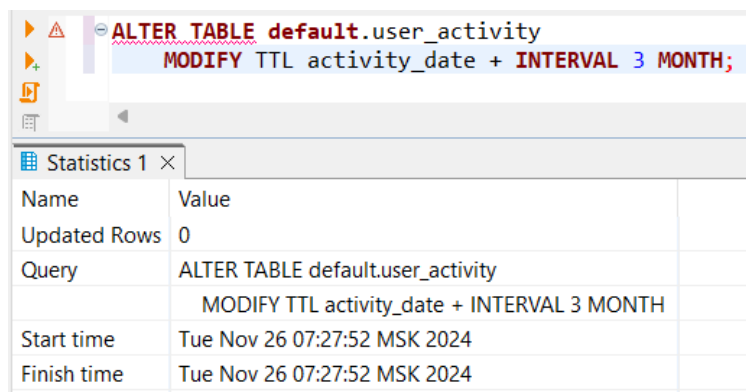
select * from default.user_activity order by user_id, activity_date

	user_id	activity_type	activity_date
1	2,001	login	2023-06-01 05:00:00
2	2,001	purchase	2023-06-01 05:30:00
3	2,001	exit	2023-06-01 06:00:00
4	2,002	login	2023-06-02 07:00:00
5	2,002	exit	2023-06-02 08:30:00
6	2,003	login	2023-06-03 06:00:00
7	2,003	purchase	2023-06-03 06:45:00
8	2,003	exit	2023-06-03 07:30:00
9	5,003	session_start	2023-05-02 07:00:00
10	5,003	purchase	2023-05-02 07:30:00
11	5,004	session_start	2023-05-02 11:00:00
12	5,004	session_end	2023-05-02 12:45:00
13	5,005	session_start	2023-05-03 06:30:00
14	5,005	purchase	2023-05-03 07:00:00
15	5,005	purchase	2023-05-03 08:15:00
16	5,005	session_end	2023-05-03 09:00:00

9. Изучите возможность использования TTL (Time to Live) для автоматического удаления старых партиций

Добавление TTL к существующей таблице

```
ALTER TABLE default.user_activity  
MODIFY TTL activity_date + INTERVAL 3 MONTH;
```

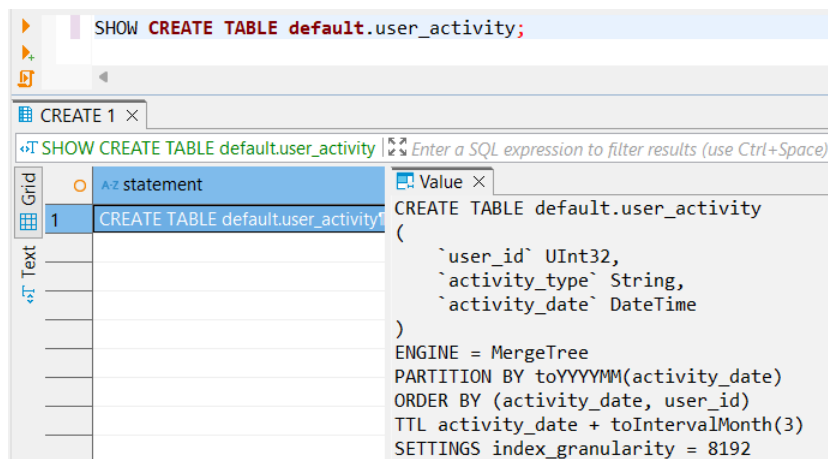


The screenshot shows the SQL Studio interface. The top pane contains the SQL statement: `ALTER TABLE default.user_activity MODIFY TTL activity_date + INTERVAL 3 MONTH;`. The bottom pane shows the 'Statistics 1' window with the following data:

Name	Value
Updated Rows	0
Query	ALTER TABLE default.user_activity MODIFY TTL activity_date + INTERVAL 3 MONTH
Start time	Tue Nov 26 07:27:52 MSK 2024
Finish time	Tue Nov 26 07:27:52 MSK 2024

Проверка успешного добавления TTL

```
SHOW CREATE TABLE default.user_activity;
```

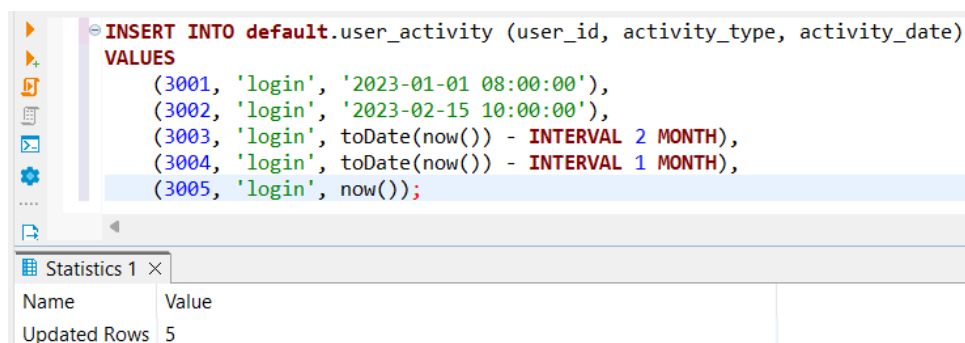


The screenshot shows the SQL Studio interface. The top pane contains the SQL statement: `SHOW CREATE TABLE default.user_activity;`. The bottom pane shows the 'CREATE 1' window with the following data:

Grid	Value
1	<pre>CREATE TABLE default.user_activity (`user_id` UInt32, `activity_type` String, `activity_date` DateTime) ENGINE = MergeTree PARTITION BY toYYYYMM(activity_date) ORDER BY (activity_date, user_id) TTL activity_date + toIntervalMonth(3) SETTINGS index_granularity = 8192</pre>

Вставка данных с разными датами

```
INSERT INTO default.user_activity (user_id, activity_type, activity_date)  
VALUES  
  (3001, 'login', '2023-01-01 08:00:00'),  
  (3002, 'login', '2023-02-15 10:00:00'),  
  (3003, 'login', toDate(now()) - INTERVAL 2 MONTH),  
  (3004, 'login', toDate(now()) - INTERVAL 1 MONTH),  
  (3005, 'login', now());
```



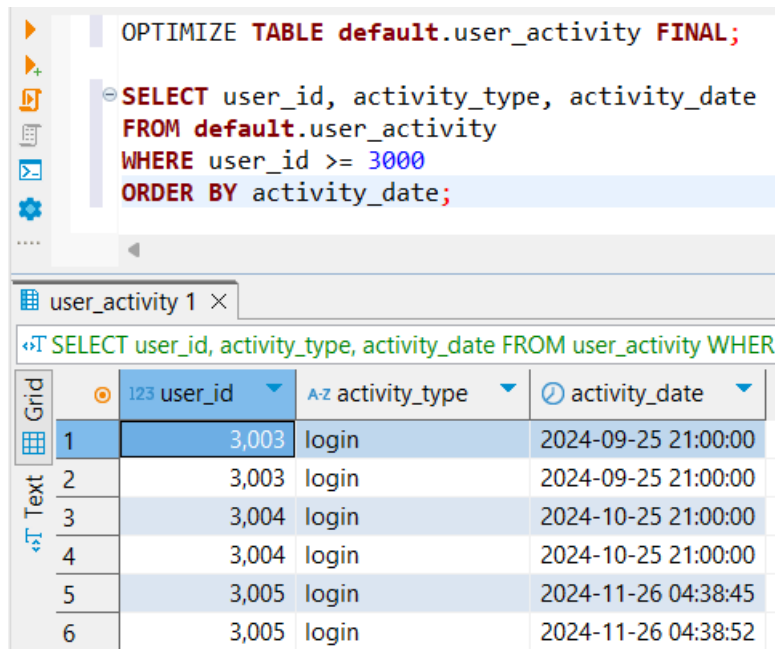
The screenshot shows the SQL Studio interface. The top pane contains the SQL statement: `INSERT INTO default.user_activity (user_id, activity_type, activity_date) VALUES (3001, 'login', '2023-01-01 08:00:00'), (3002, 'login', '2023-02-15 10:00:00'), (3003, 'login', toDate(now()) - INTERVAL 2 MONTH), (3004, 'login', toDate(now()) - INTERVAL 1 MONTH), (3005, 'login', now());`. The bottom pane shows the 'Statistics 1' window with the following data:

Name	Value
Updated Rows	5

Проверка данных

```
OPTIMIZE TABLE default.user_activity FINAL;
```

```
SELECT user_id, activity_type, activity_date  
FROM default.user_activity  
WHERE user_id >= 3000  
ORDER BY activity_date;
```

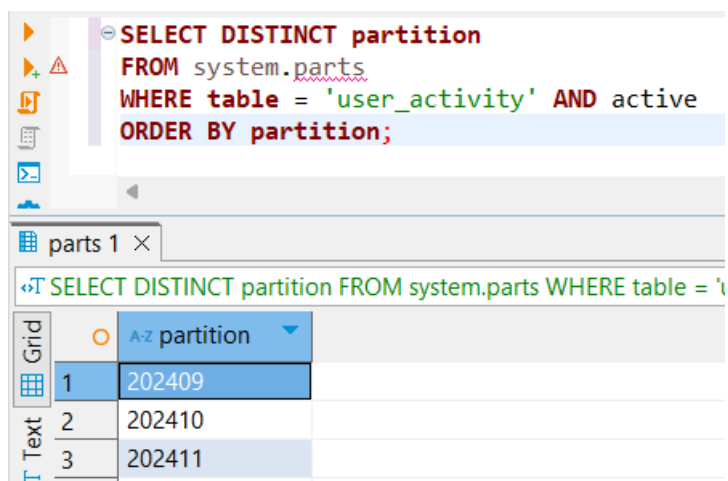


The screenshot shows a database client interface. The top pane displays the executed SQL query: `OPTIMIZE TABLE default.user_activity FINAL;` followed by `SELECT user_id, activity_type, activity_date FROM default.user_activity WHERE user_id >= 3000 ORDER BY activity_date;`. The bottom pane shows the results of the second query in a table view. The table has columns for `user_id`, `activity_type`, and `activity_date`. The first row is highlighted.

	123 user_id	A-Z activity_type	activity_date
1	3,003	login	2024-09-25 21:00:00
2	3,003	login	2024-09-25 21:00:00
3	3,004	login	2024-10-25 21:00:00
4	3,004	login	2024-10-25 21:00:00
5	3,005	login	2024-11-26 04:38:45
6	3,005	login	2024-11-26 04:38:52

Проверка оставшихся партиций

```
SELECT DISTINCT partition  
FROM system.parts  
WHERE table = 'user_activity' AND active  
ORDER BY partition;
```



The screenshot shows a database client interface. The top pane displays the executed SQL query: `SELECT DISTINCT partition FROM system.parts WHERE table = 'user_activity' AND active ORDER BY partition;`. The bottom pane shows the results in a table view. The table has columns for `partition`. The first row is highlighted.

	A-Z partition
1	202409
2	202410
3	202411